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May 24, 2021

Mr. Kevin McDermott
Albemarle County
401 McIntire Road
Charlottesville, Virginia 22902
Phone: (434) 296-5832

Reference: Rio Point –Traffic Impact Analysis (TIA) - ***Revised***

Dear Mr. McDermott,

Ramey Kemp & Associates, Inc. (RKA) has performed a Traffic Impact Analysis (TIA) for the proposed 328-unit multi-family development located on the southwest corner of the Rio Road at John Warner Parkway / CATEC Driveway intersection. The access plan includes one full-movement driveway and one right-in only driveway on Rio Road and a stub-out for a future connection on the south side of the property. If approved, the proposed development is expected to be built in 2023. Figure 1 shows the site location and study intersections, and Figure 2 shows the preliminary site plan.

The purpose of this letter report is to provide the following:

- Trip generation calculations
- Evaluation of turn lane warrants for the site driveways
- Capacity and queueing analysis of the study intersections

Existing Roadway Conditions

Route 631 (Rio Road) is a four-lane divided Minor Arterial with a 2019 Virginia Department of Transportation (VDOT) average daily traffic (ADT) volume of approximately 28,000 vehicles per day (vpd) and a posted speed limit of 35 miles per hour (mph) north of the John Warner Parkway intersection. Rio Road becomes a two-lane Major Collector with a posted speed limit of 35 mph south of the John Warner Parkway intersection. South of the Pen Park Road / Waldorf School Road intersection, the approximate 2019 VDOT ADT of Rio Road is 9,300 vpd.

Route 2500 (John Warner Parkway) is a two-lane Minor Arterial with a posted speed limit of 35 mph in the vicinity of the site and does not have a VDOT published ADT volume. Based on discussion with the County, the ADT is approximately 17,500 vpd.

Route 768 (Pen Park Road) is a two-lane local road with a 2019 VDOT ADT volume of approximately 4,400 vpd, and a posted speed limit of 35 mph in the vicinity of the site.

Route 1177 (Dunlora Drive) is a two-lane local road with a 2019 VDOT ADT volume of approximately 2,400 vpd, and a posted speed limit of 35 mph in the vicinity of the site.

Figure 3 shows existing lane configuration.

Existing Traffic Volumes
The AM peak hour (7:00 to 9:00 AM) and PM peak hour (4:00 to 6:00 PM) turning movement counts were conducted by Burns Service, Inc. during the week of August 27, 2018 at the following intersections:

- Rio Road at John Warner Parkway / CATEC Driveway
- Rio Road at Dunlora Drive
- Rio Road at Pen Park Road / Waldorf School Road

The AM peak hour (7:30 to 8:30 AM) and PM peak hour (4:45 – 5:45 PM) turning movements counts for Rio Road at Dunlora Forest Drive were conducted by RKA during the week of August 19, 2019.

Note that some volumes have been increased, as necessary, to balance between the study intersections. Additionally, the 2018 and 2019 traffic counts were used due to the currently reduced traffic volumes resulting from the COVID-19 pandemic. Based on discussion with the County and VDOT, the 2018 peak hour traffic volumes were grown by an annual rate of 2.0% for three years to estimate the existing 2021 peak hour traffic volumes. The traffic count data are enclosed, and the existing volumes are shown in Figure 4.

Background Traffic Growth
Based on discussion with the County and VDOT, an annual rate of 2.0% was used to grow the 2018 peak hour traffic volumes for five years, and the 2019 volumes for four years, to estimate the 2023 peak hour traffic volumes.

Approved Development Traffic
Based on discussion with the County and VDOT, five approved developments near the site are included in this TIA. Belvedere Residential is partially built-out, with 190 single family homes and 90 townhomes remaining to be built and is located at the end of Belvedere Boulevard. The trip generation potential of Belvedere Residential during a typical weekday, AM peak hour and PM peak hour was estimated using the methodologies published by the Institute of Transportation Engineers (ITE) *Trip Generation Manual – 10th Edition*.

Table 1
ITE Trip Generation – Belvedere Residential – Weekday – 10th Edition

Land Use (ITE Land Use Code)	Size	Weekday Daily Traffic (vpd)		AM Peak Hour (vph)		PM Peak Hour (vph)	
		Enter	Exit	Enter	Exit	Enter	Exit
Single Family Detached Housing (210)	190 homes	938	938	35	106	118	70
Multifamily Housing (Low-Rise) (220)	90 units	330	330	10	33	34	20
Total Trips		**1,268**	**1,268**	**45**	**139**	**152**	**90**

Figures 5 and 6 show the trip distribution and assignment for Belvedere Residential.

Dunlora Park Residential consists of 28 single family homes and 14 townhomes and is located on Varick Street. The ITE trip generation potential of Dunlora Park Residential is shown in Table 2.

Table 2
ITE Trip Generation – Dunlora Park Residential – Weekday – 10th Edition

Land Use (ITE Land Use Code)	Size	Weekday Daily Traffic (vpd)		AM Peak Hour (vph)		PM Peak Hour (vph)	
		Enter	Exit	Enter	Exit	Enter	Exit
Single Family Detached Housing (210)	28 homes	161	161	6	19	19	11
Multifamily Housing (Low-Rise) (220)	14 units	51	51	1	6	6	4
Total Trips		**212**	**212**	**7**	**25**	**25**	**15**

Figures 7 and 8 show the trip distribution and assignment for Dunlora Park Residential.

Lochlyn Hill Residential is partially built-out, with 129 single family homes and 14 townhomes remaining to be built and is located on the south side of Pen Park Lane. The ITE trip generation potential of Lochlyn Hill Residential is shown in Table 3.

Table 3
ITE Trip Generation – Lochlyn Hill Residential – Weekday – 10th Edition

Land Use (ITE Land Use Code)	Size	Weekday Daily Traffic (vpd)		AM Peak Hour (vph)		PM Peak Hour (vph)	
		Enter	Exit	Enter	Exit	Enter	Exit
Single Family Detached Housing (210)	129 homes	657	657	24	72	82	48
Multifamily Housing (Low-Rise) (220)	14 units	51	51	1	6	6	4
Total Trips		**708**	**708**	**25**	**78**	**88**	**52**

Figures 9 and 10 show the trip distribution and assignment for Lochlyn Hill Residential.

The SOCA Fieldhouse is a proposed indoor soccer fieldhouse, to be located at the end of Belvedere Boulevard. In addition to one indoor field, the development plan also includes a synthetic field, 3 full-sized natural surface fields, and 2 half-sized natural surface fields, all of which will be outdoors. The ITE trip generation potential of the SOCA Fieldhouse is shown in Table 4.

Table 4
ITE Trip Generation – SOCA Fieldhouse – Weekday – 10th Edition

Land Use (ITE Land Use Code)	Size	Average Daily Traffic (vpd)		AM Peak Hour (vph)		PM Peak Hour (vph)	
		Enter	Exit	Enter	Exit	Enter	Exit
Soccer Complex (488)	8 fields	286	286	5	3	96	50

Figures 11 and 12 show the trip distribution and assignment for the SOCA Fieldhouse.

The Center at Belvedere is a recreation center for senior citizens, located on Belvedere Road. The project is set to be constructed in two phases, with the first phase, a 43,240 s.f. recreation center, already built out. An additional 16,760 s.f. building is planned to be constructed in the future. The ITE trip generation potential of The Center at Belvedere is shown in Table 5.

Table 5
ITE Trip Generation – The Center at Belvedere (Senior Center) – Weekday – 10th Edition

Land Use (ITE Land Use Code)	Size	Weekday Daily Traffic (vpd)		AM Peak Hour (vph)		PM Peak Hour (vph)	
		Enter	Exit	Enter	Exit	Enter	Exit
Phase 1 – Recreational Community Center[1] (495)	43,240 s.f.	623	623	50	26	47	53
Phase 2 – Recreational Community Center[1] (495)	16,760 s.f.	242	242	19	10	18	21
Total Trips		**865**	**865**	**69**	**36**	**65**	**74**

1. ITE has no data for a senior recreation center. The trip generation estimates shown are for a standard recreational community center (all ages) and likely over-estimate the number of trips that would be generated by the proposed use.

Figures 13 and 14 show the trip distribution and assignment for The Center at Belvedere. The total approved development trips are shown in Figure 15. The total approved development trips were combined with the background growth to estimate the 2023 no-build traffic volumes, which are shown in Figure 16. Additionally, Figure 17 shows a 2023 no-build scenario including the construction of the planned roundabout.

Trip Generation

The trip generation potential of the proposed neighborhood during a typical weekday, AM peak hour, and PM peak hour was estimated using the methodologies published by the Institute of Transportation Engineers (ITE) *Trip Generation Manual – 10th Edition*. Table 6 summarizes the trip generation calculations.

Table 6
ITE Trip Generation – Typical Weekday – 10th Edition

Land Use (ITE Land Use Code)	Size	Average Daily Traffic (vpd)		AM Peak Hour (vph)		PM Peak Hour (vph)	
		Enter	Exit	Enter	Exit	Enter	Exit
Multifamily Housing (Mid-Rise) (221)	328 units	893	893	31	87	85	54

It should be noted that Rio Road is an existing transit corridor, and some of the future residents living along Rio Road will likely use the transit service. This will reduce the number of vehicles on Rio Road. To be conservative, this reduction was not applied to the trip generation potential of the site or the surrounding approved developments.

Site Traffic Distribution

The following site traffic distribution was applied based on coordination with the County and VDOT:

- 32% to / from the north on Rio Road
- 32% to / from the south on Rio Road
- 31% to / from the south on John Warner Parkway
- 2% to / from the east on Pen Park Road
- 1% to / from the south on Waldorf School Road
- 1% to / from the north on CATEC Driveway
- 1% to / from the north on Dunlora Drive

Figures 18 and 19 show the site trip distribution and site trip assignment, respectively. Figure 20 shows the projected 2023 build-out peak hour traffic volumes without improvements and Figure 21 shows the projected 2023 build-out volumes with a roundabout.

VDOT Turn Lane Warrant Analysis

The projected build-out AM and PM peak hour traffic volumes at the proposed site driveways were compared to the turn lane warrants in the Virginia Department of Transportation (VDOT) *Access Management Design Standards for Entrances and Intersections*:

Rio Road at Right-in Only Driveway:

- A southbound right-turn taper on Rio Road is warranted in the PM peak hour only

Rio Road at Full-Movement Driveway:

- A northbound left-turn lane on Rio Road is warranted
- A southbound right-turn taper on Rio Road is warranted in the PM peak hour only

Intersection Spacing Standards

VDOT requires at least 250 feet of separation between partial access driveways and full-movement driveways / intersections on Major Collector roadways. The proposed right-in only driveway is approximately 190 feet south of Dunlora Drive and 305 feet north of the proposed full-movement driveway. The proposed right-in only driveway does not meet VDOT's minimum intersection spacing standards, so an Access Management Exception (AME) request will be submitted.

VDOT requires at least 335 feet of separation between full-movement driveways and intersections on Major Collector roadways. The proposed full-movement driveway is approximately 735 feet north of Dunlora Forest Drive. The proposed full-movement driveway exceeds VDOT's minimum intersection spacing standards.

Traffic Capacity Analysis

Traffic capacity analysis for the study intersections was performed using Synchro 10, which is a comprehensive software package that allows the user to model signalized and unsignalized intersections to determine levels-of-service based on the thresholds specified in the Highway Capacity Manual (HCM) – 6th Edition. All queues reported are the maximum SimTraffic queues based on the average of 10 microsimulation runs.

Note that Rio Road is considered an east / west roadway but is north / south in the vicinity of the site. Additionally, John Warner Parkway, Dunlora Drive, Pen Park Road, and Waldorf School Road are all east / west roadways in the vicinity of the site.

Table 7 summarizes the capacity analysis results for the signalized intersection of Rio Road at John Warner Parkway / CATEC Driveway, and the Synchro and SimTraffic outputs are enclosed for reference.

Table 7
Level-of-Service Summary for Rio Road at John Warner Parkway / CATEC Driveway

CONDITION	LANE GROUP	Storage Length (ft)	AM PEAK HOUR				PM PEAK HOUR			
			Lane LOS	Lane Delay (sec)	Lane Queue (ft)	Overall LOS (Delay)	Lane LOS	Lane Delay (sec)	Lane Queue (ft)	Overall LOS (Delay)
Existing (2021) Traffic Conditions	EBL	200	E	66.9	78	D (37.1 sec)	F	86.5	249	D (52.7 sec)
	EBT/R	300	D	47.8	325		E	71.3	781	
	WBL	-	D	48.1	502		E	68.5	607	
	WBT	-	C	23.5	386		B	17.9	364	
	WBR	500	B	12.1	26		A	9.7	32	
	NBL/T	75	D	47.9	124		E	64.7	124	
	NBR	-	C	31.4	207		D	48.5	184	
	SBL/T	-	E	68.9	24		F	83.5	29	
	SBR	125	E	63.7	5		F	82.8	10	

Table 7 (Continued)
Level-of-Service Summary for Rio Road at John Warner Parkway / CATEC Driveway

CONDITION	LANE GROUP	Storage Length (ft)	AM PEAK HOUR				PM PEAK HOUR			
			Lane LOS	Lane Delay (sec)	Lane Queue (ft)	Overall LOS (Delay)	Lane LOS	Lane Delay (sec)	Lane Queue (ft)	Overall LOS (Delay)
No-Build (2023) Traffic Conditions ***Without Improvements***	EBL	200	E	73.9	105	D (42.7 sec)	F	95.1	249	E (79.7 sec)
	EBT/R	300	D	52.3	379		F	141.4	1,325	
	WBL	-	E	55.4	611		E	78.3	839	
	WBT	-	C	25.2	441		B	19.3	628	
	WBR	500	B	11.1	21		A	9.0	30	
	NBL/T	75	E	56.2	124		E	73.6	124	
	NBR	-	D	41.7	210		E	56.5	190	
	SBL/T	-	E	75.9	22		F	91.8	31	
	SBR	125	E	70.6	6		F	91.0	8	
Build (2023) Traffic Conditions ***Without Improvements***	EBL	200	E	75.5	201	D (44.9 sec)	F	97.0	299	F (88.6 sec)
	EBT/R	300	D	53.8	441		F	163.8	1,351	
	WBL	-	E	56.9	556		F	83.7	942	
	WBT	-	C	24.7	582		B	19.2	899	
	WBR	500	B	10.9	26		A	8.8	36	
	NBL/T	75	E	61.4	124		E	76.6	124	
	NBR	-	D	47.0	218		E	58.3	200	
	SBL/T	-	E	77.5	18		F	93.4	31	
	SBR	125	E	72.1	7		F	92.1	11	
No-Build (2023) Traffic Conditions ***With Roundabout*** [1]	EBL/T	-	B	11.5	64	B (11.2 sec)	D	31.6	292	C (17.2 sec)
	EBT	-	B	11.5	64		D	31.6	292	
	EBR	-	A	3.2	0		A	3.3	0	
	WBU/L	-	B	13.6	254		B	11.3	140	
	WBT/R	-	B	13.6	254		B	11.3	140	
	NBU/L/T	-	A	8.5	31		B	10.7	17	
	NBR	-	A	7.2	0		B	10.2	0	
	SBL/T/R	-	B	12.2	2		B	11.7	3	
Build (2023) Traffic Conditions ***With Roundabout*** [1]	EBL/T	-	B	11.7	65	B (11.8 sec)	E	35.5	318	C (18.6 sec)
	EBT	-	B	11.7	65		E	35.5	318	
	EBR	-	A	3.2	0		A	3.6	0	
	WBU/L	-	B	14.8	291		B	12.1	148	
	WBT/R	-	B	14.8	291		B	12.1	148	
	NBU/L/T	-	A	9.2	39		B	11.5	22	
	NBR	-	A	7.5	0		B	10.6	0	
	SBL/T/R	-	B	12.6	2		B	12.3	3	

1. The 2023 Roundabout scenario is included to show that this intersection will achieve adequate LOS upon construction of the expected improvements. The actual timeline of constructing the roundabout is not known, as it is not a part of this development.

Capacity analysis indicates that the intersection currently operates at LOS D during the AM and PM peak hours. Under no-build conditions without improvements, the intersection is expected to operate at LOS D in the AM peak hour and LOS E during the PM peak hour. Under build conditions without improvements, the intersection is expected to operate at LOS D in the AM peak hour and LOS F during the PM peak hour.

The County has submitted a SMART SCALE application to convert the existing intersection into a dual-lane roundabout. Under no-build conditions with a roundabout, the intersection is expected to operate at LOS B during the AM peak hour and LOS C during PM peak hour. Under build conditions with a roundabout, the intersection is expected to operate at LOS B during the AM peak hour and LOS C during PM peak hour.

Table 8 summarizes the capacity analysis results for the unsignalized intersection of Rio Road at Dunlora Drive, and the Synchro and SimTraffic outputs are enclosed for reference. Note that HCM 6 reports were used for the existing, no-build, and build without improvements scenarios.

Table 8
Level-of-Service Summary for Rio Road at Dunlora Drive

CONDITION	LANE GROUP	Storage Length (ft)	AM PEAK HOUR				PM PEAK HOUR			
			Lane LOS	Lane Delay (sec)	Lane Queue (ft)	Overall LOS (Delay)[3]	Lane LOS	Lane Delay (sec)	Lane Queue (ft)	Overall LOS (Delay)[3]
Existing (2021) Traffic Conditions	WBL[1] WBR[1] NBT/R SBL[2] SBT	- 200 - 50 -	F C - A -	57.2 15.3 - 9.5 -	96 106 - 65 -	N/A	E B - A -	39.1 14.0 - 9.6 -	60 74 - 91 -	N/A
No-Build (2023) Traffic Conditions ***Without Improvements***	WBL[1] WBR[1] NBT/R SBL[2] SBT	- 200 - 50 -	F C - A -	138.3 17.5 - 9.9 -	302 223 - 85 -	N/A	F C - B -	70.0 15.7 - 10.2 -	144 162 - 98 -	N/A
Build (2023) Traffic Conditions ***Without Improvements***	WBL[1] WBR[1] NBT/R SBL[2] SBT	- 200 - 50 -	F C - B -	188.0 18.9 - 10.2 -	468 500 - 87 -	N/A	F C - B -	89.8 16.3 - 10.4 -	141 143 - 96 -	N/A
No-Build (2023) Traffic Conditions ***With Roundabout***	WBR[1] NBT/R SBT	- - -	C - -	24.6 - -	468 - -	N/A	C - -	17.1 - -	335 - -	N/A
Build (2023) Traffic Conditions ***With Roundabout***	WBR[1] NBT/R SBT	- - -	D - -	28.2 - -	552 - -	N/A	C - -	17.9 - -	287 - -	N/A

1. Level of service for minor approach
2. Level of service for major street left-turn movement
3. HCM methodology does not provide lane group or overall LOS, delay, and queue lengths for major street through movements or right turns at unsignalized intersections.

Capacity analysis indicates that the minor street left-turn movement currently operates with long delays (greater than 50 seconds) during the AM peak hour and moderate delays (between 25 and 50 seconds) during the PM peak hour. Under no-build conditions without improvements, the minor street left-turn movement is expected to operate with long delays (greater than 50 seconds) during both peak hours. Under build conditions without improvements, capacity analysis indicates that the minor street left-turn movement is expected to operate with long delays (greater than 50 seconds) during the AM and PM peak hours.

As part of the roundabout installation at the Rio Road at John Warner / CATEC intersection, Dunlora Drive will likely be converted to right-in / right-out operation because it will be located within the functional area of the roundabout. Under no-build conditions with a roundabout, the minor street right-turn movement is expected to operate with short delays (less than 25 seconds) in both peak hours. Under build conditions with a roundabout, the minor street right-turn movement is expected to operate with moderate delays (between 25 and 50 seconds) in the AM peak hour and short delays (less than 25 seconds) in the PM peak hour.

Table 9 summarizes the capacity analysis results for the unsignalized intersection of Rio Road at Dunlora Forest Drive, and the Synchro and SimTraffic outputs are enclosed for reference.

Table 9
Level-of-Service Summary for Rio Road at Dunlora Forest Drive

CONDITION	LANE GROUP	Storage Length (ft)	AM PEAK HOUR				PM PEAK HOUR			
			Lane LOS	Lane Delay (sec)	Lane Queue (ft)	Overall LOS (Delay)[3]	Lane LOS	Lane Delay (sec)	Lane Queue (ft)	Overall LOS (Delay)[3]
Existing (2021) Traffic Conditions	WBL[1]	-	D	28.8	44	N/A	D	30.1	39	N/A
	WBR[1]	25	B	13.7	33		B	14.1	30	
	NBT	-	-	-	-		-	-	-	
	NBR	200	-	-	-		-	-	-	
	SBL[2]	225	A	9.1	30		A	9.4	46	
	SBT	-	-	-	-		-	-	-	
No-Build (2023) Traffic Conditions	WBL[1]	-	E	36.2	47	N/A	E	40.9	32	N/A
	WBR[1]	25	B	14.9	39		C	15.8	30	
	NBT	-	-	-	-		-	-	-	
	NBR	200	-	-	-		-	-	-	
	SBL[2]	225	A	9.4	33		A	9.9	48	
	SBT	-	-	-	-		-	-	-	
Build (2023) Traffic Conditions	WBL[1]	-	E	38.5	54	N/A	E	44.0	33	N/A
	WBR[1]	25	C	15.1	56		C	16.3	40	
	NBT	-	-	-	-		-	-	-	
	NBR	200	-	-	-		-	-	-	
	SBL[2]	225	A	9.5	31		B	10.0	42	
	SBT	-	-	-	-		-	-	-	

1. Level of service for minor approach
2. Level of service for major street left-turn movement
3. HCM methodology does not provide lane group or overall LOS, delay, and queue lengths for major street through movements or right turns at unsignalized intersections.

Capacity analysis indicates that the minor street left-turn movement currently operates with moderate delays (between 25 and 50 seconds) during both the AM and PM peak hours. Under no-build conditions, the minor street left-turn movement is expected to continue to operate with moderate delays (between 25 and 50 seconds) during both the AM and PM peak hours.

Under build conditions, capacity analysis indicates that the minor street left-turn movement is expected to continue to operate with moderate delays (between 25 and 50 seconds) during both the AM and PM peak hours.

No improvements are warranted or recommended at this intersection at build out of the neighborhood.

Table 10 summarizes the capacity analysis results for the signalized intersection of Rio Road at Pen Park Road / Waldorf School Road, and the Synchro and SimTraffic outputs are enclosed for reference.

Table 10
Level-of-Service Summary for Rio Road at Pen Park Road / Waldorf School Road

CONDITION	LANE GROUP	Storage Length (ft)	AM PEAK HOUR				PM PEAK HOUR			
			Lane LOS	Lane Delay (sec)	Lane Queue (ft)	Overall LOS (Delay)	Lane LOS	Lane Delay (sec)	Lane Queue (ft)	Overall LOS (Delay)
Existing (2021) Traffic Conditions	EBL/T/R	-	C	26.8	97	C (22.2 sec)	C	24.7	33	B (13.2 sec)
	WBL/T	350	D	43.0	170		C	25.6	73	
	WBR	-	C	31.6	135		C	30.4	70	
	NBL	75	B	13.1	150		A	8.1	60	
	NBT	-	C	20.6	320		B	14.0	296	
	NBR	125	B	15.0	192		A	8.8	154	
	SBL	225	B	14.9	207		A	9.9	188	
	SBT	-	B	17.4	342		A	8.8	206	
	SBR	100	B	12.5	172		A	6.3	20	
No-Build (2023) Traffic Conditions	EBL/T/R	-	C	32.9	121	C (25.6 sec)	C	27.7	45	B (14.6 sec)
	WBL/T	350	E	61.5	207		C	28.7	84	
	WBR	-	D	41.6	158		C	34.0	80	
	NBL	75	B	13.0	156		A	8.0	72	
	NBT	-	C	22.3	397		B	16.4	368	
	NBR	125	B	14.1	225		A	8.3	192	
	SBL	225	B	16.2	224		B	11.6	117	
	SBT	-	B	17.4	337		A	9.0	248	
	SBR	100	B	11.6	126		A	5.9	40	
Build (2023) Traffic Conditions	EBL/T/R	-	C	33.7	134	C (26.2 sec)	C	28.4	52	B (15.1 sec)
	WBL/T	350	E	63.8	208		C	29.4	90	
	WBR	-	D	43.2	151		C	34.9	89	
	NBL	75	B	13.4	174		A	7.9	87	
	NBT	-	C	22.7	381		B	17.5	384	
	NBR	125	B	14.0	224		A	8.2	209	
	SBL	225	B	16.5	225		B	12.3	119	
	SBT	-	B	18.2	377		A	9.0	228	
	SBR	100	B	11.5	188		A	5.9	5	

Capacity analysis indicates that the intersection currently operates at LOS C during the AM peak hour and LOS B during the PM peak hour. Under no-build conditions, the intersection is expected to continue to operate at LOS C during the AM peak hour and LOS B during the PM peak hour.

Under build conditions, capacity analysis indicates that the intersection is expected to continue to operate at LOS C during the AM peak hour and LOS B during the PM peak hour with all movements at LOS E or better.

No improvements are warranted or recommended at this intersection at build out of the neighborhood.

Table 11 summarizes the capacity analysis results for the unsignalized intersection of Rio Road and Full-movement Driveway, and the Synchro and SimTraffic outputs are enclosed for reference.

Table 11
Level-of-Service Summary for Rio Road at Full-movement Driveway

CONDITION	LANE GROUP	Storage Length (ft)	AM PEAK HOUR				PM PEAK HOUR			
			Lane LOS	Lane Delay (sec)	Lane Queue (ft)	Overall LOS (Delay)[3]	Lane LOS	Lane Delay (sec)	Lane Queue (ft)	Overall LOS (Delay)[3]
Build (2023) Traffic Conditions	EBL[1]	-	F	55.0	180	N/A	F	58.4	115	N/A
	EBR[1]	-	B	13.6	57		B	13.8	38	
	NBL[2]	100	A	9.0	63		A	9.3	72	
	NBT	-	-	-	-		-	-	-	
	SBT/R	-	-	-	-		-	-	-	

1. Level of service for minor approach
2. Level of service for major street left-turn movement
3. HCM methodology does not provide lane group or overall LOS, delay, and queue lengths for major street through movements or right turns at unsignalized intersections.

Under build conditions, capacity analysis indicates that the minor street left-turn movement is expected to operate with long delays (greater than 50 seconds) during the AM and PM peak hours with the following improvements:

- Construct a northbound left-turn lane on Rio Road with 100 feet of storage and 100 feet of taper
- Construct a 100-foot southbound right-turn taper on Rio Road
- Construct the site driveway with one ingress lane and two egress lanes

Recommendations
Based on the trip generation potential of the site, the following improvements are recommended:

Rio Road at Right-in Only Driveway:
- Construct a 100-foot southbound right-turn taper on Rio Road
- Construct the site driveway with one ingress lane

Rio Road at Full-movement Driveway:
- Construct a northbound left-turn lane on Rio Road with 100 feet of storage and 100-foot taper
- Construct a 100-foot southbound right-turn taper on Rio Road
- Construct the site driveway with one ingress lane and two egress lanes

Figure 22 shows the recommended lane configuration.

We appreciate your attention to this matter. Please contact me at (804) 217-8560 if you have any questions about this report.

Sincerely yours,

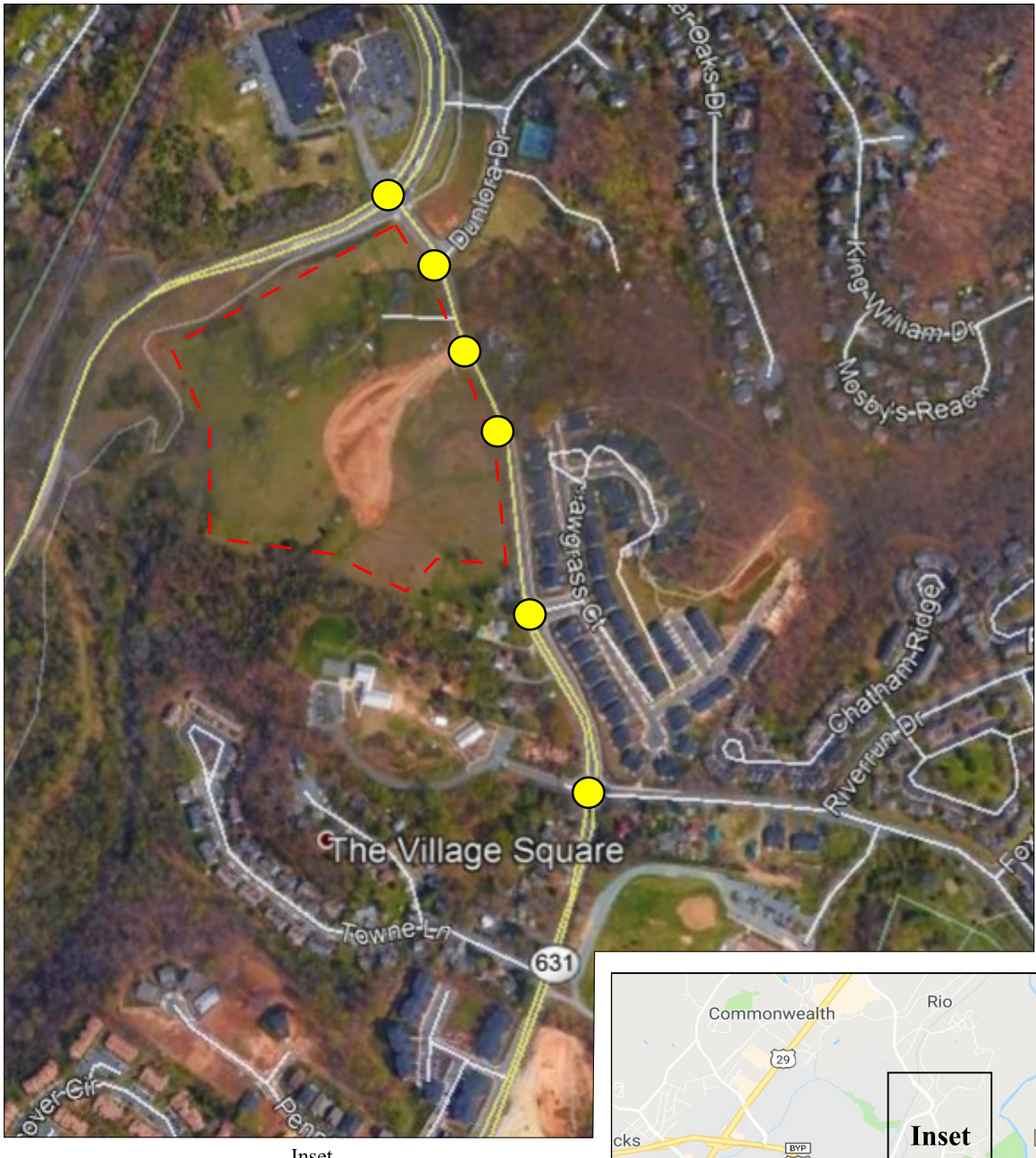
Ramey Kemp & Associates, Inc.

COMMONWEALTH OF VIRGINIA
5/27/2021
MICHAEL D. BAILEY
Lic. No. 054363
DocuSigned by:
Michael D. Bailey
AA917789752743E...
PROFESSIONAL ENGINEER

Michael Bailey, P.E., PTOE
State Traffic Operations Lead

Enclosures: Figures, VDOT turn lane warrant diagrams, Traffic count data, Synchro output

Copy to: Mr. Adam Moore, P.E., VDOT
Mr. Chris Henry, Stony Point Development Group
Mr. Craig Kotarski, P.E., Timmons Group
Mr. Kevin Miller, Stony Point Development Group
Mr. Steven Blaine, Woods Rogers PLC



Inset

Overview

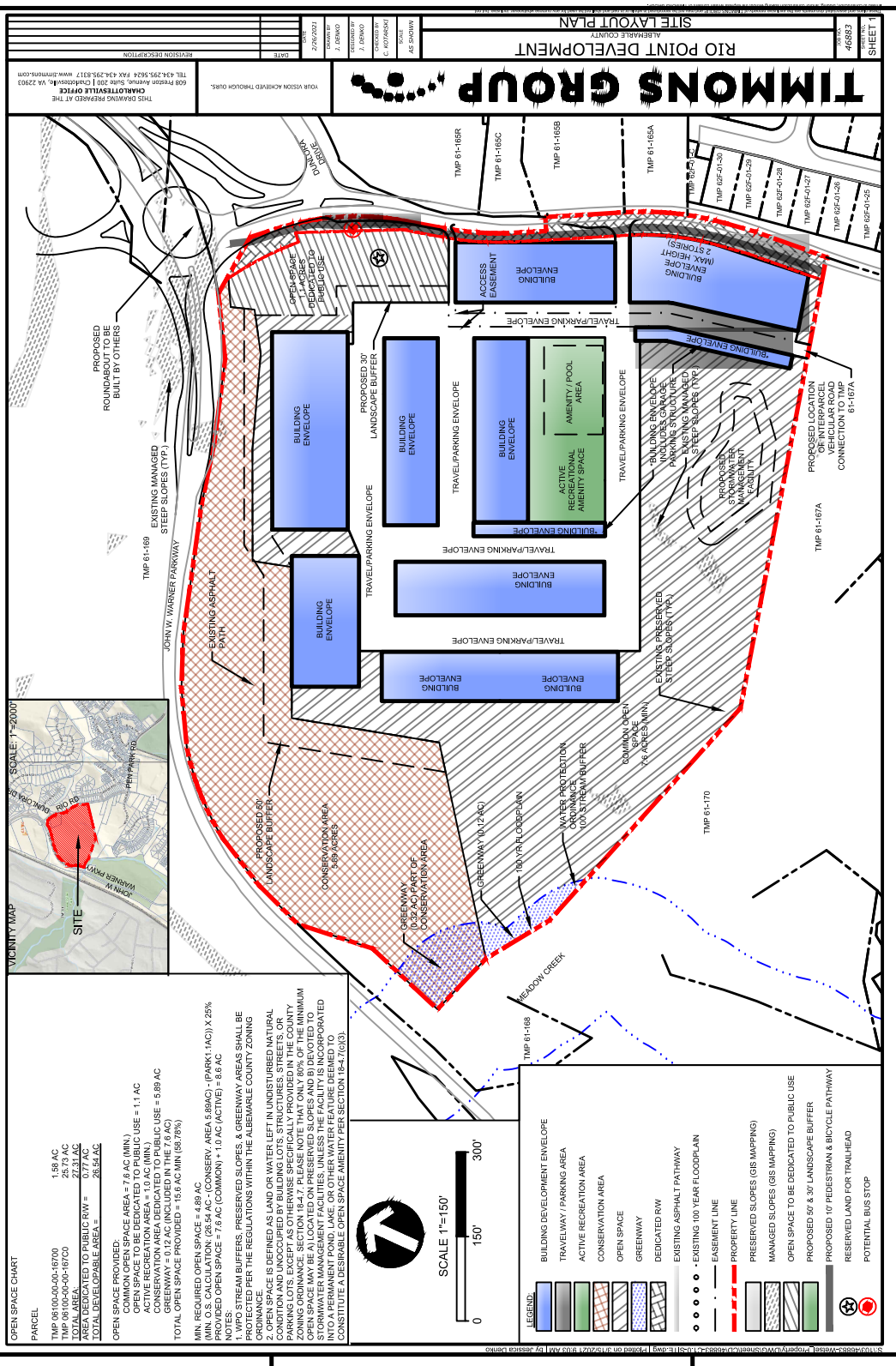
LEGEND

N

Study Intersection

Site Boundary

Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	Site Location and Study Intersections Figure 1



Moving forward.
RKA
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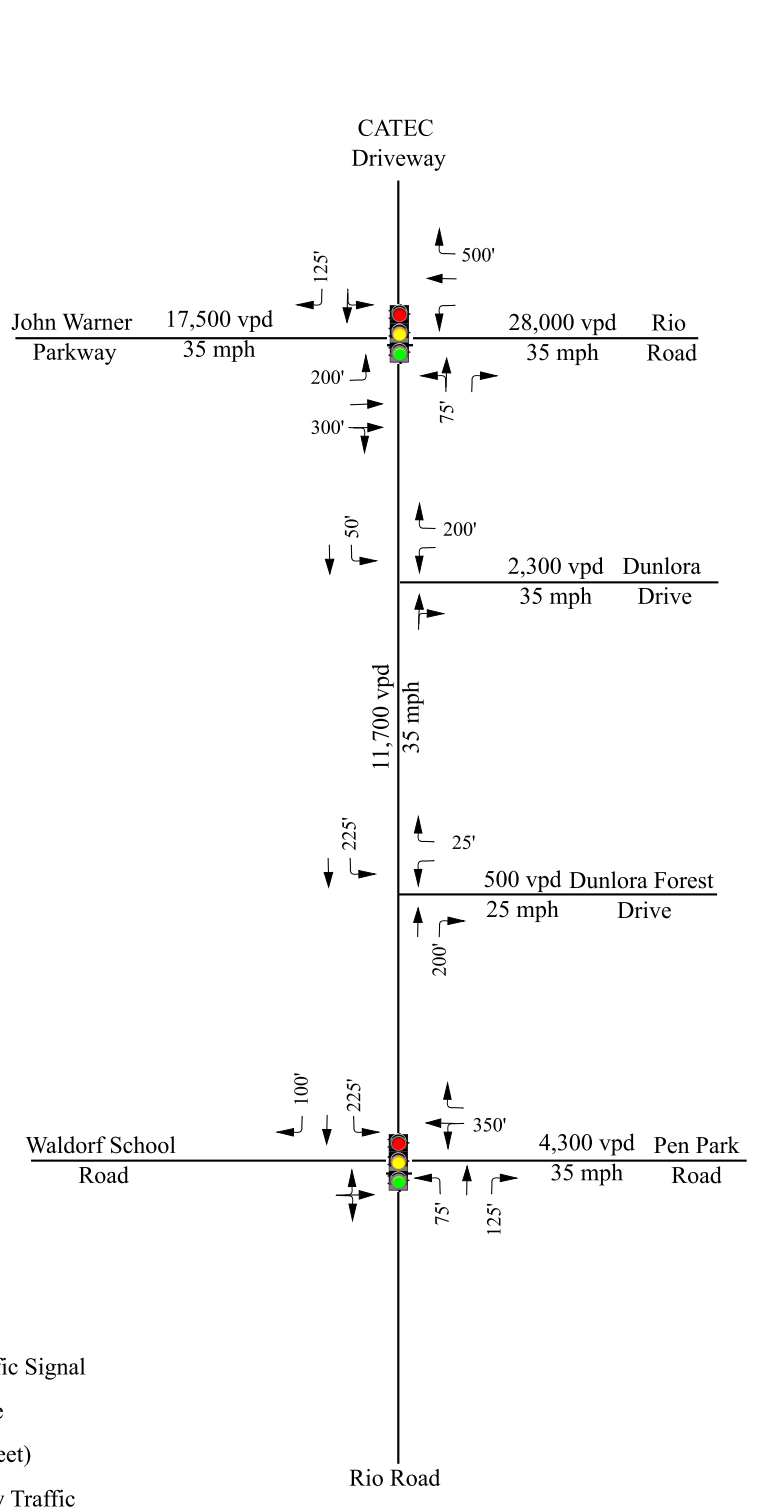
Rio Point
Albemarle County, Virginia

Preliminary Site Plan

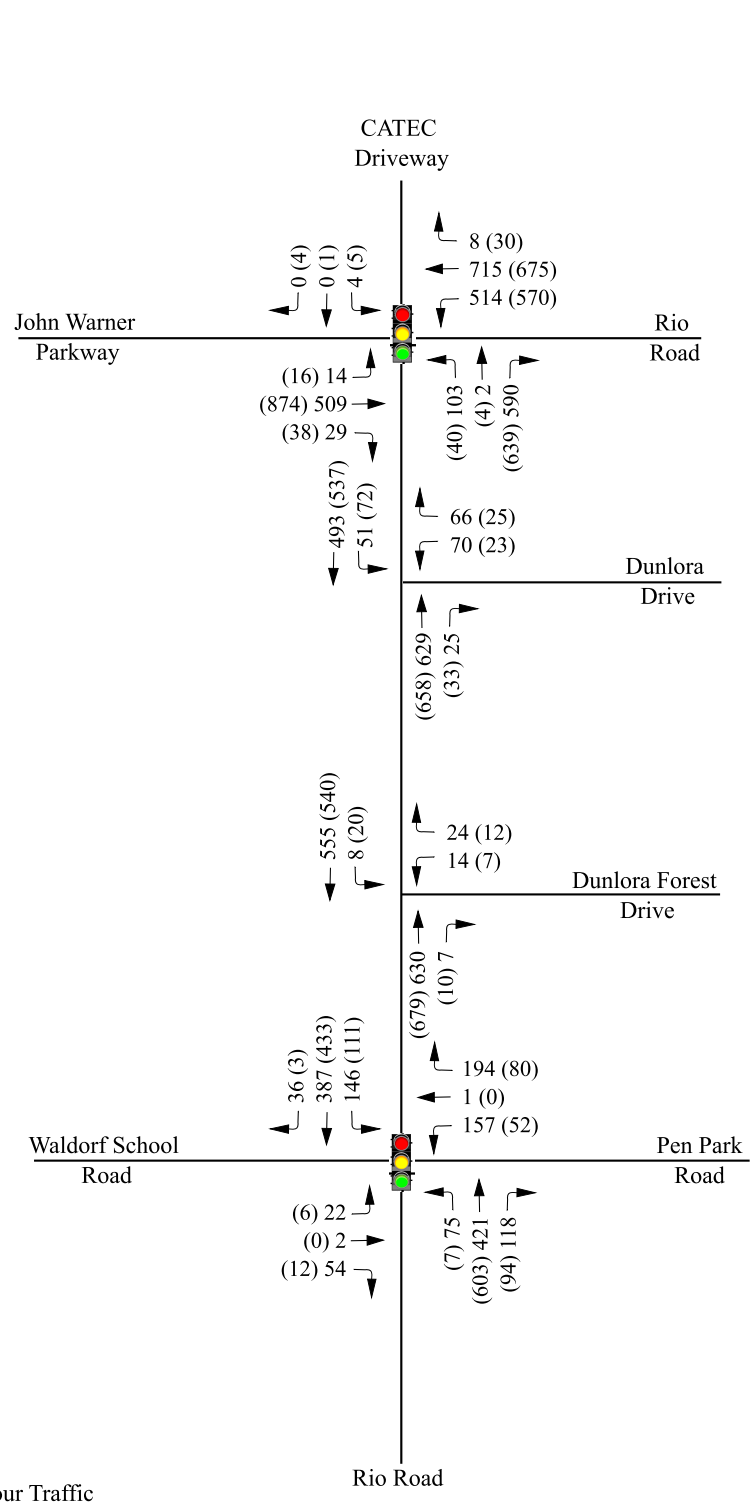
Figure 2



LEGEND

- Existing Traffic Signal
- Existing Lane
- X' — Storage (In Feet)
- X vpd — Average Daily Traffic

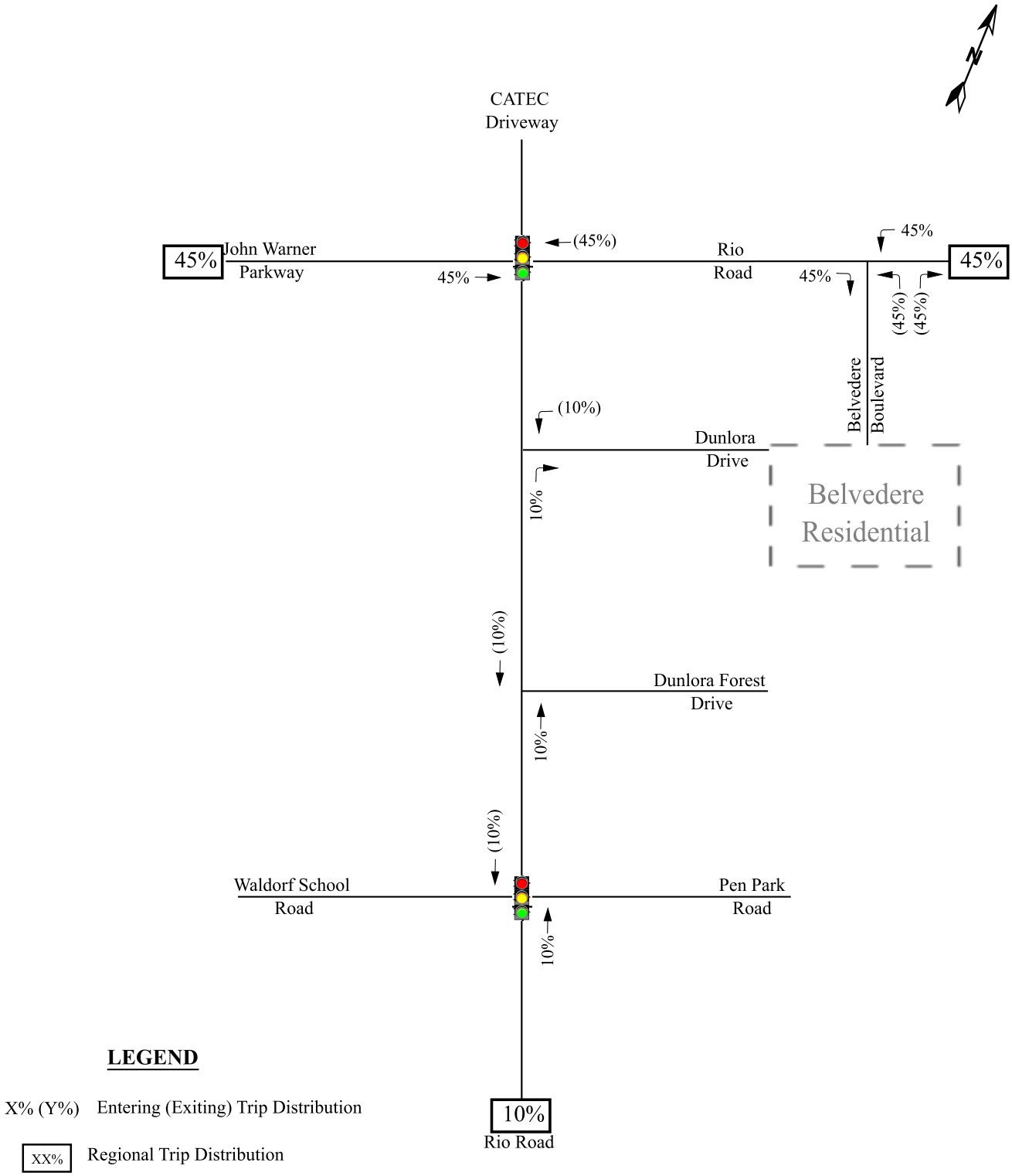
Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	Existing (2021) Lane Configurations Figure 3



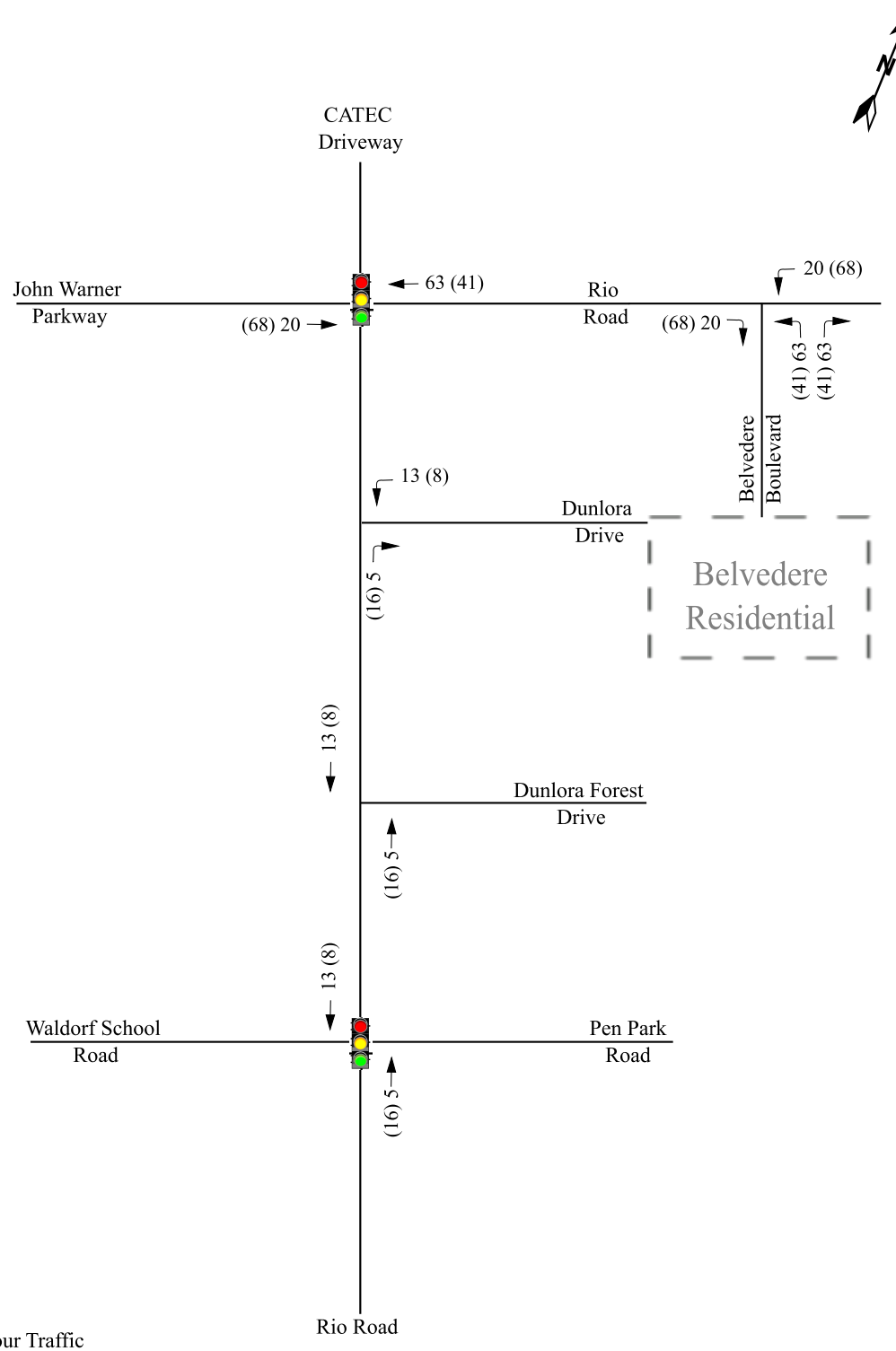
LEGEND

X (Y) AM (PM) Peak Hour Traffic

Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	Existing (2021) Peak Hour Traffic Volumes Figure 4



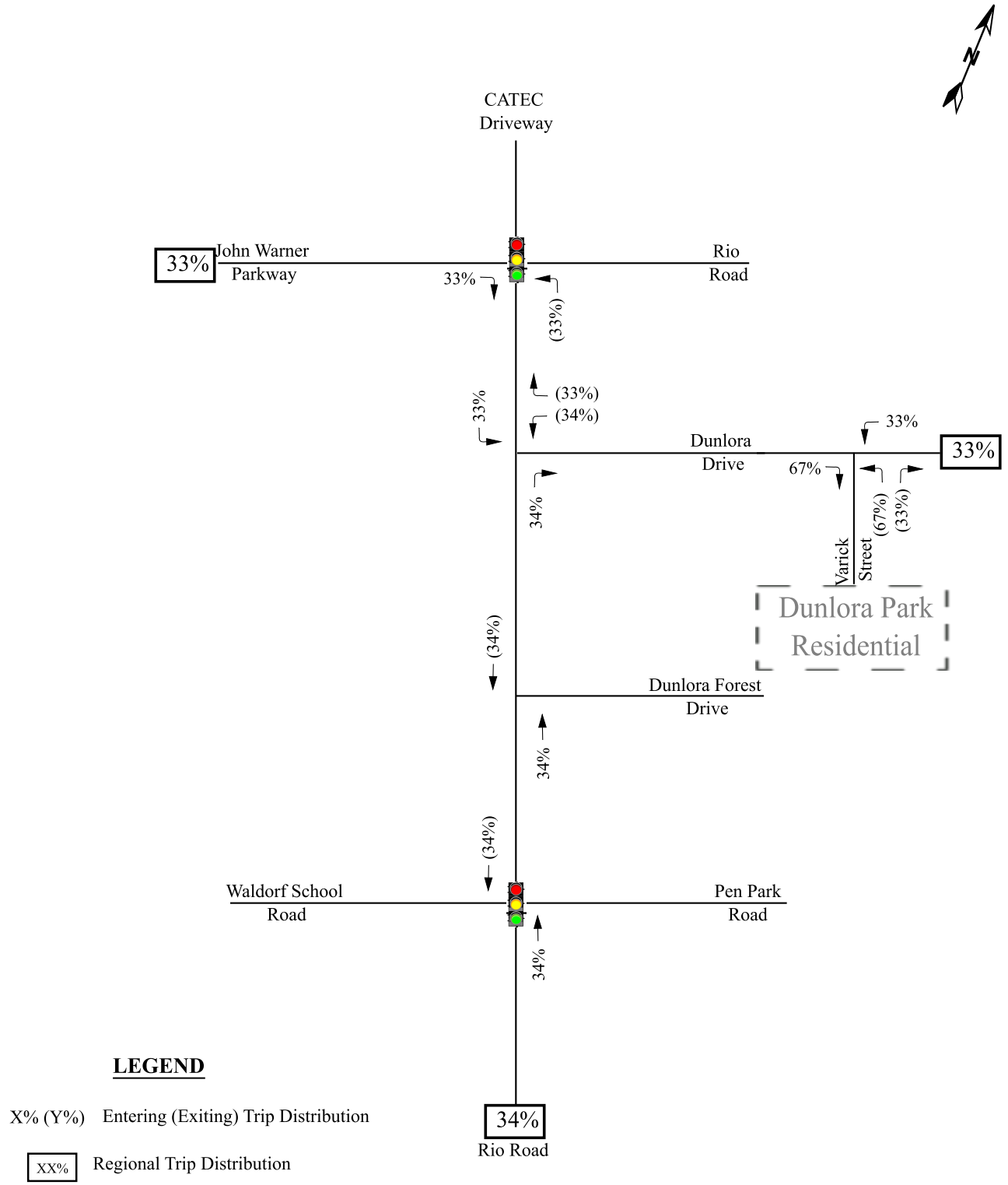
Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	Belvedere Residential Distribution Figure 5



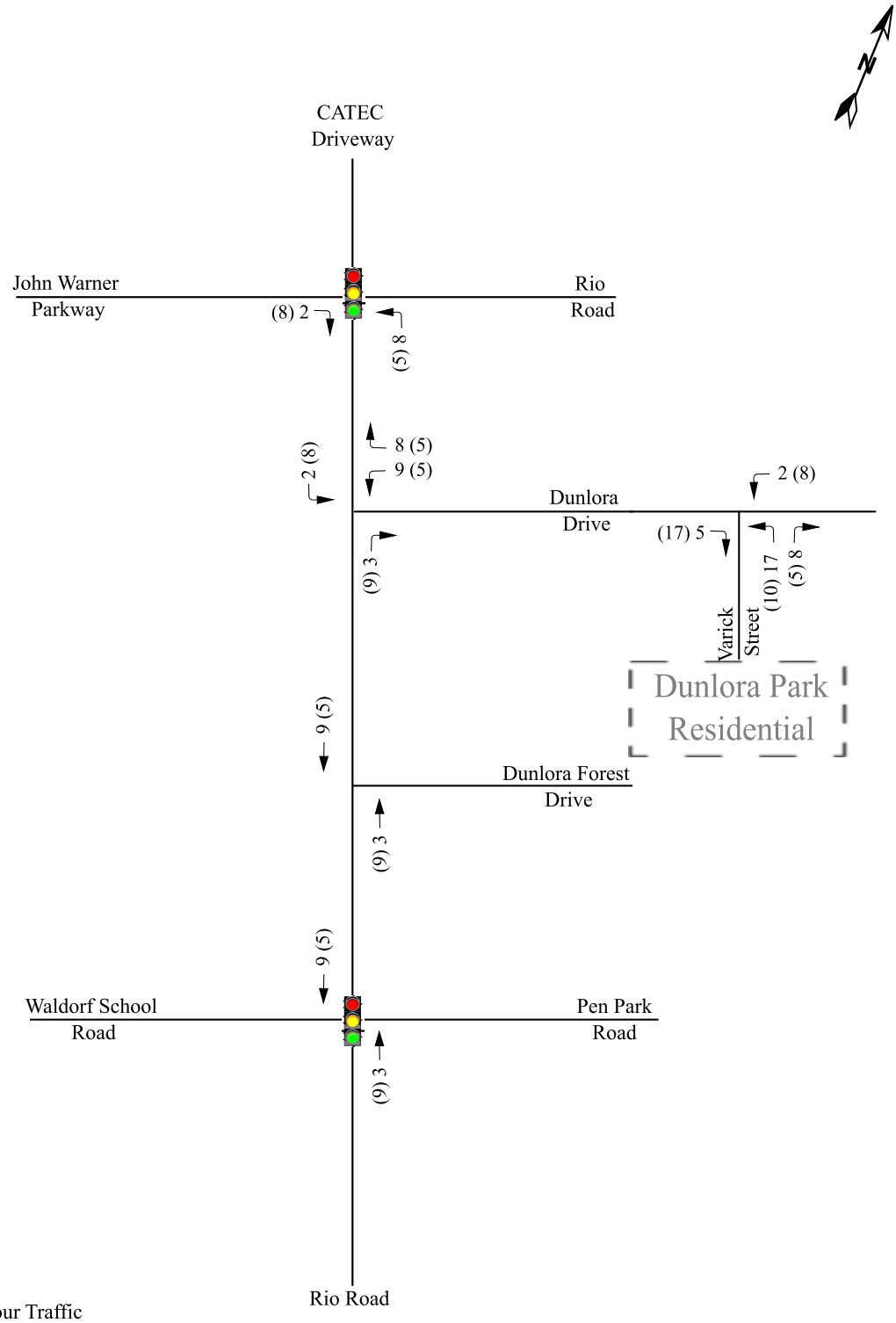
LEGEND

X (Y) AM (PM) Peak Hour Traffic

Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	Belvedere Residential Assignment Figure 6



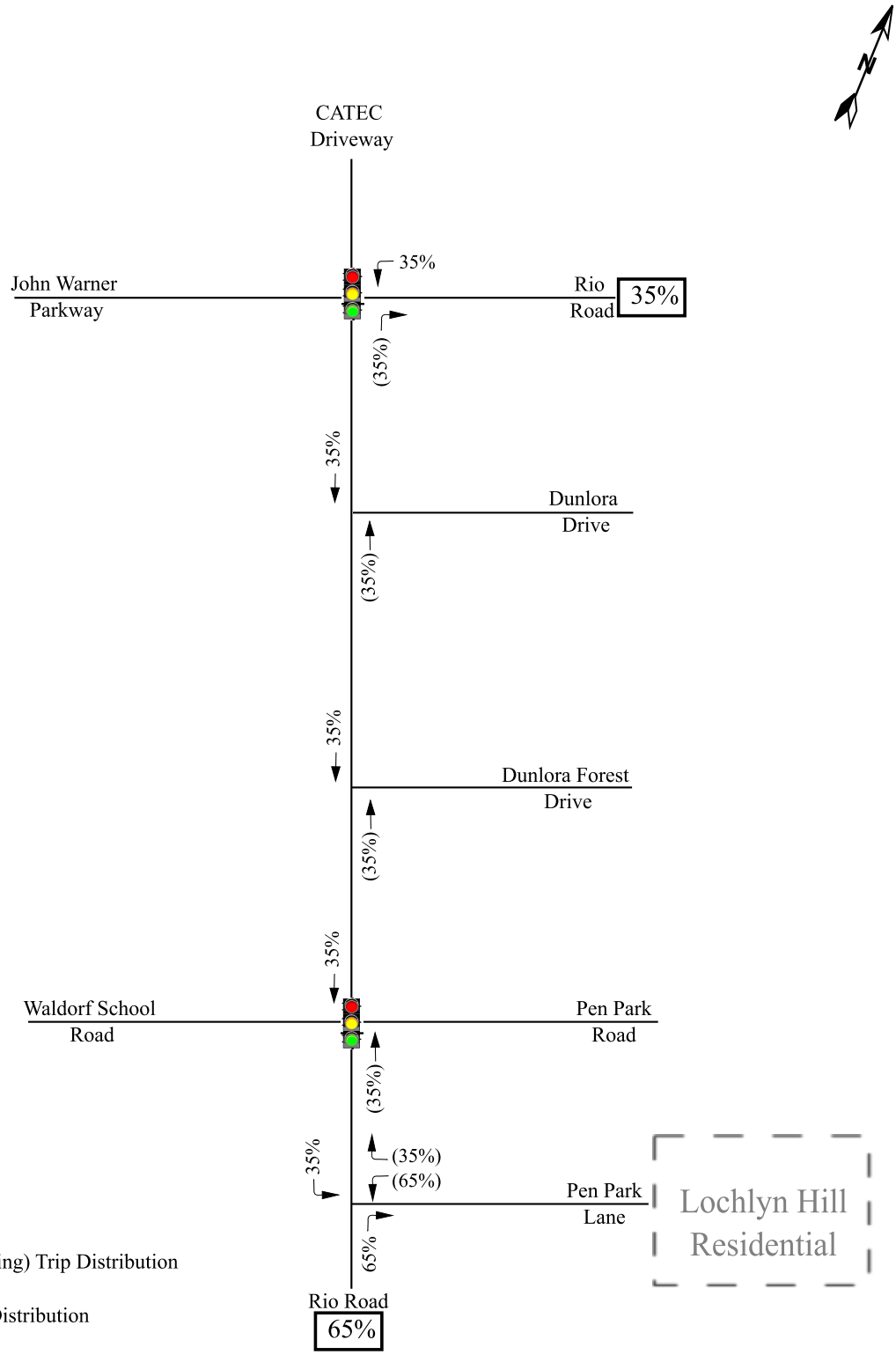
Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	Dunlora Park Residential Distribution Figure 7



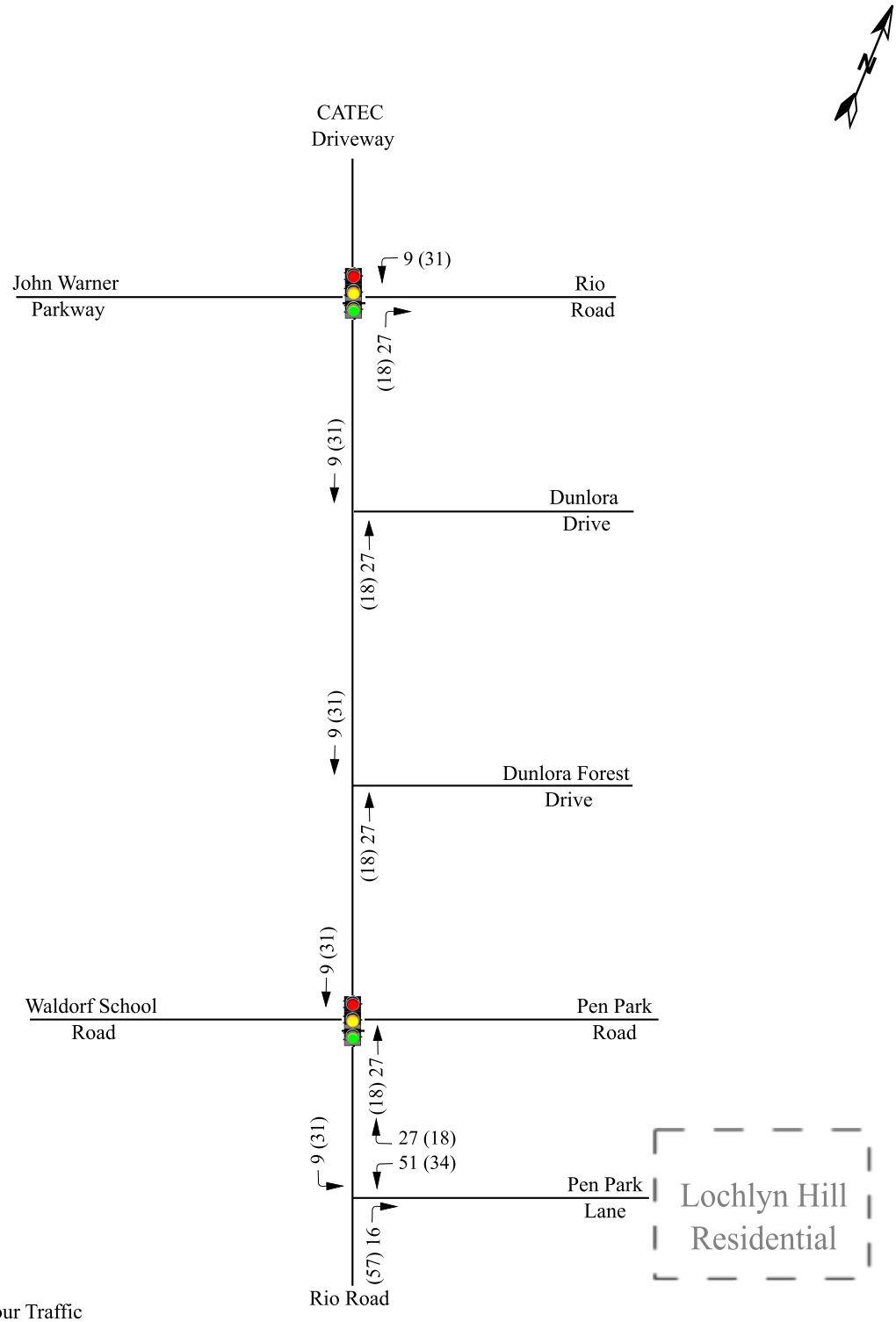
LEGEND

X (Y) AM (PM) Peak Hour Traffic

Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	Dunlora Park Residential Assignment Figure 8



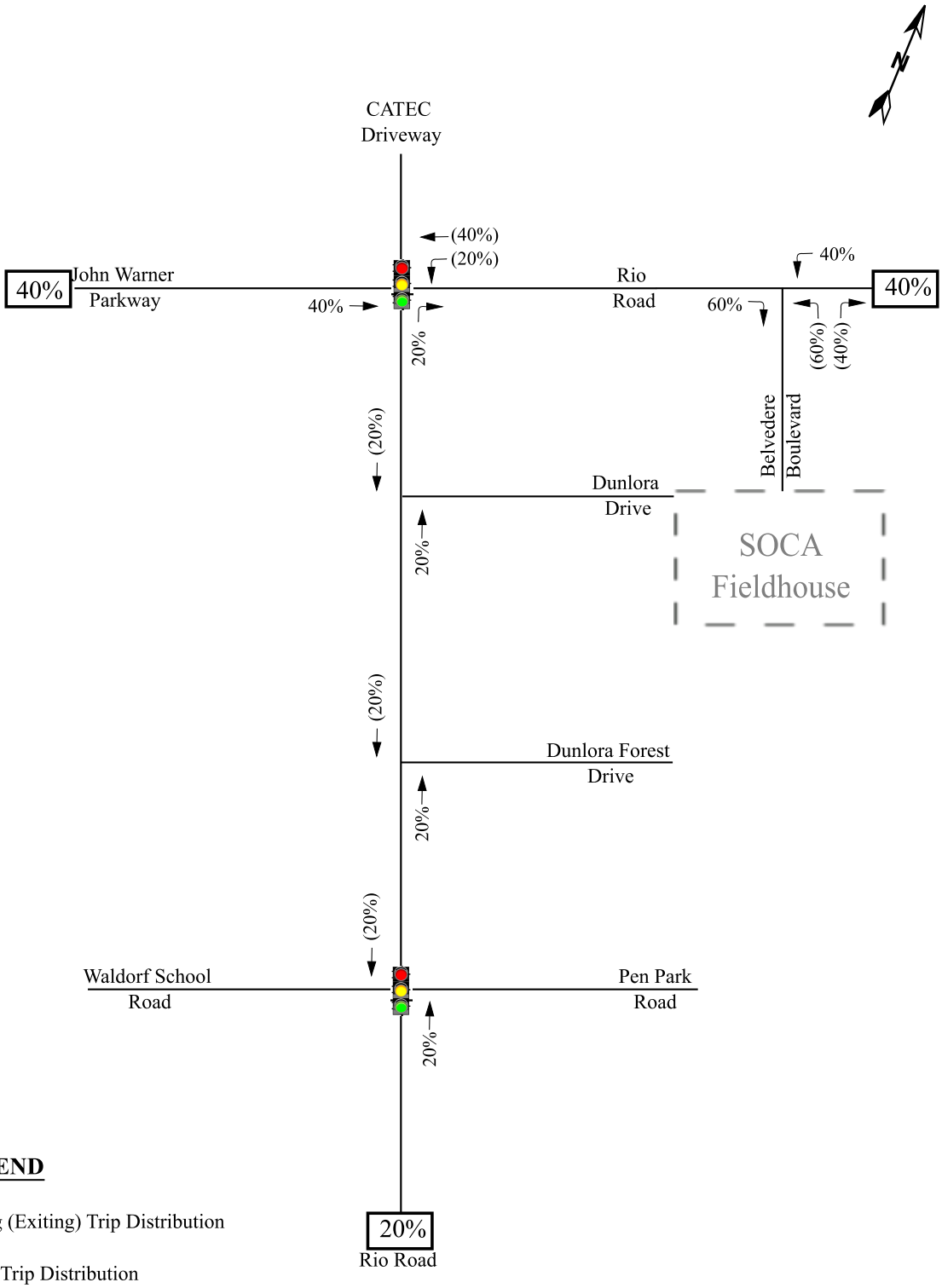
Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	Lochlyn Hill Residential Distribution Figure 9



LEGEND

X (Y) AM (PM) Peak Hour Traffic

Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	Lochlyn Hill Residential Assignment Figure 10

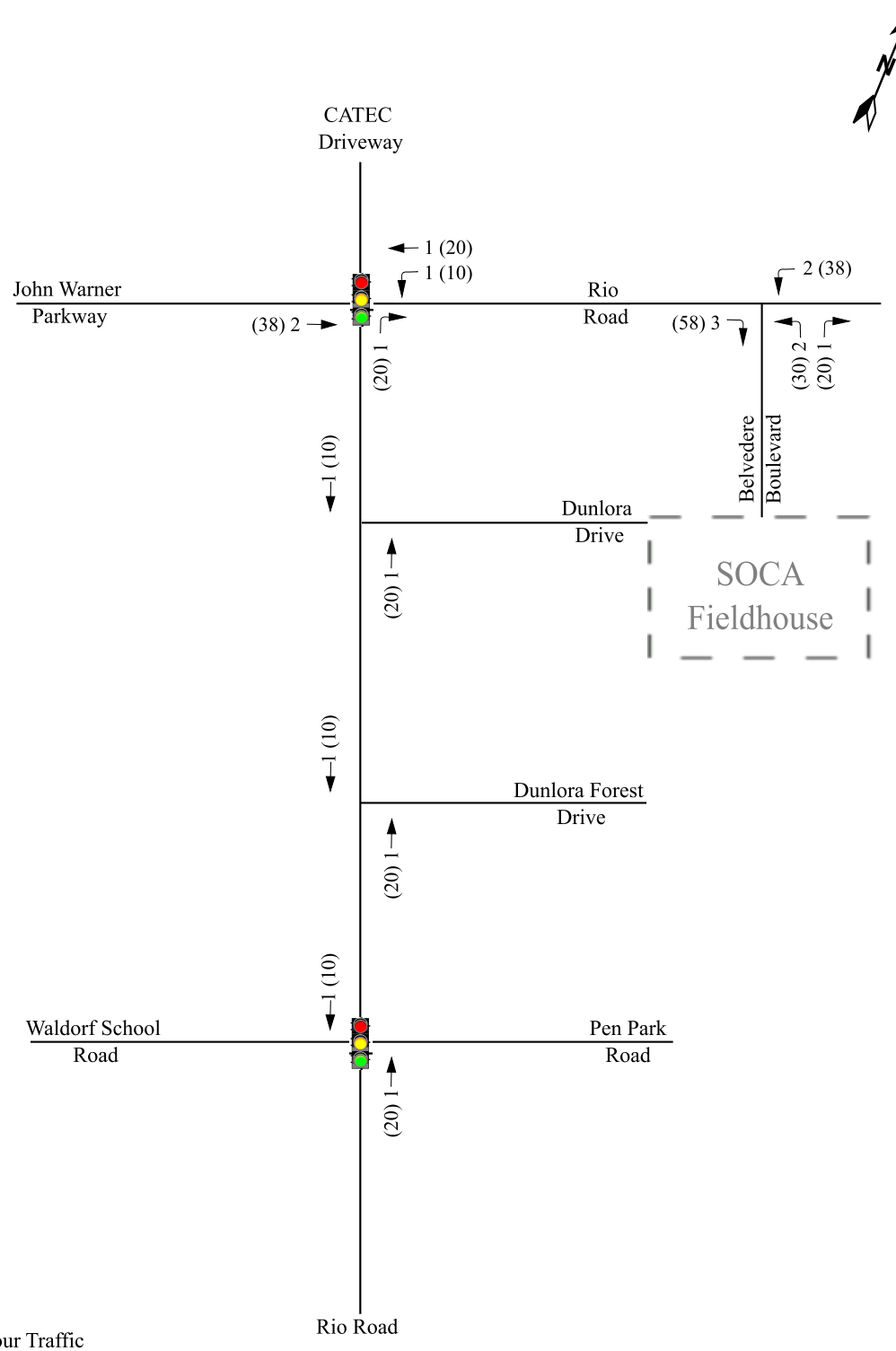


LEGEND

X% (Y%) Entering (Exiting) Trip Distribution

XX% Regional Trip Distribution

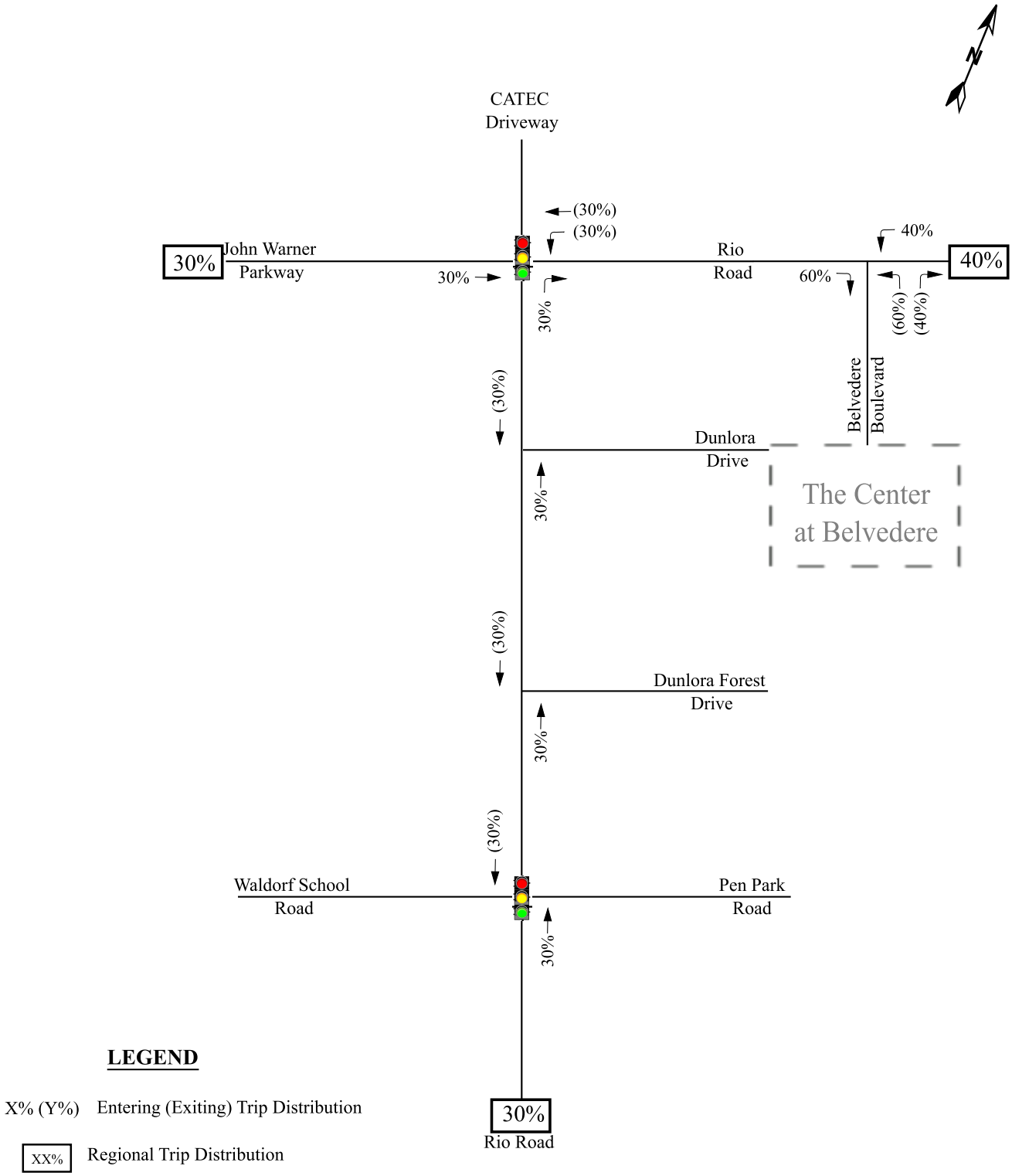
Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	SOCA Fieldhouse Distribution Figure 11



LEGEND

X (Y) AM (PM) Peak Hour Traffic

Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	SOCA Fieldhouse Assignment Figure 12



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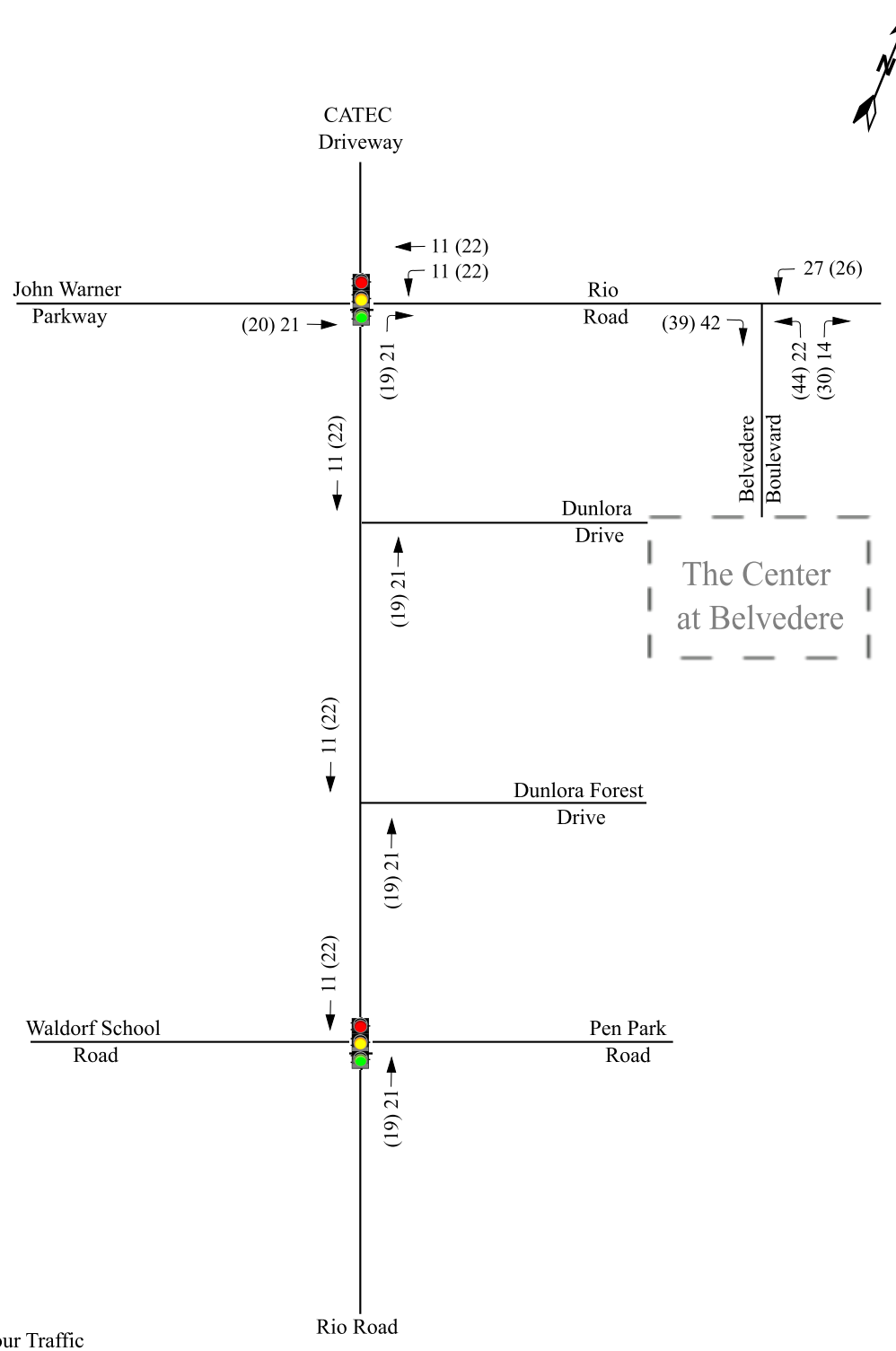
Albemarle County, Virginia

The Center at Belvedere
(Senior Center) Distribution

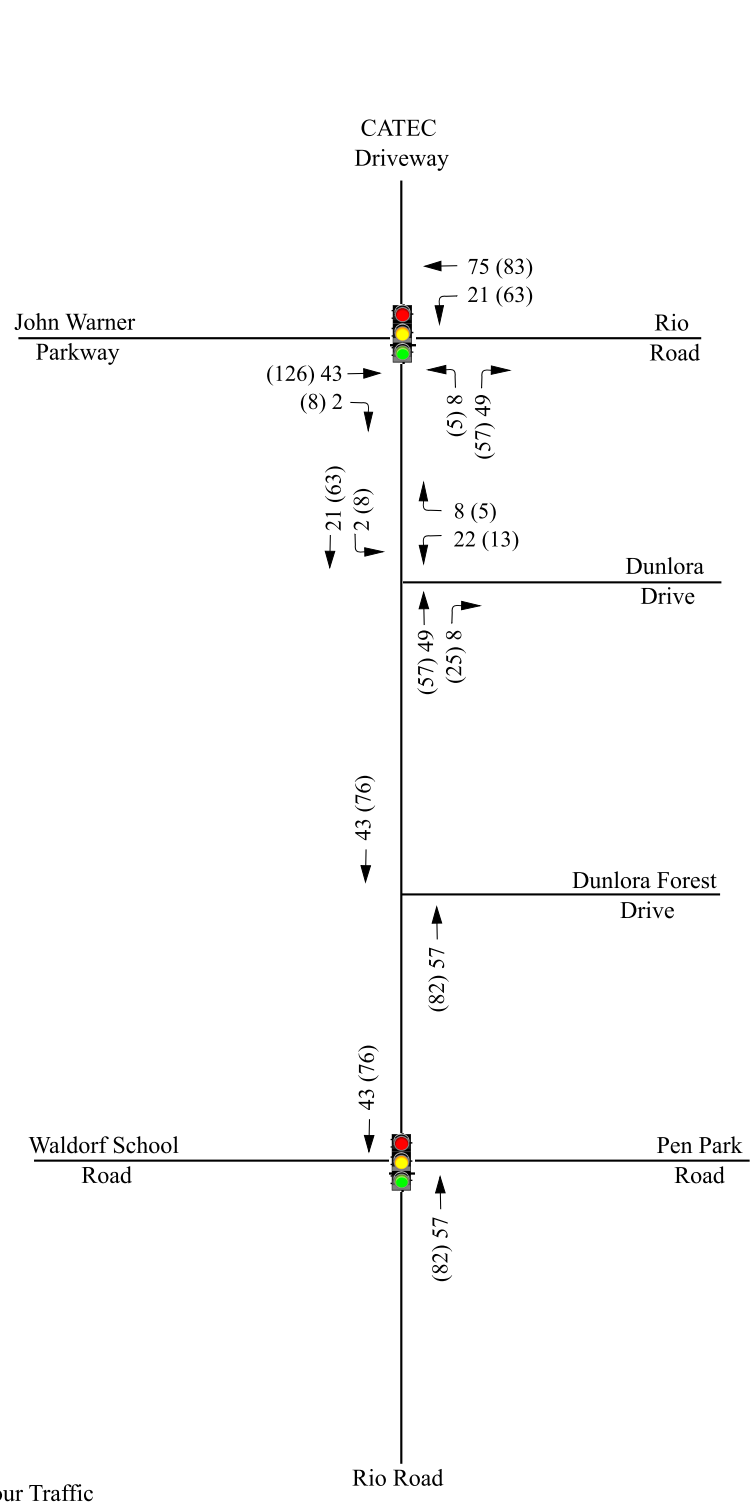
Figure 13



LEGEND

X (Y) AM (PM) Peak Hour Traffic

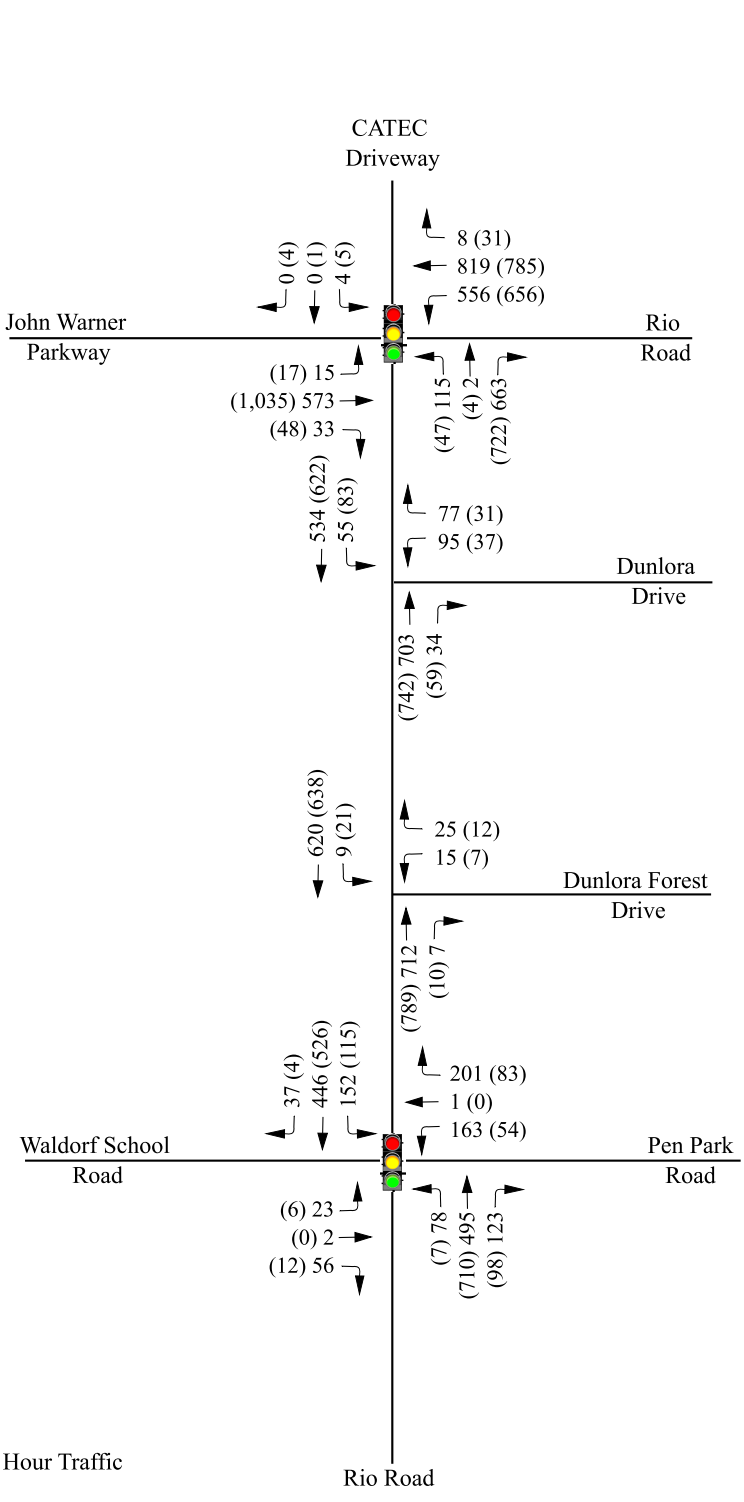
Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	The Center at Belvedere (Senior Center) Assignment Figure 14



LEGEND

X (Y) AM (PM) Peak Hour Traffic

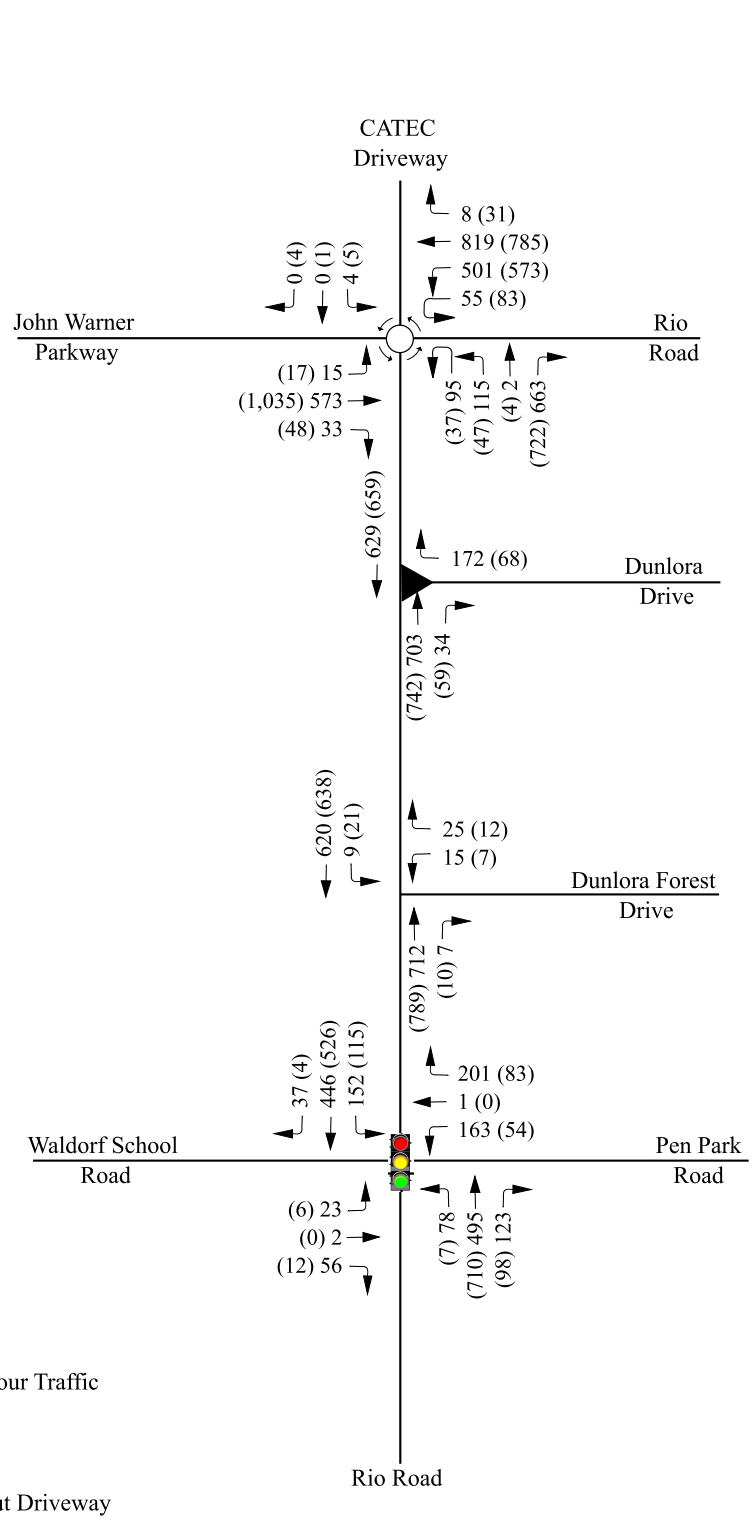
Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	Total Approved Development Volumes Figure 15



LEGEND

X (Y) AM (PM) Peak Hour Traffic

Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	No-Build (2023) Peak Hour Traffic Volumes Figure 16



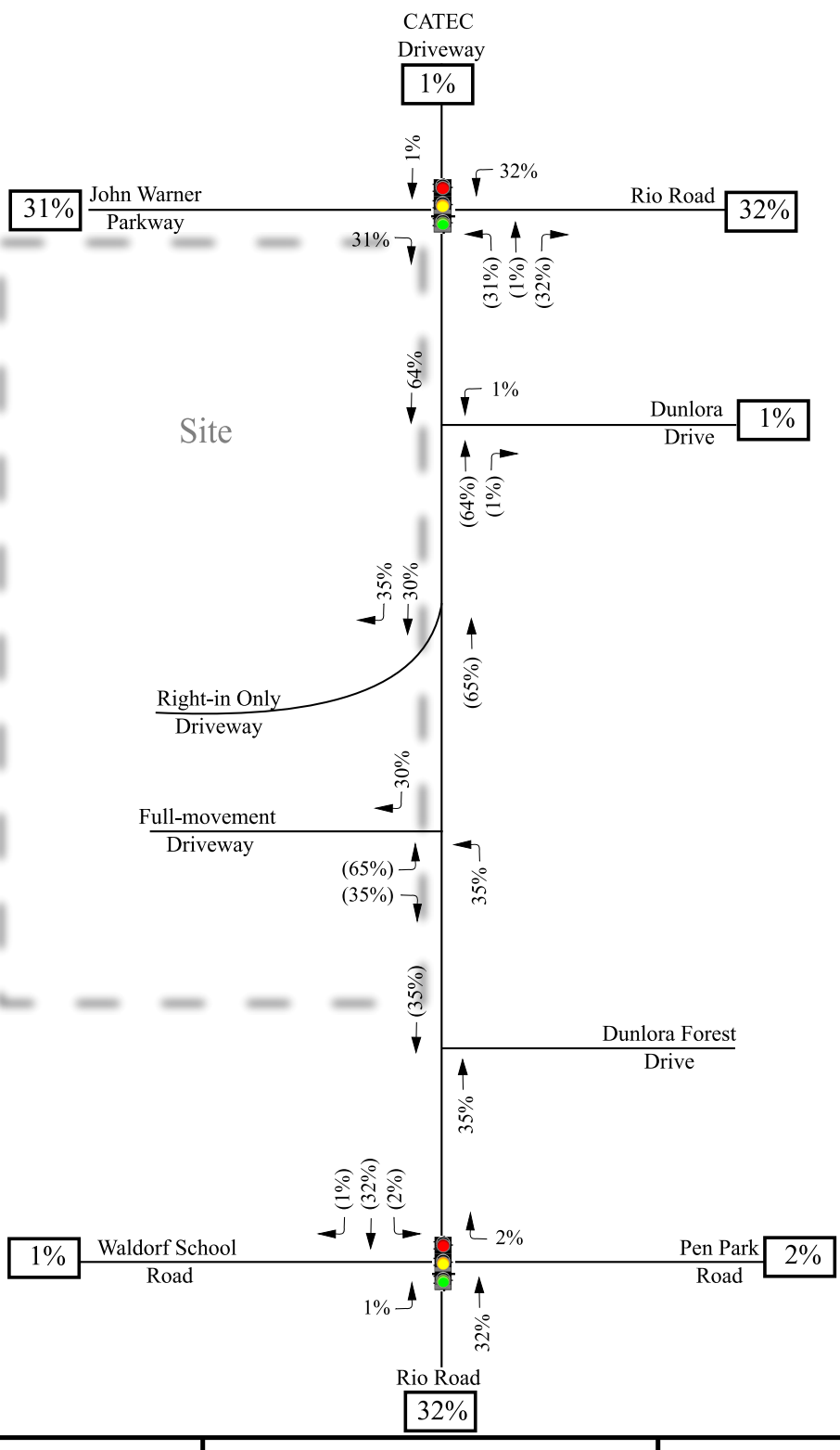
LEGEND

X (Y) AM (PM) Peak Hour Traffic

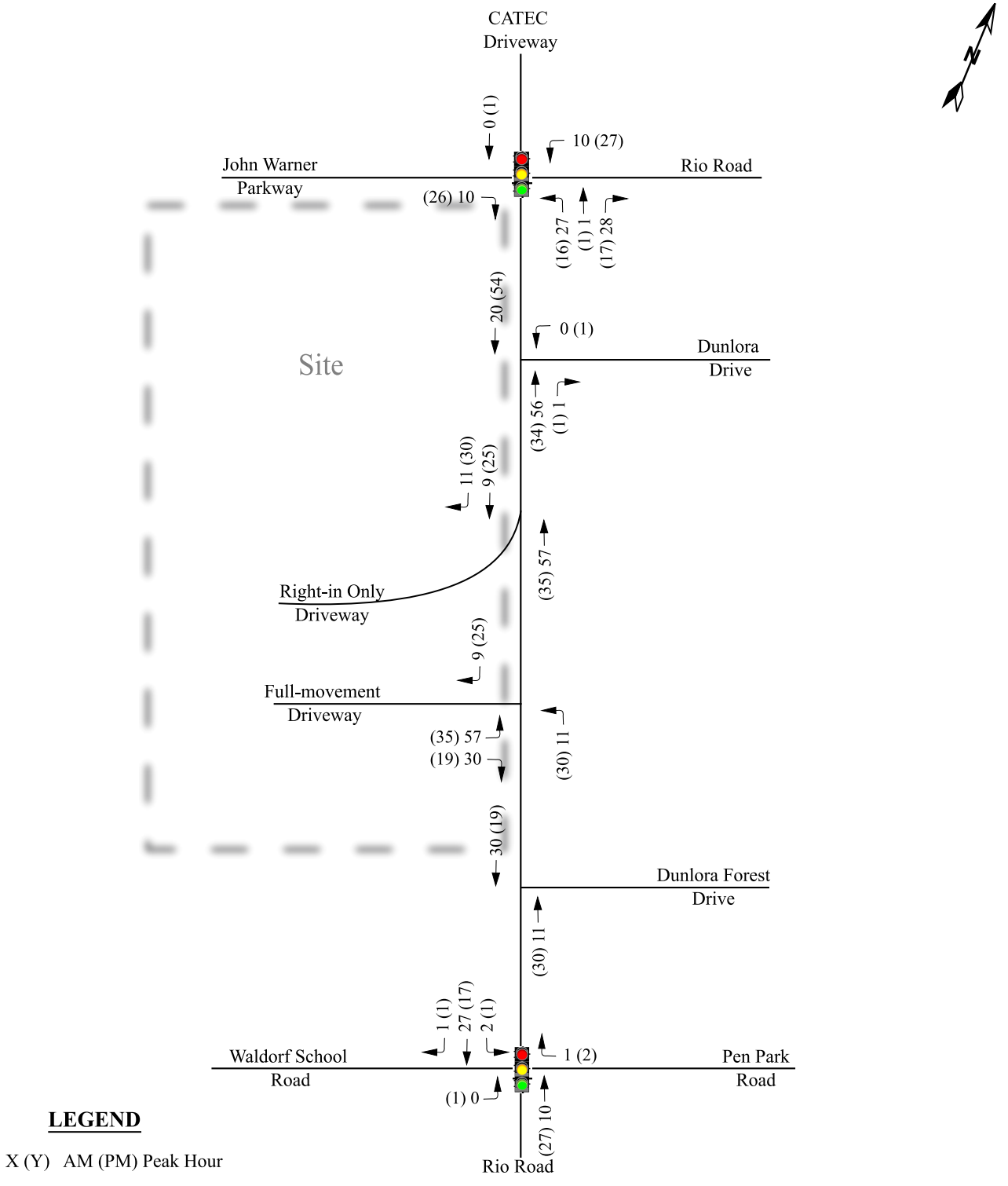
Roundabout

Right-in / Right-out Driveway

Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	No-Build (2023) Peak Hour Traffic Volumes ***With Roundabout*** Figure 17



Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	Site Trip Distribution Figure 18



Moving forward.
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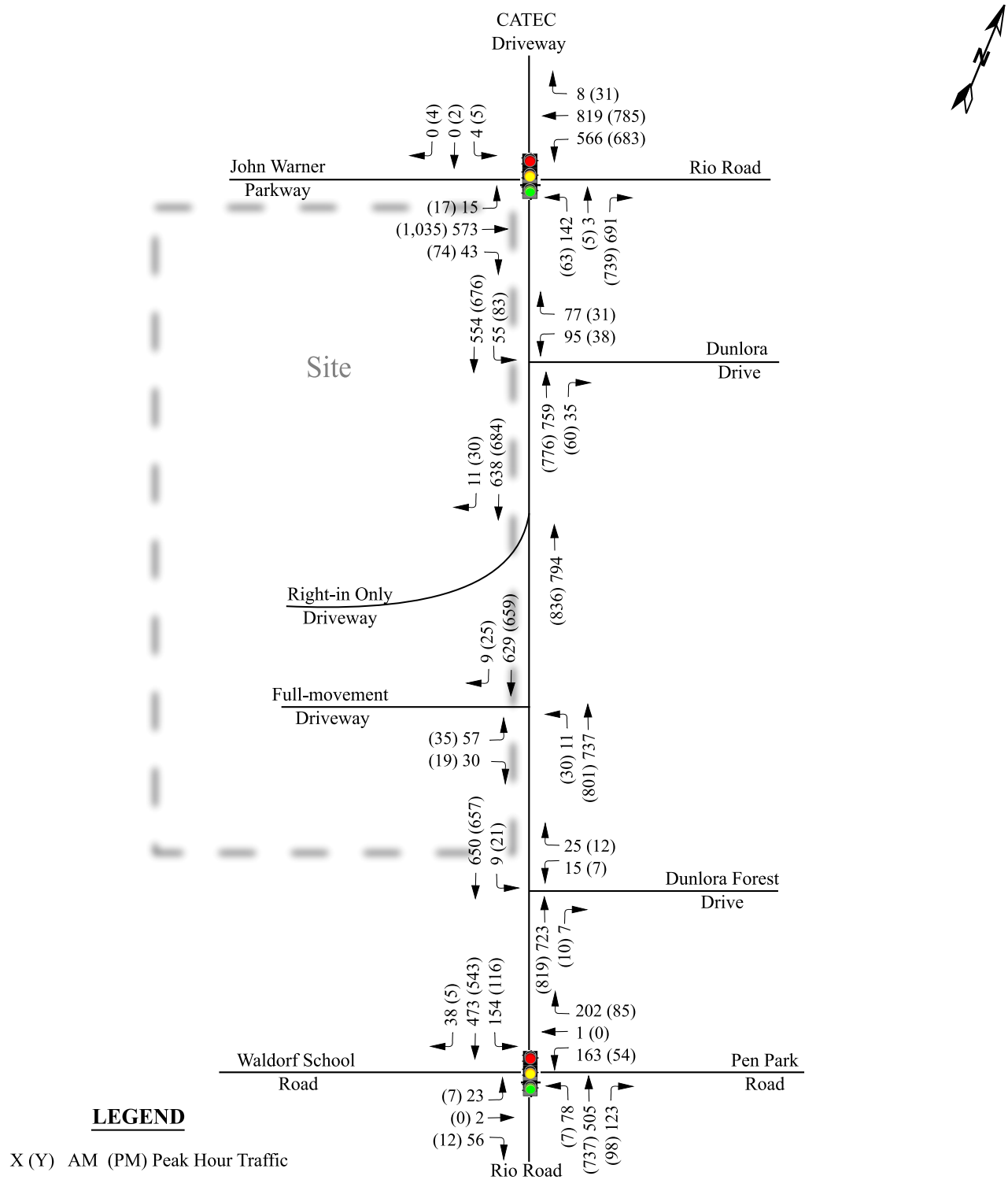
Albemarle County, Virginia

Site Trip Assignment

Figure 19



Moving forward.
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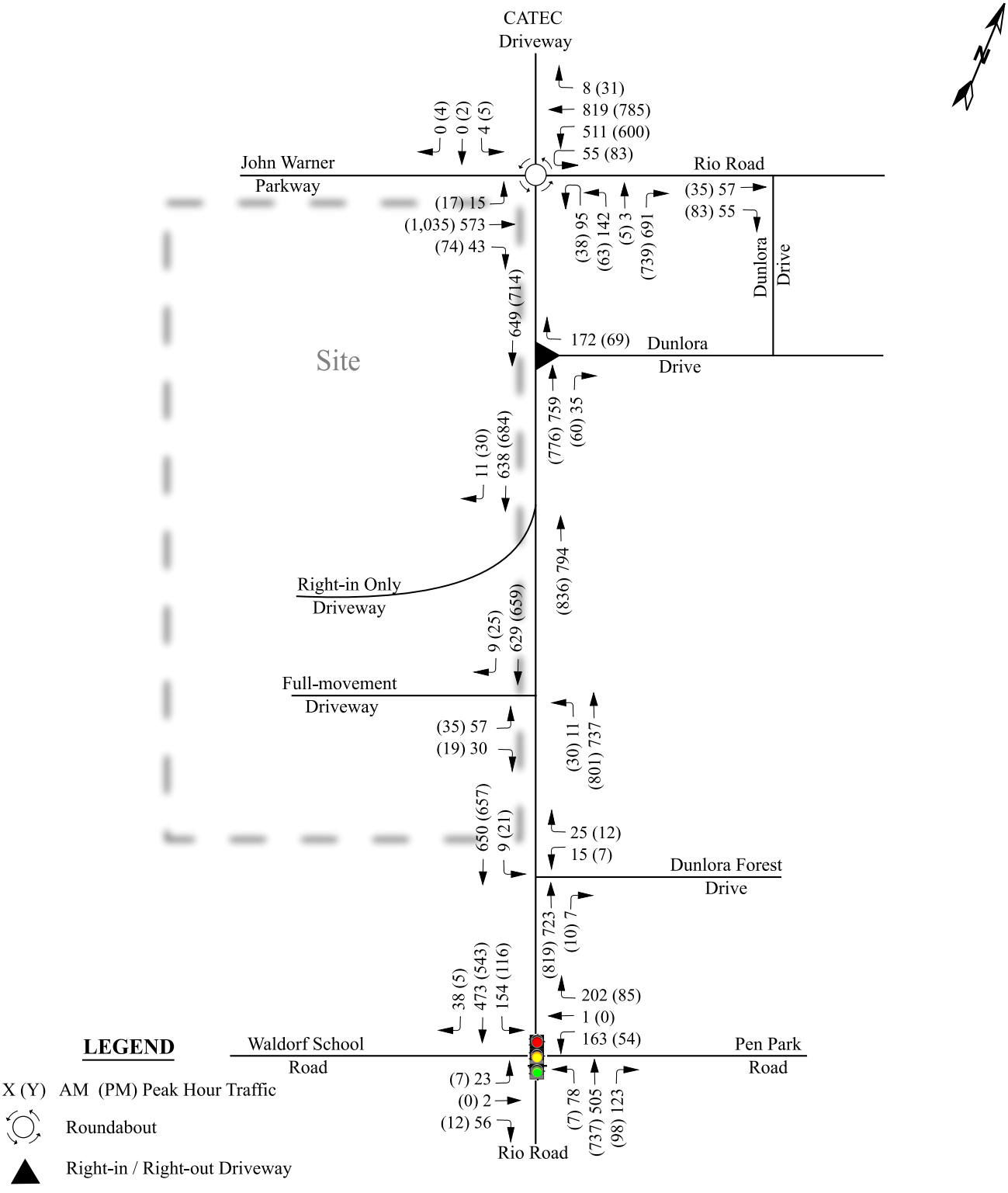
Rio Point
Albemarle County, Virginia

Build (2023) Peak Hour Traffic Volumes

Figure 20



Moving forward.
RKA
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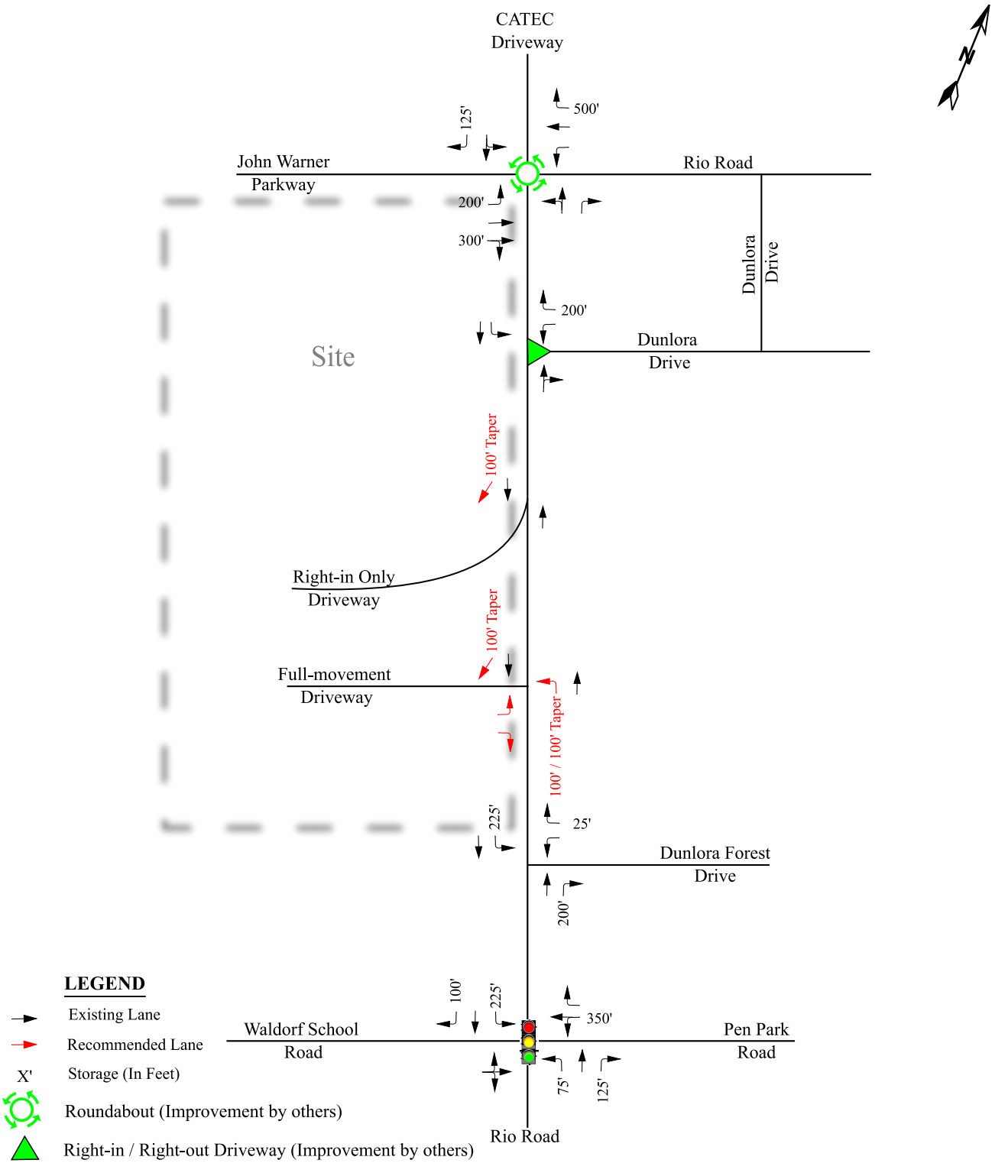
Rio Point
Albemarle County, Virginia

Build (2023) Peak Hour Traffic Volumes
With Roundabout

Figure 21



Moving forward. RKA RAMEY KEMP ASSOCIATES	Rio Point Albemarle County, Virginia	Recommended Lane Configuration Figure 22

Rio Road at Full-Movement Driveway
Northbound Left-turn Lane Warrant
Build (2023) Volumes

WARRANT FOR LEFT-TURN STORAGE LANES ON TWO-LANE HIGHWAY

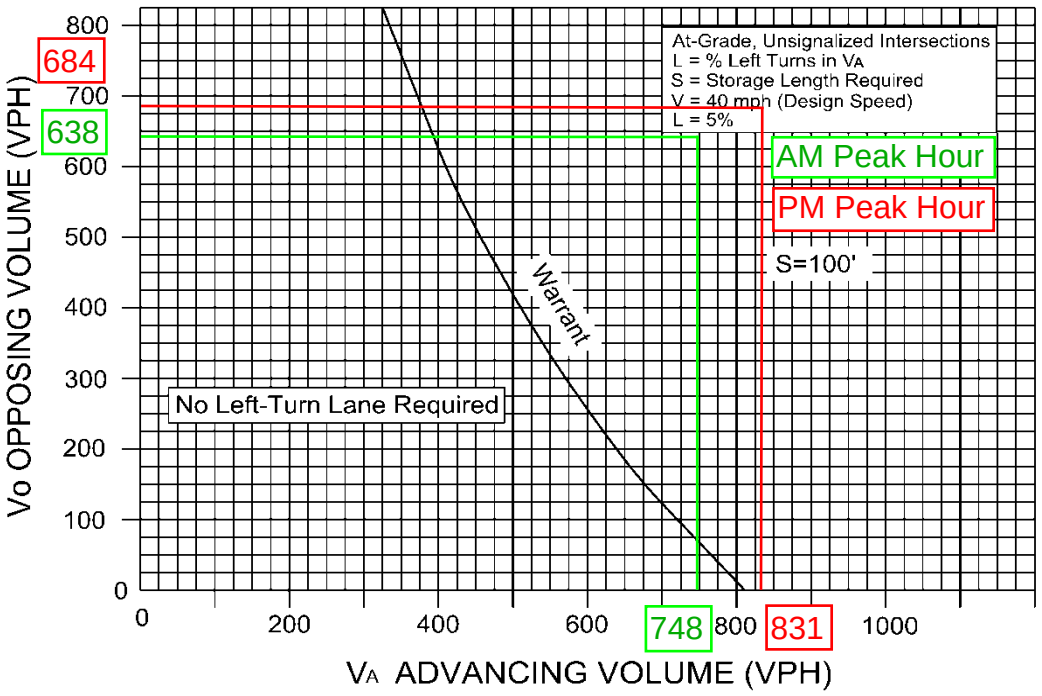


FIGURE 3-5

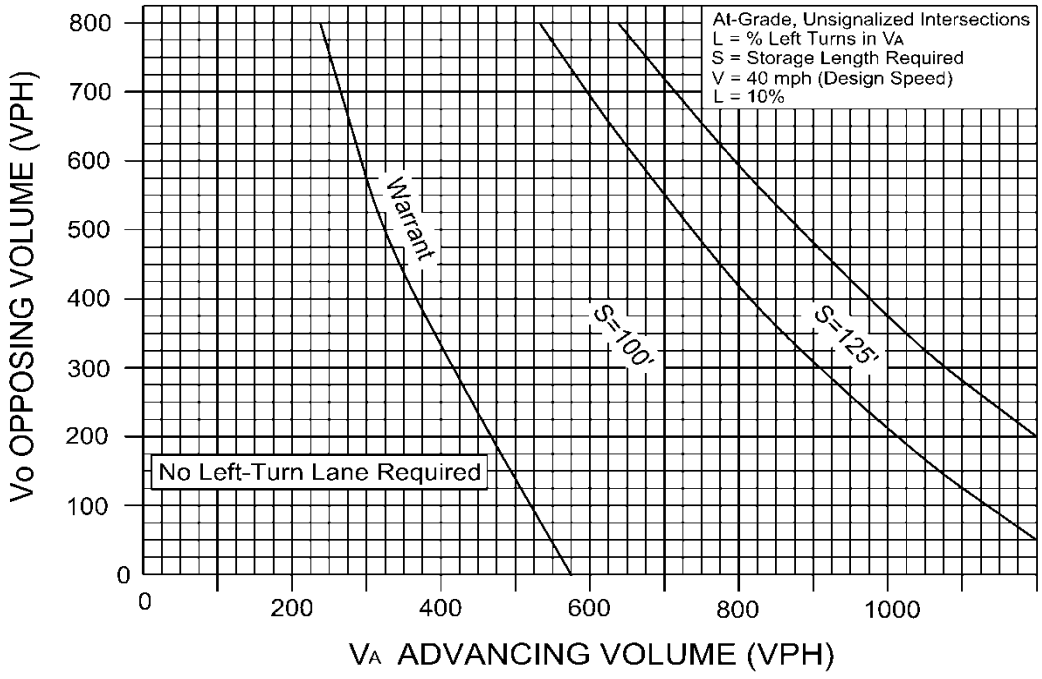
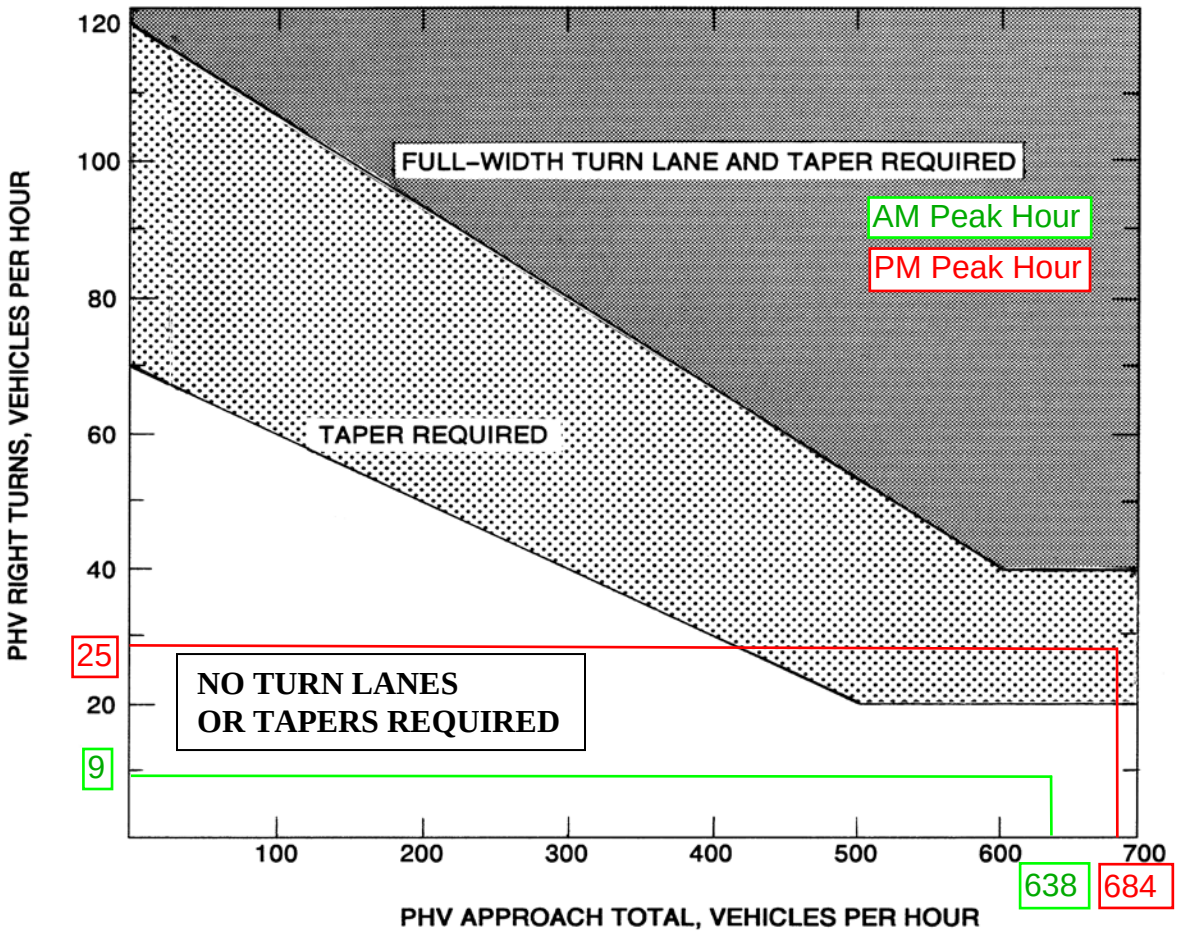


FIGURE 3-6

Rio Road at Full-Movement Driveway
Southbound Right-turn Lane Warrant
Build (2023) Volumes



Appropriate Radius required at all Intersections and Entrances (Commercial or Private).

LEGEND

PHV - Peak Hour Volume (also Design Hourly Volume equivalent)

Adjustment for Right Turns

For posted speeds at or under 45 mph, PHV right turns > 40, and
PHV total < 300.
Adjusted right turns = PHV Right Turns - 20
If PHV is not known use formula: PHV = ADT x K x D

K = the percent of AADT occurring in the peak hour
D = the percent of traffic in the peak direction of flow

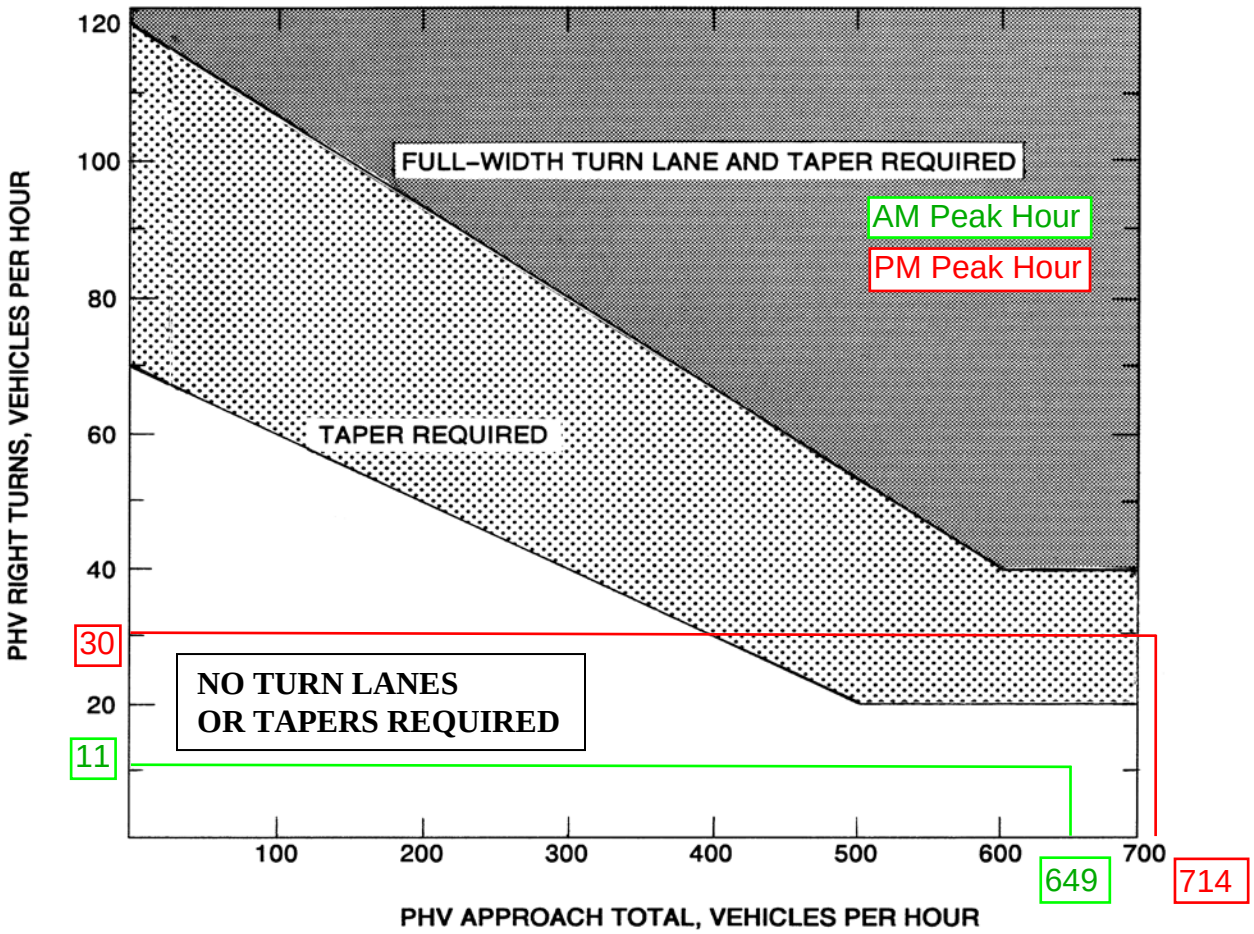
Note: An average of 11% for K x D will suffice.

When right turn facilities are warranted, see Figure 3-1 for design criteria.*

FIGURE 3-26 WARRANTS FOR RIGHT TURN TREATMENT (2-LANE HIGHWAY)

* Rev. 1/15

Rio Road at Right-in Only Driveway
Southbound Right-turn Lane Warrant
Build (2023) Volumes



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LEGEND

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Note: An average of 11% for K x D will suffice.

When right turn facilities are warranted, see Figure 3-1 for design criteria.*

FIGURE 3-26 WARRANTS FOR RIGHT TURN TREATMENT (2-LANE HIGHWAY)

* Rev. 1/15

Burns Service Inc.

1202 Langdon Terrace Drive
Indian Trail, NC, 28079

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File Name : Charlottesville(Rio and John W. Warner) AM Peak
Site Code :
Start Date : 8/29/2018
Page No : 1

Groups Printed- Cars + - Trucks

	CATEC Access Southbound				John W. Warner Parkway Westbound				Rio Road Northbound				Rio Road Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
07:00	0	1	1	2	0	111	50	161	52	1	12	65	2	82	0	84	312
07:15	0	0	0	0	1	113	69	183	80	0	25	105	2	114	0	116	404
07:30	0	0	0	0	2	168	112	282	137	0	32	169	7	118	0	125	576
07:45	0	0	0	0	1	181	164	346	142	0	19	161	9	126	6	141	648
Total	0	1	1	2	4	573	395	972	411	1	88	500	20	440	6	466	1940
08:00	0	0	3	3	1	153	112	266	140	1	24	165	10	101	5	116	550
08:15	0	0	1	1	4	172	97	273	129	1	22	152	2	135	2	139	565
08:30	2	0	2	4	7	168	71	246	109	0	24	133	2	110	6	118	501
08:45	1	1	2	4	3	126	66	195	97	2	18	117	1	155	4	160	476
Total	3	1	8	12	15	619	346	980	475	4	88	567	15	501	17	533	2092
Grand Total	3	2	9	14	19	1192	741	1952	886	5	176	1067	35	941	23	999	4032
Apprch %	21.4	14.3	64.3		1	61.1	38		83	0.5	16.5		3.5	94.2	2.3		
Total %	0.1	0	0.2	0.3	0.5	29.6	18.4	48.4	22	0.1	4.4	26.5	0.9	23.3	0.6	24.8	
Cars +	3	2	9	14	19	1192	738	1949	886	5	176	1067	35	941	23	999	4029
% Cars +	100	100	100	100	100	100	99.6	99.8	100	100	100	100	100	100	100	100	99.9
Trucks	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	3
% Trucks	0	0	0	0	0	0	0.4	0.2	0	0	0	0	0	0	0	0	0.1

Burns Service Inc.

1202 Langdon Terrace Drive
Indian Trail, NC, 28079

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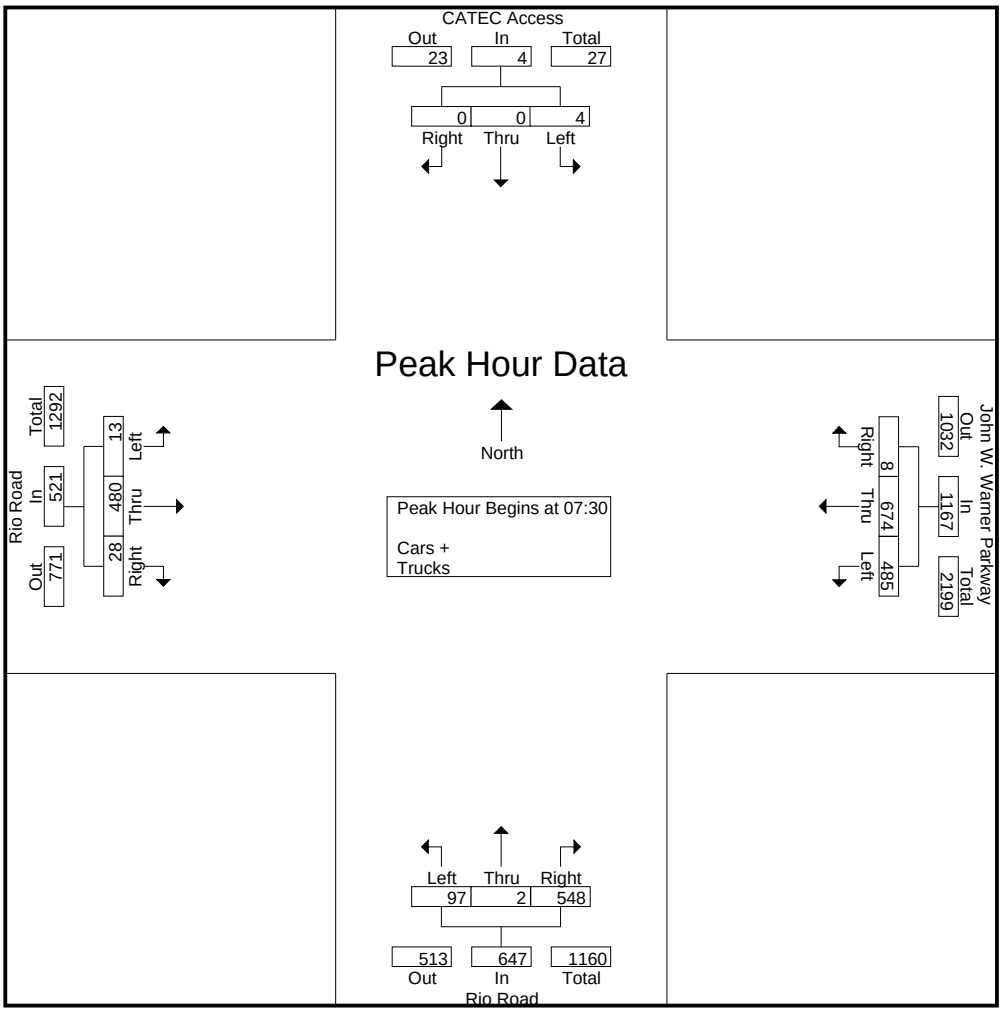
File Name : Charlottesville(Rio and John W. Warner) AM Peak
Site Code :
Start Date : 8/29/2018
Page No : 2

	CATEC Access Southbound				John W. Warner Parkway Westbound				Rio Road Northbound				Rio Road Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30																	
07:30	**0**	**0**	**0**	**0**	**2**	**168**	**112**	**282**	**137**	**0**	32	169	7	118	0	125	576
07:45	0	0	0	0	1	181	164	**346**	**142**	0	19	161	9	126	**6**	**141**	**648**
08:00	0	0	**3**	**3**	1	153	112	266	140	**1**	24	165	**10**	101	5	116	550
08:15	0	0	1	1	**4**	172	97	273	129	1	22	152	2	**135**	2	139	565
Total Volume	0	0	4	4	8	674	485	1167	548	2	97	647	28	480	13	521	2339
% App. Total	0	0	100		0.7	57.8	41.6		84.7	0.3	15		5.4	92.1	2.5		
PHF	.000	.000	.333	.333	.500	.931	.739	.843	.965	.500	.758	.957	.700	.889	.542	.924	.902



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1202 Langdon Terrace Drive
Indian Trail, NC, 28079

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File Name : Charlottesville(Rio and John W. Warner) PM Peak
Site Code :
Start Date : 8/29/2018
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Groups Printed- Cars + - Trucks

	CATEC Access Southbound					John W. Warner Parkway Westbound					Rio Road Northbound					Rio Road Eastbound					
Start Time	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Int. Total
16:00	3	1	2	0	6	3	145	119	0	267	111	0	7	0	118	8	186	2	1	197	588
16:15	4	0	2	0	6	3	137	124	0	264	132	0	7	0	139	7	199	1	1	208	617
16:30	2	0	1	0	3	5	145	143	0	293	130	1	9	0	140	7	183	3	0	193	629
16:45	1	1	1	0	3	2	159	125	0	286	151	0	9	0	160	6	205	3	0	214	663
Total	10	2	6	0	18	13	586	511	0	1110	524	1	32	0	557	28	773	9	2	812	2497
17:00	2	0	0	0	2	7	175	139	0	321	155	3	10	0	168	13	188	6	0	207	698
17:15	1	0	1	0	2	7	154	159	0	320	165	0	5	0	170	5	218	2	0	225	717
17:30	0	0	3	0	3	12	148	114	0	274	131	1	14	0	146	12	213	4	0	229	652
17:45	1	0	1	0	2	5	147	108	0	260	123	0	8	0	131	9	149	2	2	162	555
Total	4	0	5	0	9	31	624	520	0	1175	574	4	37	0	615	39	768	14	2	823	2622
Grand Total	14	2	11	0	27	44	1210	1031	0	2285	1098	5	69	0	1172	67	1541	23	4	1635	5119
Apprch %	51.9	7.4	40.7	0		1.9	53	45.1	0		93.7	0.4	5.9	0		4.1	94.3	1.4	0.2		
Total %	0.3	0	0.2	0	0.5	0.9	23.6	20.1	0	44.6	21.4	0.1	1.3	0	22.9	1.3	30.1	0.4	0.1	31.9	
Cars +	14	2	11	0	27	44	1210	1031	0	2285	1098	5	69	0	1172	67	1540	23	4	1634	5118
% Cars +	100	100	100	0	100	100	100	100	0	100	100	100	100	0	100	100	99.9	100	100	99.9	100
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0

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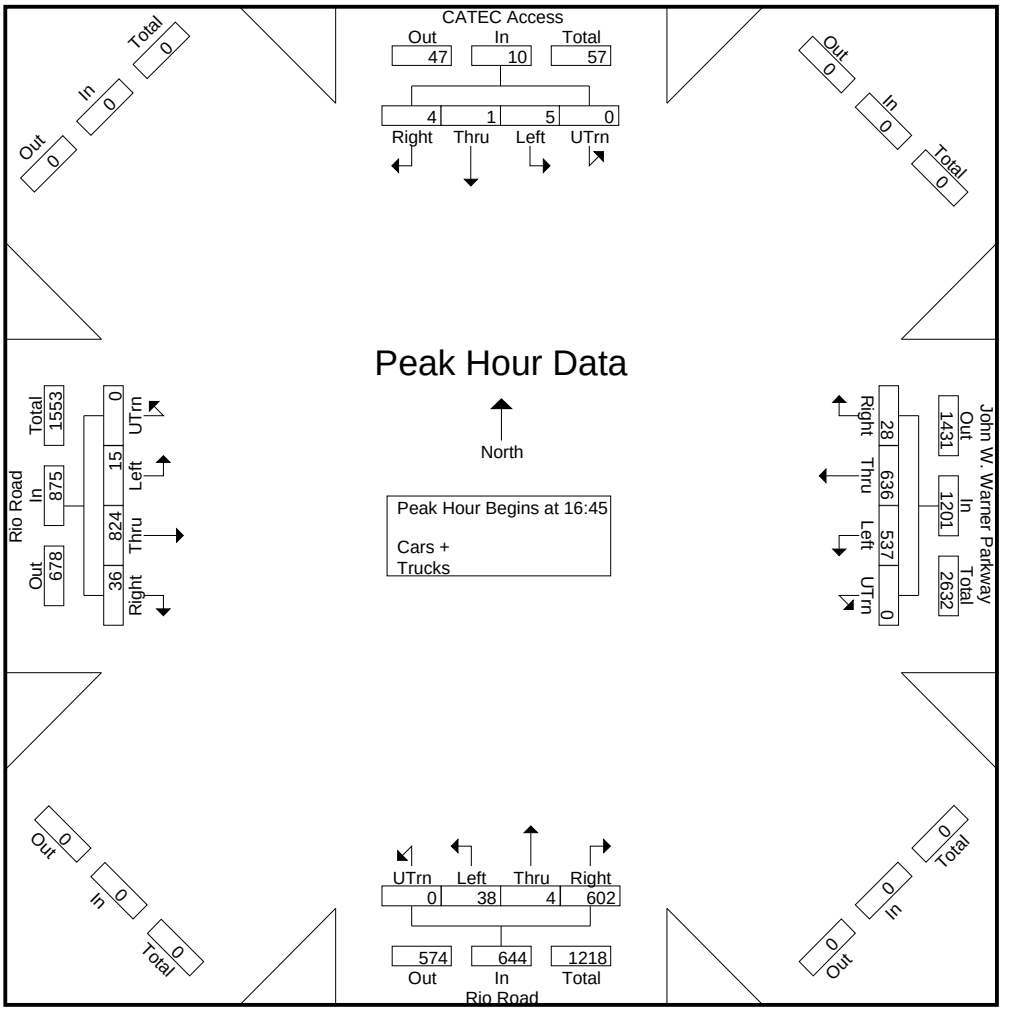
Indian Trail, NC, 28079

We Count because YOU Count

File Name : Charlottesville(Rio and John W. Warner) PM Peak
Site Code :
Start Date : 8/29/2018
Page No : 2

	CATEC Access Southbound					John W. Warner Parkway Westbound					Rio Road Northbound					Rio Road Eastbound					
Start Time	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 16:45																					
16:45	1	**1**	1	0	**3**	2	159	125	0	286	151	0	9	0	160	6	205	3	0	214	663
17:00	**2**	0	0	0	2	7	**175**	139	0	**321**	155	**3**	10	0	168	**13**	188	**6**	0	207	698
17:15	1	0	1	0	2	7	154	**159**	0	320	**165**	0	5	0	**170**	5	**218**	2	0	225	**717**
17:30	0	0	**3**	0	3	**12**	148	114	0	274	131	1	**14**	0	146	12	213	4	0	**229**	652
Total Volume	4	1	5	0	10	28	636	537	0	1201	602	4	38	0	644	36	824	15	0	875	2730
% App. Total																					
PHF	.500	.250	.417	.000	.833	.583	.909	.844	.000	.935	.912	.333	.679	.000	.947	.692	.945	.625	.000	.955	.952



Burns Service Inc.

1202 Langdon Terrace Drive
Indian Trail, NC, 28079

We Count because YOU Count

File Name : Charlottesville(Rio and Dunlora) AM Peak
Site Code :
Start Date : 8/29/2018
Page No : 1

Groups Printed- Cars + - Trucks

	Rio Road Southbound			Dunlora Drive Westbound			Rio Road Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
07:00	48	5	53	7	5	12	4	60	64	129
07:15	61	6	67	14	7	21	1	88	89	177
07:30	117	5	122	22	10	32	1	149	150	304
07:45	127	15	142	9	29	38	10	159	169	349
Total	353	31	384	52	51	103	16	456	472	959
08:00	109	10	119	15	11	26	11	149	160	305
08:15	79	18	97	16	16	32	2	136	138	267
08:30	63	5	68	14	13	27	3	122	125	220
08:45	64	8	72	12	13	25	5	104	109	206
Total	315	41	356	57	53	110	21	511	532	998
Grand Total	668	72	740	109	104	213	37	967	1004	1957
Apprch %	90.3	9.7		51.2	48.8		3.7	96.3		
Total %	34.1	3.7	37.8	5.6	5.3	10.9	1.9	49.4	51.3	
Cars +	657	67	724	109	103	212	36	957	993	1929
% Cars +	98.4	93.1	97.8	100	99	99.5	97.3	99	98.9	98.6
Trucks	11	5	16	0	1	1	1	10	11	28
% Trucks	1.6	6.9	2.2	0	1	0.5	2.7	1	1.1	1.4

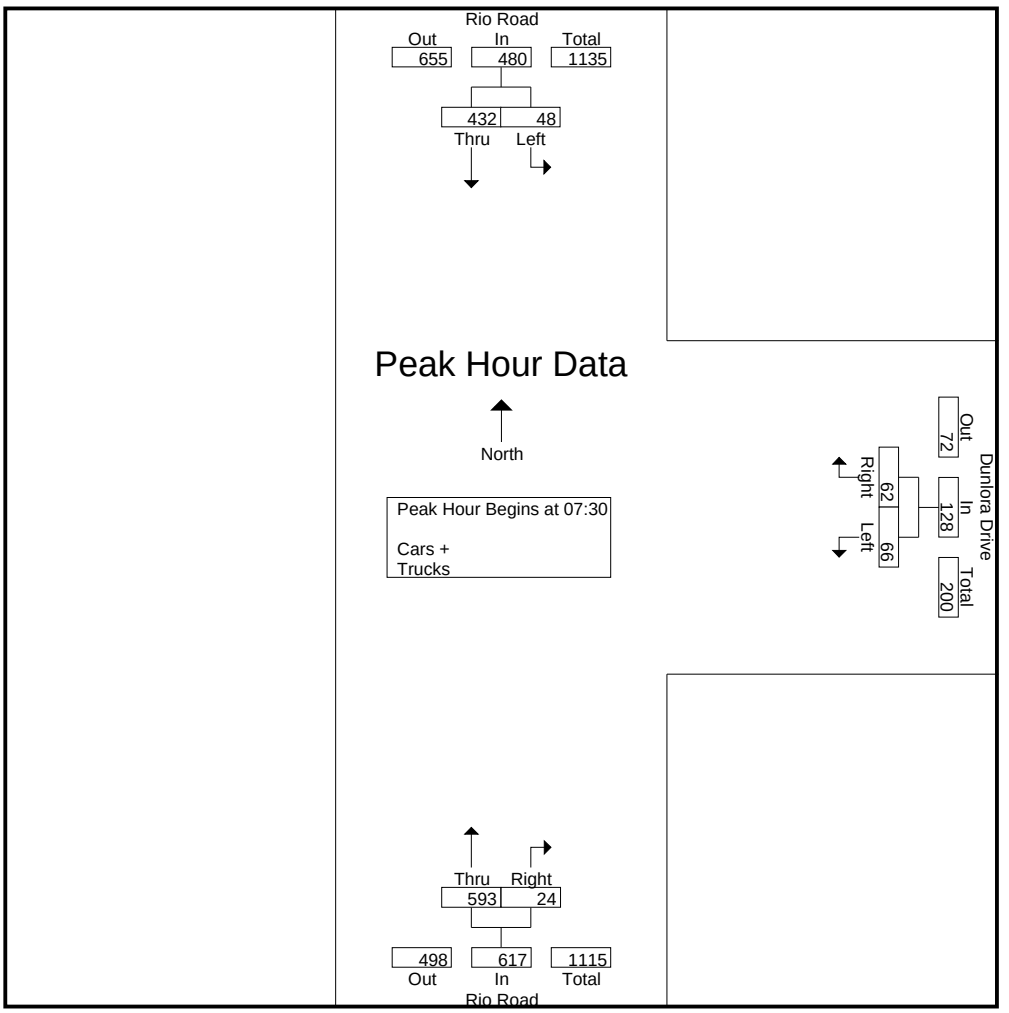
Burns Service Inc.

1202 Langdon Terrace Drive
Indian Trail, NC, 28079

We Count because YOU Count

File Name : Charlottesville(Rio and Dunlora) AM Peak
Site Code :
Start Date : 8/29/2018
Page No : 2

	Rio Road Southbound			Dunlora Drive Westbound			Rio Road Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:30										
07:30	117	5	122	**22**	10	32	1	149	150	304
07:45	**127**	15	**142**	9	**29**	**38**	10	**159**	**169**	**349**
08:00	109	10	119	15	11	26	**11**	149	160	305
08:15	79	**18**	97	16	16	32	2	136	138	267
Total Volume	432	48	480	62	66	128	24	593	617	1225
% App. Total	90	10		48.4	51.6		3.9	96.1		
PHF	.850	.667	.845	.705	.569	.842	.545	.932	.913	.878



Burns Service Inc.

1202 Langdon Terrace Drive
Indian Trail, NC, 28079

We Count because YOU Count

File Name : Charlottesville(Rio and Dunlora) PM Peak
Site Code :
Start Date : 8/29/2018
Page No : 1

Groups Printed- Cars + - Trucks

	Rio Road Southbound			Dunlora Drive Westbound			Rio Road Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
16:00	90	31	121	4	2	6	8	117	125	252
16:15	96	13	109	4	7	11	8	135	143	263
16:30	99	18	117	5	5	10	5	129	134	261
16:45	100	18	118	7	6	13	6	148	154	285
Total	385	80	465	20	20	40	27	529	556	1061
17:00	119	20	139	5	2	7	7	170	177	323
17:15	116	17	133	4	3	7	10	160	170	310
17:30	112	13	125	8	11	19	8	132	140	284
17:45	90	13	103	6	5	11	6	116	122	236
Total	437	63	500	23	21	44	31	578	609	1153
Grand Total	822	143	965	43	41	84	58	1107	1165	2214
Apprch %	85.2	14.8		51.2	48.8		5	95		
Total %	37.1	6.5	43.6	1.9	1.9	3.8	2.6	50	52.6	
Cars +	815	138	953	43	41	84	58	1103	1161	2198
% Cars +	99.1	96.5	98.8	100	100	100	100	99.6	99.7	99.3
Trucks	7	5	12	0	0	0	0	4	4	16
% Trucks	0.9	3.5	1.2	0	0	0	0	0.4	0.3	0.7

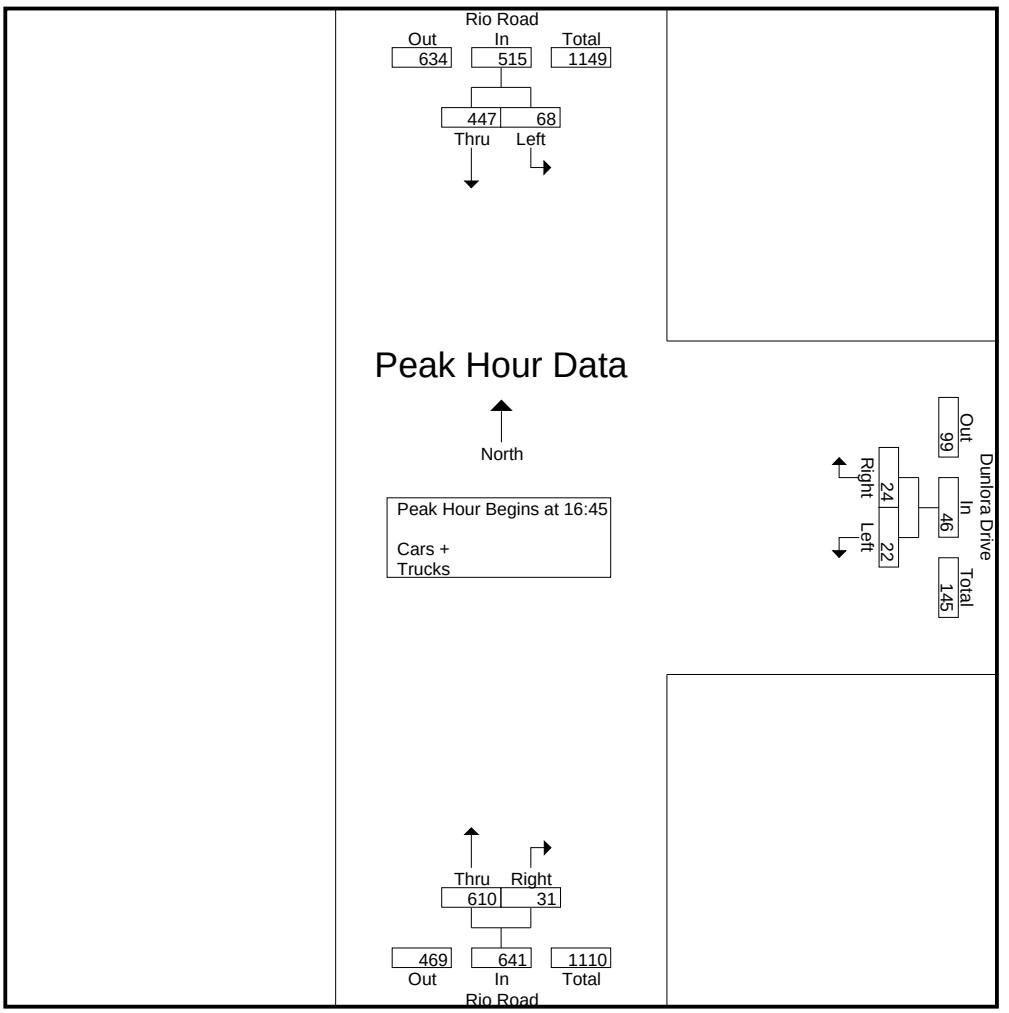
Burns Service Inc.

1202 Langdon Terrace Drive
Indian Trail, NC, 28079

We Count because YOU Count

File Name : Charlottesville(Rio and Dunlora) PM Peak
Site Code :
Start Date : 8/29/2018

	Rio Road Southbound			Dunlora Drive Westbound			Rio Road Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 16:45										
16:45	100	18	118	7	6	13	6	148	154	285
17:00	**119**	**20**	**139**	5	2	7	7	**170**	**177**	**323**
17:15	116	17	133	4	3	7	**10**	160	170	310
17:30	112	13	125	**8**	**11**	**19**	8	132	140	284
Total Volume	447	68	515	24	22	46	31	610	641	1202
% App. Total	86.8	13.2		52.2	47.8		4.8	95.2		
PHF	.939	.850	.926	.750	.500	.605	.775	.897	.905	.930



Burns Service Inc.

1202 Langdon Terrace Drive
Indian Trail, NC, 28079

We Count because YOU Count

File Name : Charlottesville(Rio and Pen Park) AM Peak
Site Code :
Start Date : 8/29/2018
Page No : 1

Groups Printed- Cars + - Trucks

	Rio Road Southbound					Pen Park Road Westbound					Rio Road Northbound					Waldrof School Road Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00	2	41	8	0	51	15	0	16	0	31	6	46	1	0	53	1	0	0	0	1	136
07:15	2	51	18	0	71	22	0	12	0	34	20	62	4	0	86	0	0	0	0	0	191
07:30	5	67	39	0	111	46	0	31	0	77	36	88	8	0	132	2	1	0	0	3	323
07:45	13	95	71	0	179	65	1	54	0	120	48	87	26	0	161	8	1	5	0	14	474
Total	22	254	136	0	412	148	1	113	0	262	110	283	39	0	432	11	2	5	0	18	1124
08:00	11	81	18	1	111	54	0	45	0	99	18	90	28	1	137	27	0	9	0	36	383
08:15	5	95	10	0	110	18	0	18	0	36	9	108	9	0	126	14	0	7	0	21	293
08:30	3	64	5	0	72	20	0	12	0	32	5	92	3	0	100	9	0	5	0	14	218
08:45	1	74	5	0	80	9	0	16	0	25	9	98	1	0	108	3	1	3	0	7	220
Total	20	314	38	1	373	101	0	91	0	192	41	388	41	1	471	53	1	24	0	78	1114
Grand Total	42	568	174	1	785	249	1	204	0	454	151	671	80	1	903	64	3	29	0	96	2238
Apprch %	5.4	72.4	22.2	0.1		54.8	0.2	44.9	0		16.7	74.3	8.9	0.1		66.7	3.1	30.2	0		
Total %	1.9	25.4	7.8	0	35.1	11.1	0	9.1	0	20.3	6.7	30	3.6	0	40.3	2.9	0.1	1.3	0	4.3	
Cars +	42	568	174	1	785	249	1	204	0	454	151	671	80	1	903	64	3	29	0	96	2238
% Cars +	100	100	100	100	100	100	100	100	0	100	100	100	100	100	100	100	100	100	0	100	100
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

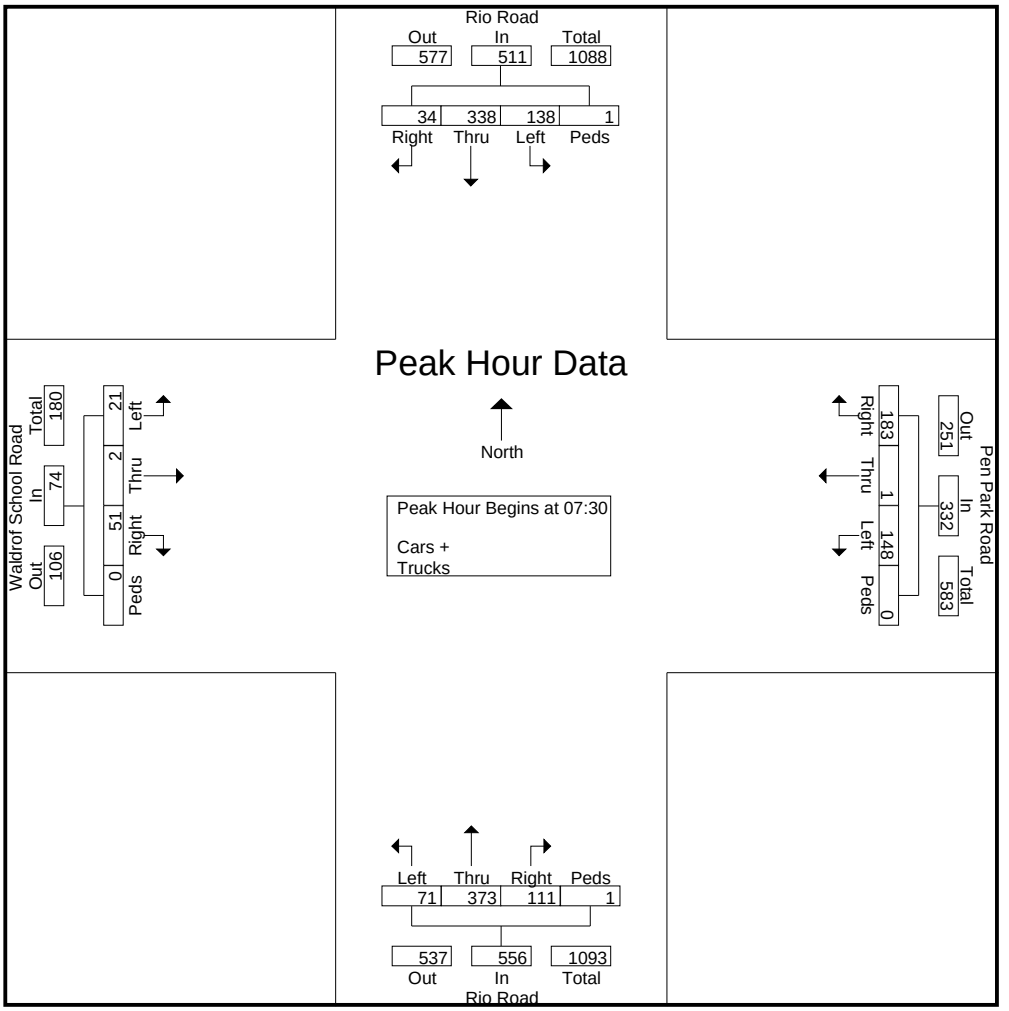
Burns Service Inc.

1202 Langdon Terrace Drive
Indian Trail, NC, 28079

We Count because YOU Count

File Name : Charlottesville(Rio and Pen Park) AM Peak
Site Code :
Start Date : 8/29/2018
Page No : 2

	Rio Road Southbound					Pen Park Road Westbound					Rio Road Northbound					Waldrof School Road Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30																					
07:30	5	67	39	0	111	46	0	31	0	77	36	88	8	0	132	2	**1**	0	0	3	323
07:45	**13**	**95**	**71**	0	**179**	**65**	**1**	**54**	0	**120**	**48**	87	26	0	**161**	8	1	5	0	14	**474**
08:00	11	81	18	**1**	111	54	0	45	0	99	18	90	**28**	**1**	137	**27**	0	**9**	0	**36**	383
08:15	5	95	10	0	110	18	0	18	0	36	9	**108**	9	0	126	14	0	7	0	21	293
Total Volume	34	338	138	1	511	183	1	148	0	332	111	373	71	1	556	51	2	21	0	74	1473
% App. Total																					
PHF	.654	.889	.486	.250	.714	.704	.250	.685	.000	.692	.578	.863	.634	.250	.863	.472	.500	.583	.000	.514	.777



Burns Service Inc.

1202 Langdon Terrace Drive
Indian Trail, NC, 28079

We Count because YOU Count

File Name : Charlottesville(Rio and Pen Park) PM Peak
Site Code :
Start Date : 8/29/2018
Page No : 1

Groups Printed- Cars + - Trucks

	Rio Road Southbound					Pen Park Road Westbound					Rio Road Northbound					Waldorf School Road Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
16:00	0	78	14	0	92	11	0	12	0	23	12	109	1	0	122	1	0	2	0	3	240
16:15	2	86	18	0	106	19	0	9	0	28	20	128	2	0	150	4	0	1	0	5	289
16:30	4	83	28	0	115	21	0	9	0	30	18	105	0	0	123	3	0	2	0	5	273
16:45	0	99	23	0	122	23	0	15	0	38	16	129	0	0	145	0	0	1	0	1	306
Total	6	346	83	0	435	74	0	45	0	119	66	471	3	0	540	8	0	6	0	14	1108
17:00	1	100	29	0	130	18	0	14	0	32	22	161	4	0	187	2	0	1	1	4	353
17:15	2	93	29	1	125	19	0	15	0	34	24	148	3	0	175	8	0	3	0	11	345
17:30	0	89	24	0	113	14	0	5	0	19	27	126	0	0	153	1	0	1	0	2	287
17:45	0	87	18	0	105	14	0	13	0	27	20	112	0	0	132	0	0	0	1	1	265
Total	3	369	100	1	473	65	0	47	0	112	93	547	7	0	647	11	0	5	2	18	1250
Grand Total	9	715	183	1	908	139	0	92	0	231	159	1018	10	0	1187	19	0	11	2	32	2358
Apprch %	1	78.7	20.2	0.1		60.2	0	39.8	0		13.4	85.8	0.8	0		59.4	0	34.4	6.2		
Total %	0.4	30.3	7.8	0	38.5	5.9	0	3.9	0	9.8	6.7	43.2	0.4	0	50.3	0.8	0	0.5	0.1	1.4	
Cars +	9	715	183	1	908	139	0	92	0	231	159	1018	10	0	1187	19	0	11	2	32	2358
% Cars +	100	100	100	100	100	100	0	100	0	100	100	100	100	0	100	100	0	100	100	100	100
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

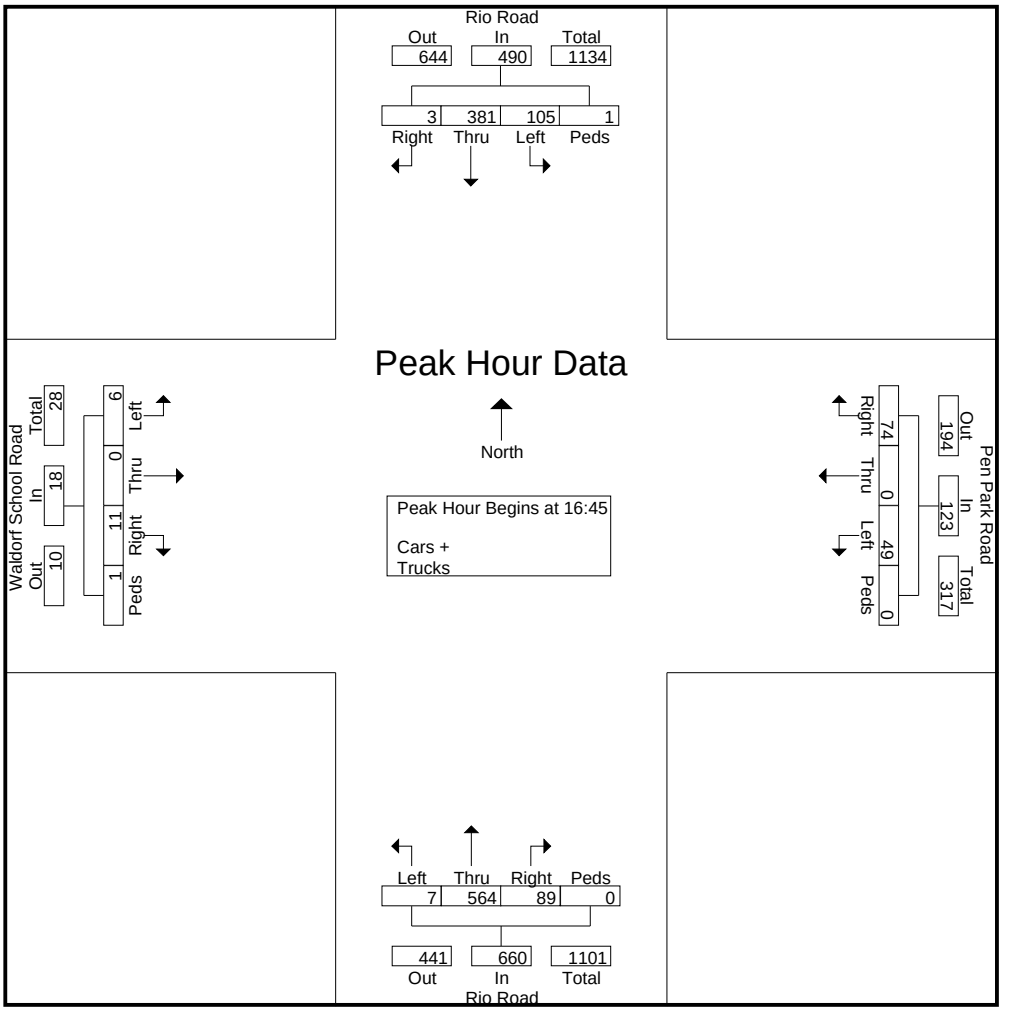
Burns Service Inc.

1202 Langdon Terrace Drive
Indian Trail, NC, 28079

We Count because YOU Count

File Name : Charlottesville(Rio and Pen Park) PM Peak
Site Code :
Start Date : 8/29/2018
Page No : 2

	Rio Road Southbound					Pen Park Road Westbound					Rio Road Northbound					Waldorf School Road Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 16:45																					
16:45	0	99	23	0	122	**23**	0	**15**	0	**38**	16	129	0	0	145	0	0	1	0	1	306
17:00	1	**100**	**29**	0	**130**	18	0	14	0	32	22	**161**	**4**	0	**187**	2	0	1	**1**	4	**353**
17:15	**2**	93	29	**1**	125	19	0	15	0	34	24	148	3	0	175	**8**	0	**3**	0	**11**	345
17:30	0	89	24	0	113	14	0	5	0	19	**27**	126	0	0	153	1	0	1	0	2	287
Total Volume	3	381	105	1	490	74	0	49	0	123	89	564	7	0	660	11	0	6	1	18	1291
% App. Total																					
PHF	.375	.953	.905	.250	.942	.804	.000	.817	.000	.809	.824	.876	.438	.000	.882	.344	.000	.500	.250	.409	.914



Ramey Kemp & Associates

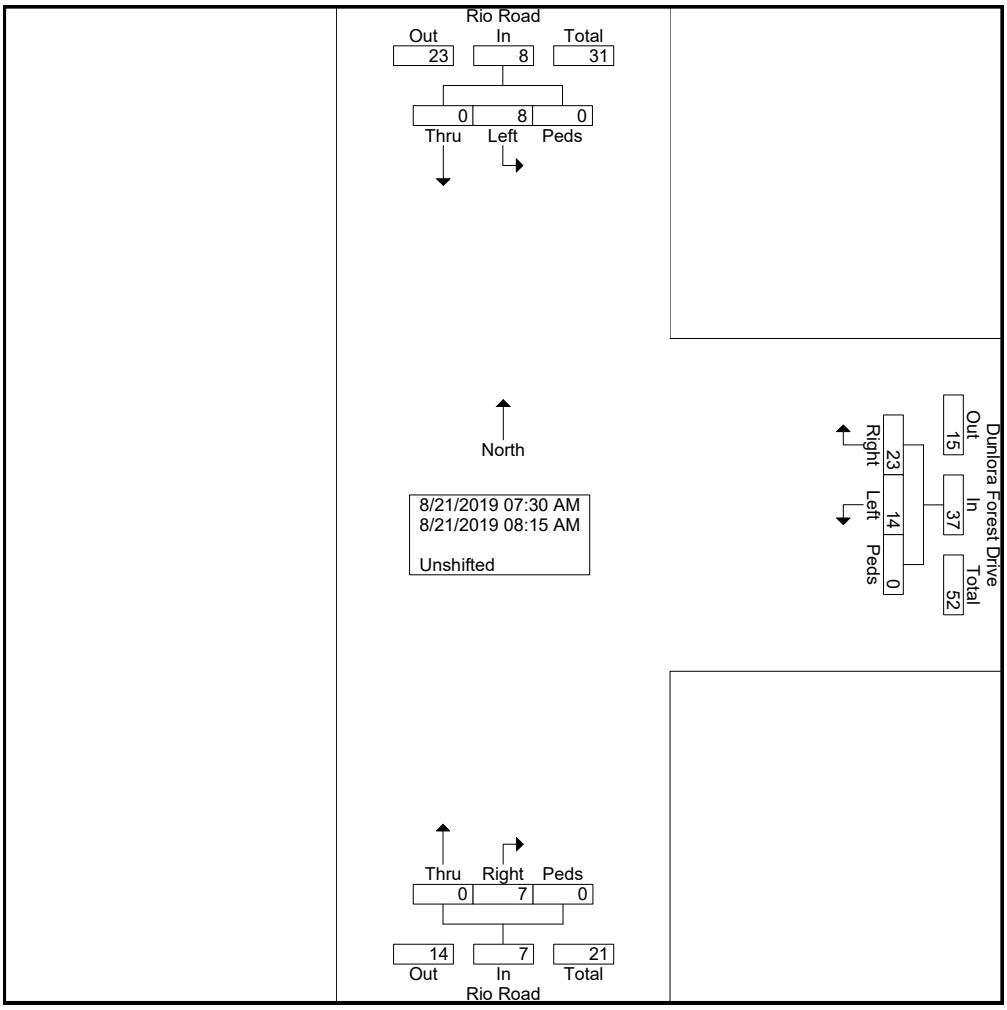
4343 Cox Road
Glen Allen, VA 23060

Counted By: Rupinski
Weather: Clear
Equipment ID: 4792

File Name : Dunlora Forest Drive AM
Site Code : 00000001
Start Date : 8/21/2019
Page No : 1

Groups Printed- Unshifted

	Rio Road From North				Dunlora Forest Drive From East				Rio Road From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
07:30 AM	0	3	0	3	11	4	0	15	2	0	0	2	20
07:45 AM	0	2	0	2	4	5	0	9	0	0	0	0	11
Total	0	5	0	5	15	9	0	24	2	0	0	2	31
08:00 AM	0	3	0	3	2	3	0	5	3	0	0	3	11
08:15 AM	0	0	0	0	6	2	0	8	2	0	0	2	10
Grand Total	0	8	0	8	23	14	0	37	7	0	0	7	52
Apprch %	0	100	0		62.2	37.8	0		100	0	0		
Total %	0	15.4	0	15.4	44.2	26.9	0	71.2	13.5	0	0	13.5	



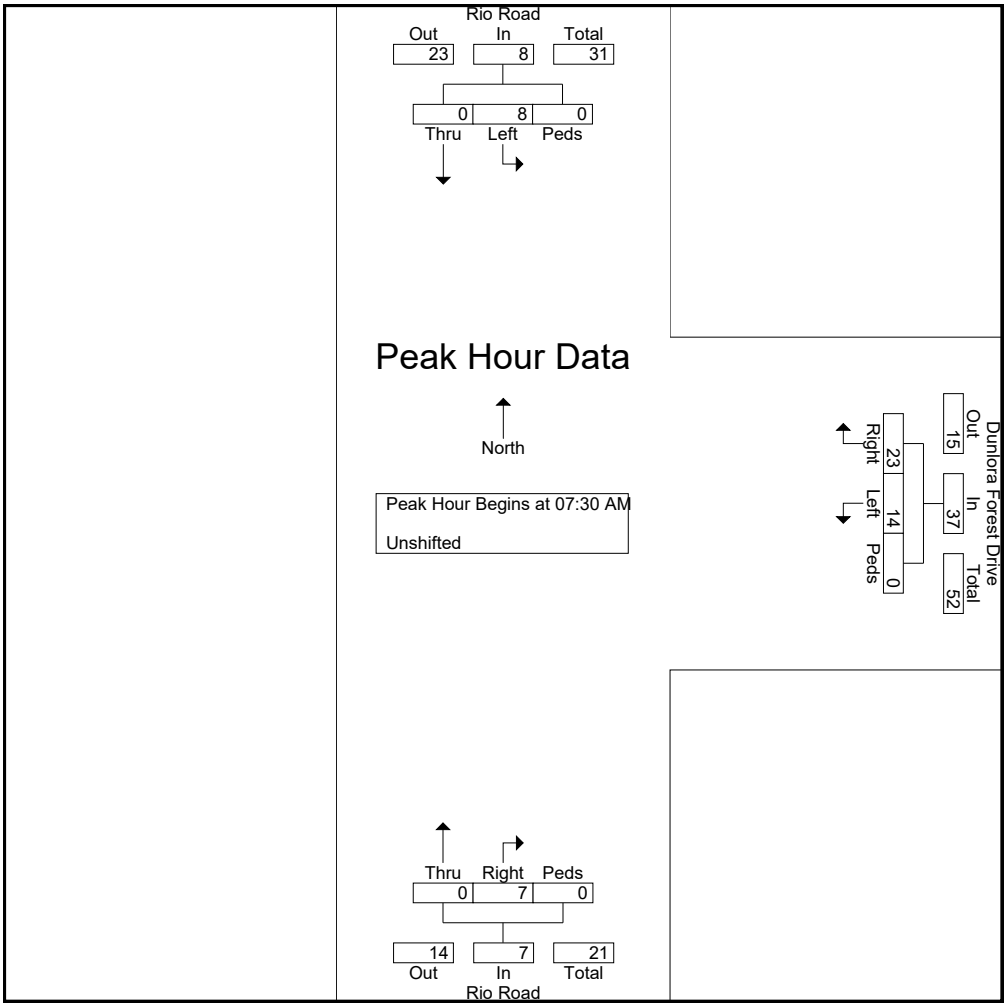
Ramey Kemp & Associates

4343 Cox Road
Glen Allen, VA 23060

Counted By: Rupinski
Weather: Clear
Equipment ID: 4792

File Name : Dunlora Forest Drive AM
Site Code : 00000001
Start Date : 8/21/2019
Page No : 2

	Rio Road From North				Dunlora Forest Drive From East				Rio Road From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 08:15 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	0	**3**	**0**	**3**	**11**	4	0	**15**	2	0	0	2	**20**
07:45 AM	0	2	0	2	4	**5**	0	9	0	0	0	0	11
08:00 AM	0	3	0	3	2	3	0	5	**3**	0	0	**3**	11
08:15 AM	0	0	0	0	6	2	0	8	2	0	0	2	10
Total Volume	0	8	0	8	23	14	0	37	7	0	0	7	52
% App. Total	0	100	0		62.2	37.8	0		100	0	0		
PHF	.000	.667	.000	.667	.523	.700	.000	.617	.583	.000	.000	.583	.650



Ramey Kemp & Associates

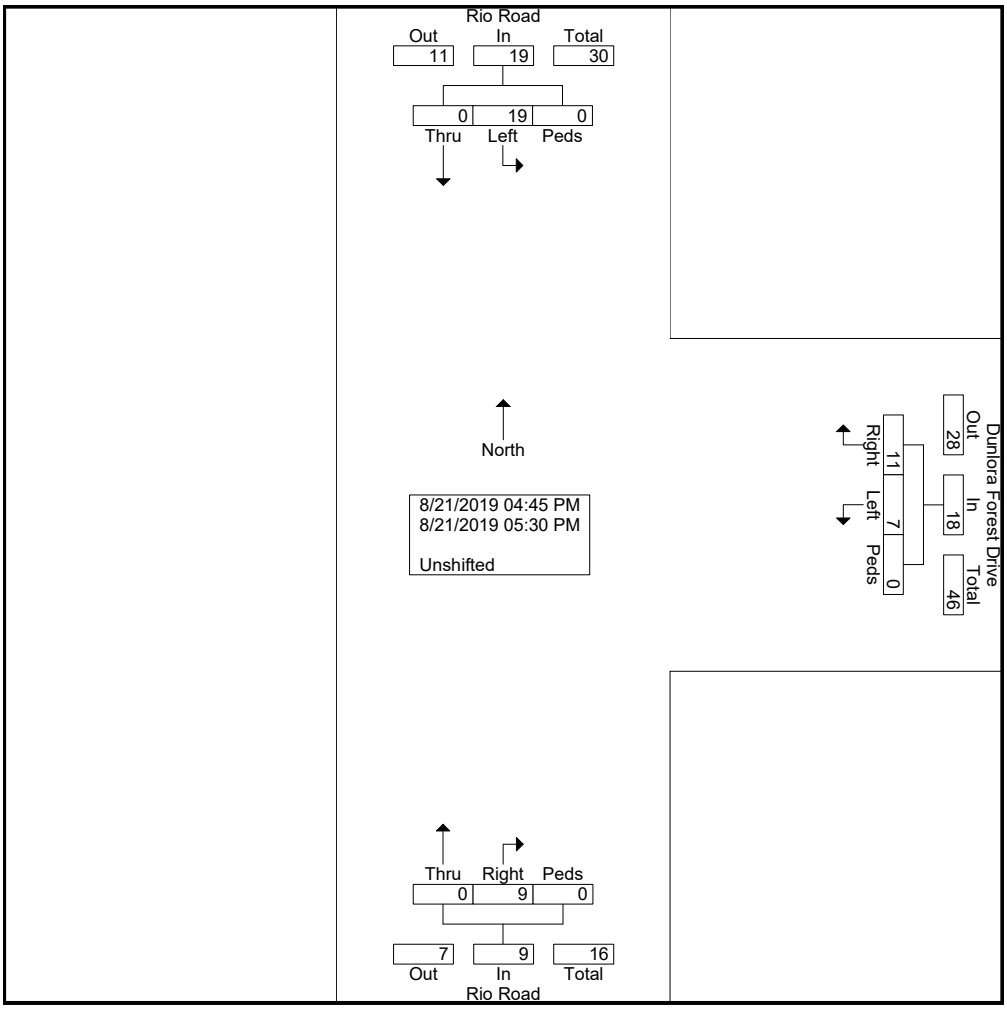
4343 Cox Road
Glen Allen, VA 23060

Counted By: Lee
Weather: Clear
Equipment ID: 4792

File Name : Dunlora Forest Drive PM
Site Code : 00000007
Start Date : 8/21/2019
Page No : 1

Groups Printed- Unshifted

	Rio Road From North				Dunlora Forest Drive From East				Rio Road From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
04:45 PM	0	3	0	3	2	2	0	4	1	0	0	1	8
Total	0	3	0	3	2	2	0	4	1	0	0	1	8
05:00 PM	0	5	0	5	1	3	0	4	1	0	0	1	10
05:15 PM	0	6	0	6	3	1	0	4	5	0	0	5	15
05:30 PM	0	5	0	5	5	1	0	6	2	0	0	2	13
Grand Total	0	19	0	19	11	7	0	18	9	0	0	9	46
Apprch %	0	100	0		61.1	38.9	0		100	0	0		
Total %	0	41.3	0	41.3	23.9	15.2	0	39.1	19.6	0	0	19.6	



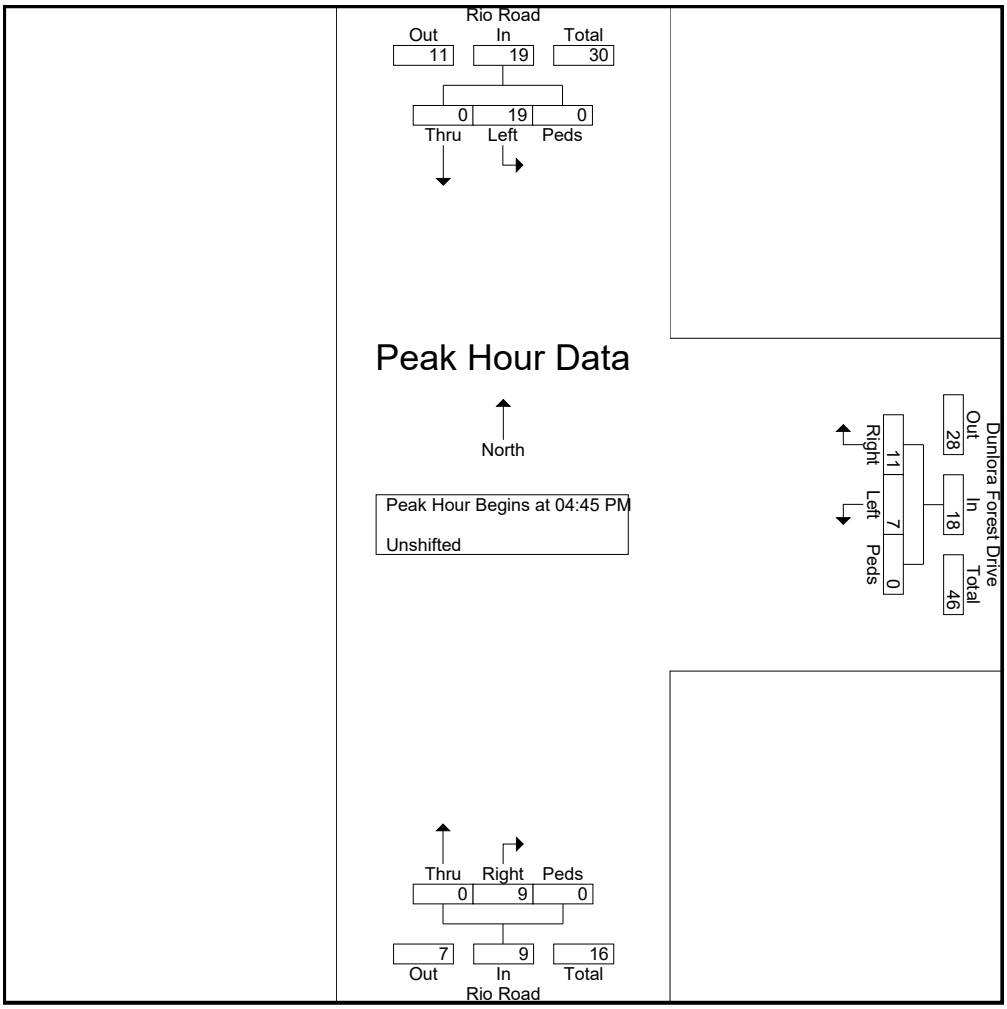
Ramey Kemp & Associates

4343 Cox Road
Glen Allen, VA 23060

Counted By: Lee
Weather: Clear
Equipment ID: 4792

File Name : Dunlora Forest Drive PM
Site Code : 00000007
Start Date : 8/21/2019
Page No : 2

	Rio Road From North				Dunlora Forest Drive From East				Rio Road From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:45 PM to 05:30 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:45 PM													
04:45 PM	0	3	0	3	2	2	0	4	1	0	0	1	8
05:00 PM	0	5	0	5	1	**3**	0	4	1	0	0	1	10
05:15 PM	0	**6**		**6**	3	1	0	4	**5**	0	0	**5**	**15**
05:30 PM	0	5	0	5	**5**	1	0	**6**	2	0	0	2	13
Total Volume	0	19	0	19	11	7	0	18	9	0	0	9	46
% App. Total	0	100	0		61.1	38.9	0		100	0	0		
PHF	.000	.792	.000	.792	.550	.583	.000	.750	.450	.000	.000	.450	.767



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	509	29	514	715	8	103	2	590	4	1	1
Future Volume (veh/h)	14	509	29	514	715	8	103	2	590	4	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	16	566	32	571	794	9	114	2	656	4	1	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	42	793	45	616	1036	897	299	5	818	17	4	19
Arrive On Green	0.02	0.23	0.23	0.35	0.55	0.55	0.17	0.17	0.17	0.01	0.01	0.01
Sat Flow, veh/h	1781	3419	193	1781	1870	1585	1752	31	1585	1439	360	1585
Grp Volume(v), veh/h	16	294	304	571	794	9	116	0	656	5	0	1
Grp Sat Flow(s),veh/h/ln	1781	1777	1836	1781	1870	1585	1783	0	1585	1798	0	1585
Q Serve(g_s), s	1.1	19.4	19.5	39.4	42.0	0.3	7.4	0.0	21.8	0.4	0.0	0.1
Cycle Q Clear(g_c), s	1.1	19.4	19.5	39.4	42.0	0.3	7.4	0.0	21.8	0.4	0.0	0.1
Prop In Lane	1.00		0.11	1.00		1.00	0.98		1.00	0.80		1.00
Lane Grp Cap(c), veh/h	42	412	426	616	1036	897	304	0	818	22	0	19
V/C Ratio(X)	0.38	0.71	0.71	0.93	0.77	0.01	0.38	0.00	0.80	0.23	0.00	0.05
Avail Cap(c_a), veh/h	103	729	753	1080	1797	1542	304	0	818	152	0	134
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	61.4	45.1	45.1	40.2	22.1	12.1	47.0	0.0	25.5	62.5	0.0	62.4
Incr Delay (d2), s/veh	5.5	2.8	2.7	7.9	1.5	0.0	0.9	0.0	5.9	6.4	0.0	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.0	13.7	14.1	25.2	24.9	0.2	6.0	0.0	23.8	0.4	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.9	47.9	47.8	48.1	23.5	12.1	47.9	0.0	31.4	68.9	0.0	63.7
LnGrp LOS	E	D	D	D	C	B	D	A	C	E	A	E
Approach Vol, veh/h		614			1374			772			6	
Approach Delay, s/veh		48.4			33.7			33.9			68.1	
Approach LOS		D			C			C			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	51.7	37.2		30.0	10.6	78.3		8.7				
Change Period (Y+Rc), s	* 7.6	* 7.6		* 8.2	* 7.6	* 7.6		7.2				
Max Green Setting (Gmax), s	* 77	* 52		* 22	* 7.4	* 1.2E2		10.8				
Max Q Clear Time (g_c+I1), s	41.4	21.5		23.8	3.1	44.0		2.4				
Green Ext Time (p_c), s	2.7	8.1		0.0	0.0	18.3		0.0				

Intersection Summary

HCM 6th Ctrl Delay	37.1
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	4.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	70	66	629	25	51	493
Future Vol, veh/h	70	66	629	25	51	493
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	200	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	80	75	715	28	58	560

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1405	729	0	0	743	0
Stage 1	729	-	-	-	-	-
Stage 2	676	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	154	423	-	-	864	-
Stage 1	477	-	-	-	-	-
Stage 2	505	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	144	423	-	-	864	-
Mov Cap-2 Maneuver	144	-	-	-	-	-
Stage 1	477	-	-	-	-	-
Stage 2	471	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	36.9	0	0.9
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	144	423	864	-
HCM Lane V/C Ratio	-	-	0.552	0.177	0.067	-
HCM Control Delay (s)	-	-	57.2	15.3	9.5	-
HCM Lane LOS	-	-	F	C	A	-
HCM 95th %tile Q(veh)	-	-	2.8	0.6	0.2	-

Intersection	
Int Delay, s/veh	0.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	14	24	630	7	8	555
Future Vol, veh/h	14	24	630	7	8	555
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	25	-	200	225	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	27	700	8	9	617

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1335	700	0	0	708	0
Stage 1	700	-	-	-	-	-
Stage 2	635	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	169	439	-	-	891	-
Stage 1	493	-	-	-	-	-
Stage 2	528	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	167	439	-	-	891	-
Mov Cap-2 Maneuver	167	-	-	-	-	-
Stage 1	493	-	-	-	-	-
Stage 2	523	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.3	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	167	439	891	-
HCM Lane V/C Ratio	-	-	0.093	0.061	0.01	-
HCM Control Delay (s)	-	-	28.8	13.7	9.1	-
HCM Lane LOS	-	-	D	B	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0.2	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	2	54	157	1	194	75	421	118	146	387	36
Future Volume (veh/h)	22	2	54	157	1	194	75	421	118	146	387	36
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	28	3	69	201	1	249	96	540	151	187	496	46
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	67	35	79	258	1	349	382	706	598	362	764	648
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.06	0.38	0.38	0.09	0.41	0.41
Sat Flow, veh/h	0	160	356	697	3	1585	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	100	0	0	202	0	249	96	540	151	187	496	46
Grp Sat Flow(s),veh/h/ln	517	0	0	700	0	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	10.0	2.2	17.4	4.5	4.3	14.7	1.2
Cycle Q Clear(g_c), s	15.2	0.0	0.0	15.2	0.0	10.0	2.2	17.4	4.5	4.3	14.7	1.2
Prop In Lane	0.28		0.69	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	181	0	0	258	0	349	382	706	598	362	764	648
V/C Ratio(X)	0.55	0.00	0.00	0.78	0.00	0.71	0.25	0.76	0.25	0.52	0.65	0.07
Avail Cap(c_a), veh/h	181	0	0	258	0	349	549	1157	981	474	1157	981
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.1	0.0	0.0	28.7	0.0	24.9	12.8	18.8	14.8	13.8	16.4	12.4
Incr Delay (d2), s/veh	3.7	0.0	0.0	14.3	0.0	6.7	0.3	1.8	0.2	1.1	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.6	0.0	0.0	7.7	0.0	7.5	1.5	11.4	2.7	2.8	9.7	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.8	0.0	0.0	43.0	0.0	31.6	13.1	20.6	15.0	14.9	17.4	12.5
LnGrp LOS	C	A	A	D	A	C	B	C	B	B	B	B
Approach Vol, veh/h		100			451			787			729	
Approach Delay, s/veh		26.8			36.7			18.6			16.4	
Approach LOS		C			D			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.7	33.3		22.0	11.5	35.5		22.0				
Change Period (Y+Rc), s	7.3	7.3		* 6.8	7.3	7.3		* 6.8				
Max Green Setting (Gmax), s	10.7	42.7		* 15	10.7	42.7		* 15				
Max Q Clear Time (g_c+I1), s	6.3	19.4		17.2	4.2	16.7		17.2				
Green Ext Time (p_c), s	0.2	6.6		0.0	0.1	6.0		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		22.2	
HCM 6th LOS		C	

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection: 1: Rio Road & John Warner Parkway & CATEC Driveway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	R	LT	R	LT	R
Maximum Queue (ft)	78	325	297	502	386	26	124	207	24	5
Average Queue (ft)	15	194	161	260	158	2	89	136	3	0
95th Queue (ft)	55	288	269	426	313	11	142	208	14	3
Link Distance (ft)		1309		956	956			162	309	
Upstream Blk Time (%)								6		
Queuing Penalty (veh)								43		
Storage Bay Dist (ft)	200		300			500	75			125
Storage Blk Time (%)		8	0		0		27	18		
Queuing Penalty (veh)		26	0		0		162	19		

Intersection: 2: Rio Road & Dunlora Drive

Movement	WB	WB	NB	B12	SB	SB
Directions Served	L	R	TR	T	L	T
Maximum Queue (ft)	96	106	269	25	65	50
Average Queue (ft)	39	41	54	1	24	3
95th Queue (ft)	79	83	184	16	58	35
Link Distance (ft)	506		236	918		162
Upstream Blk Time (%)			1			0
Queuing Penalty (veh)			5			0
Storage Bay Dist (ft)		200			50	
Storage Blk Time (%)					2	
Queuing Penalty (veh)					10	

Intersection: 3: Rio Road & Dunlora Forest Drive

Movement	WB	WB	NB	SB	SB
Directions Served	L	R	R	L	T
Maximum Queue (ft)	44	33	2	30	3
Average Queue (ft)	12	15	0	4	0
95th Queue (ft)	35	34	2	20	3
Link Distance (ft)	166				918
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		25	200	225	
Storage Blk Time (%)	9	4			
Queuing Penalty (veh)	2	1			

Intersection: 4: Rio Road & Waldorf School Road/Pen Park Road

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	97	170	135	150	320	192	207	342	172
Average Queue (ft)	39	74	49	41	128	38	60	121	16
95th Queue (ft)	79	141	100	102	238	107	129	248	71
Link Distance (ft)	740		1306		976			523	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		350		75		125	225		100
Storage Blk Time (%)				0	19			8	
Queuing Penalty (veh)				3	37			16	

Network Summary

Network wide Queuing Penalty: 325

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	874	38	570	675	30	40	4	639	5	1	4
Future Volume (veh/h)	16	874	38	570	675	30	40	4	639	5	1	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	17	940	41	613	726	32	43	4	687	5	1	4
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	41	1051	46	646	1203	1047	215	20	784	27	5	28
Arrive On Green	0.02	0.30	0.30	0.36	0.64	0.64	0.13	0.13	0.13	0.02	0.02	0.02
Sat Flow, veh/h	1781	3469	151	1781	1870	1585	1636	152	1585	1496	299	1585
Grp Volume(v), veh/h	17	482	499	613	726	32	47	0	687	6	0	4
Grp Sat Flow(s),veh/h/ln	1781	1777	1843	1781	1870	1585	1789	0	1585	1796	0	1585
Q Serve(g_s), s	1.6	42.9	42.9	55.4	37.5	1.2	3.9	0.0	21.8	0.5	0.0	0.4
Cycle Q Clear(g_c), s	1.6	42.9	42.9	55.4	37.5	1.2	3.9	0.0	21.8	0.5	0.0	0.4
Prop In Lane	1.00		0.08	1.00		1.00	0.91		1.00	0.83		1.00
Lane Grp Cap(c), veh/h	41	538	559	646	1203	1047	235	0	784	32	0	28
V/C Ratio(X)	0.42	0.89	0.89	0.95	0.60	0.03	0.20	0.00	0.88	0.19	0.00	0.14
Avail Cap(c_a), veh/h	80	562	583	832	1385	1202	235	0	784	117	0	103
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	79.8	55.2	55.2	51.3	17.3	9.7	64.2	0.0	37.4	80.2	0.0	80.1
Incr Delay (d2), s/veh	6.6	16.5	16.1	17.2	0.7	0.0	0.5	0.0	11.1	3.4	0.0	2.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.4	29.2	30.1	36.2	22.6	0.8	3.3	0.0	35.7	0.5	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	86.5	71.7	71.3	68.5	17.9	9.7	64.7	0.0	48.5	83.5	0.0	82.8
LnGrp LOS	F	E	E	E	B	A	E	A	D	F	A	F
Approach Vol, veh/h		998			1371			734			10	
Approach Delay, s/veh		71.8			40.3			49.5			83.3	
Approach LOS		E			D			D			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	67.7	57.8		30.0	11.4	114.1		10.2				
Change Period (Y+Rc), s	* 7.6	* 7.6		* 8.2	* 7.6	* 7.6		7.2				
Max Green Setting (Gmax), s	* 77	* 52		* 22	* 7.4	* 1.2E2		10.8				
Max Q Clear Time (g_c+I1), s	57.4	44.9		23.8	3.6	39.5		2.5				
Green Ext Time (p_c), s	2.7	5.3		0.0	0.0	15.6		0.0				

Intersection Summary

HCM 6th Ctrl Delay	52.7
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	23	25	658	33	72	537
Future Vol, veh/h	23	25	658	33	72	537
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	200	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	25	27	708	35	77	577

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1457	726	0	0	743	0
Stage 1	726	-	-	-	-	-
Stage 2	731	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	143	425	-	-	864	-
Stage 1	479	-	-	-	-	-
Stage 2	476	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	130	425	-	-	864	-
Mov Cap-2 Maneuver	130	-	-	-	-	-
Stage 1	479	-	-	-	-	-
Stage 2	434	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	26	0	1.1
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	130	425	864	-
HCM Lane V/C Ratio	-	-	0.19	0.063	0.09	-
HCM Control Delay (s)	-	-	39.1	14	9.6	-
HCM Lane LOS	-	-	E	B	A	-
HCM 95th %tile Q(veh)	-	-	0.7	0.2	0.3	-

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	12	679	10	20	540
Future Vol, veh/h	7	12	679	10	20	540
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	25	-	200	225	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	13	754	11	22	600

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1398	754	0	0	765	0
Stage 1	754	-	-	-	-	-
Stage 2	644	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	155	409	-	-	848	-
Stage 1	465	-	-	-	-	-
Stage 2	523	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	151	409	-	-	848	-
Mov Cap-2 Maneuver	151	-	-	-	-	-
Stage 1	465	-	-	-	-	-
Stage 2	509	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	151	409	848	-
HCM Lane V/C Ratio	-	-	0.052	0.033	0.026	-
HCM Control Delay (s)	-	-	30.1	14.1	9.4	-
HCM Lane LOS	-	-	D	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.1	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	1	12	52	1	80	7	603	94	111	433	3
Future Volume (veh/h)	6	1	12	52	1	80	7	603	94	111	433	3
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	7	1	13	57	1	88	8	663	103	122	476	3
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	108	27	85	247	3	139	486	880	746	382	999	847
Arrive On Green	0.09	0.09	0.09	0.09	0.09	0.09	0.01	0.47	0.47	0.07	0.53	0.53
Sat Flow, veh/h	293	305	972	1420	38	1585	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	21	0	0	58	0	88	8	663	103	122	476	3
Grp Sat Flow(s),veh/h/ln	1570	0	0	1457	0	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.0	0.0	0.0	1.4	0.0	3.1	0.1	16.9	2.1	1.9	9.2	0.1
Cycle Q Clear(g_c), s	0.7	0.0	0.0	2.1	0.0	3.1	0.1	16.9	2.1	1.9	9.2	0.1
Prop In Lane	0.33		0.62	0.98		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	220	0	0	250	0	139	486	880	746	382	999	847
V/C Ratio(X)	0.10	0.00	0.00	0.23	0.00	0.64	0.02	0.75	0.14	0.32	0.48	0.00
Avail Cap(c_a), veh/h	479	0	0	495	0	414	795	1373	1164	578	1373	1164
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.5	0.0	0.0	25.1	0.0	25.6	8.1	12.6	8.7	9.4	8.5	6.3
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.5	0.0	4.7	0.0	1.3	0.1	0.5	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.5	0.0	0.0	1.3	0.0	2.3	0.1	9.9	1.1	1.1	5.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.7	0.0	0.0	25.6	0.0	30.4	8.1	14.0	8.8	9.9	8.8	6.3
LnGrp LOS	C	A	A	C	A	C	A	B	A	A	A	A
Approach Vol, veh/h		21			146			774			601	
Approach Delay, s/veh		24.7			28.5			13.2			9.0	
Approach LOS		C			C			B			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.6	34.7		11.9	7.9	38.4		11.9				
Change Period (Y+Rc), s	7.3	7.3		* 6.8	7.3	7.3		* 6.8				
Max Green Setting (Gmax), s	10.7	42.7		* 15	10.7	42.7		* 15				
Max Q Clear Time (g_c+I1), s	3.9	18.9		2.7	2.1	11.2		5.1				
Green Ext Time (p_c), s	0.2	8.5		0.0	0.0	5.9		0.3				

Intersection Summary

HCM 6th Ctrl Delay	13.2
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection: 1: Rio Road & John Warner Parkway & CATEC Driveway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	R	LT	R	LT	R
Maximum Queue (ft)	249	781	400	607	364	32	124	184	29	10
Average Queue (ft)	35	363	299	336	118	5	54	157	4	1
95th Queue (ft)	156	592	435	551	273	23	118	205	18	5
Link Distance (ft)		1309		956	956			162	309	
Upstream Blk Time (%)								12		
Queuing Penalty (veh)								85		
Storage Bay Dist (ft)	200		300			500	75			125
Storage Blk Time (%)		36	9		0		8	35		
Queuing Penalty (veh)		179	39		0		53	16		

Intersection: 2: Rio Road & Dunlora Drive

Movement	WB	WB	NB	B12	SB	SB
Directions Served	L	R	TR	T	L	T
Maximum Queue (ft)	60	74	302	84	91	172
Average Queue (ft)	16	24	111	6	39	16
95th Queue (ft)	44	59	264	62	78	94
Link Distance (ft)	506		236	573		162
Upstream Blk Time (%)			3			0
Queuing Penalty (veh)			19			2
Storage Bay Dist (ft)		200			50	
Storage Blk Time (%)					7	0
Queuing Penalty (veh)					38	0

Intersection: 3: Rio Road & Dunlora Forest Drive

Movement	WB	WB	SB
Directions Served	L	R	L
Maximum Queue (ft)	39	30	46
Average Queue (ft)	6	9	11
95th Queue (ft)	25	29	37
Link Distance (ft)	350		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		25	225
Storage Blk Time (%)	4	3	
Queuing Penalty (veh)	0	0	

Intersection: 4: Rio Road & Waldorf School Road/Pen Park Road

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	33	73	70	60	296	154	118	206	20
Average Queue (ft)	11	28	24	5	129	27	44	74	1
95th Queue (ft)	30	61	53	33	231	86	92	174	9
Link Distance (ft)	736		1306		976			546	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		350		75		125	225		100
Storage Blk Time (%)					16			3	
Queuing Penalty (veh)					16			4	

Network Summary

Network wide Queuing Penalty: 451

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	573	33	556	819	8	115	2	663	4	1	1
Future Volume (veh/h)	15	573	33	556	819	8	115	2	663	4	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	17	637	37	618	910	9	128	2	737	4	1	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	43	848	49	659	1111	961	270	4	830	17	4	19
Arrive On Green	0.02	0.25	0.25	0.37	0.59	0.59	0.15	0.15	0.15	0.01	0.01	0.01
Sat Flow, veh/h	1781	3413	198	1781	1870	1585	1755	27	1585	1439	360	1585
Grp Volume(v), veh/h	17	331	343	618	910	9	130	0	737	5	0	1
Grp Sat Flow(s),veh/h/ln	1781	1777	1835	1781	1870	1585	1783	0	1585	1798	0	1585
Q Serve(g_s), s	1.3	24.4	24.5	47.4	54.5	0.3	9.4	0.0	21.8	0.4	0.0	0.1
Cycle Q Clear(g_c), s	1.3	24.4	24.5	47.4	54.5	0.3	9.4	0.0	21.8	0.4	0.0	0.1
Prop In Lane	1.00		0.11	1.00		1.00	0.98		1.00	0.80		1.00
Lane Grp Cap(c), veh/h	43	441	456	659	1111	961	274	0	830	21	0	19
V/C Ratio(X)	0.40	0.75	0.75	0.94	0.82	0.01	0.47	0.00	0.89	0.23	0.00	0.05
Avail Cap(c_a), veh/h	93	657	679	973	1620	1392	274	0	830	137	0	121
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	68.1	49.2	49.2	43.1	22.7	11.1	54.7	0.0	30.0	69.4	0.0	69.2
Incr Delay (d2), s/veh	5.8	3.2	3.1	12.3	2.5	0.0	1.5	0.0	11.6	6.6	0.0	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.2	16.6	17.1	30.6	31.5	0.2	7.8	0.0	32.6	0.4	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.9	52.4	52.3	55.4	25.2	11.1	56.2	0.0	41.7	75.9	0.0	70.6
LnGrp LOS	E	D	D	E	C	B	E	A	D	E	A	E
Approach Vol, veh/h		691			1537			867			6	
Approach Delay, s/veh		52.9			37.3			43.9			75.1	
Approach LOS		D			D			D			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	60.0	42.8		30.0	11.0	91.8		8.9				
Change Period (Y+Rc), s	* 7.6	* 7.6		* 8.2	* 7.6	* 7.6		7.2				
Max Green Setting (Gmax), s	* 77	* 52		* 22	* 7.4	* 1.2E2		10.8				
Max Q Clear Time (g_c+I1), s	49.4	26.5		23.8	3.3	56.5		2.4				
Green Ext Time (p_c), s	3.0	8.7		0.0	0.0	23.1		0.0				

Intersection Summary

HCM 6th Ctrl Delay	42.7
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	10

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	95	77	703	34	55	534
Future Vol, veh/h	95	77	703	34	55	534
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	200	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	108	88	799	39	63	607

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1552	819	0	0	838	0
Stage 1	819	-	-	-	-	-
Stage 2	733	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	125	375	-	-	796	-
Stage 1	433	-	-	-	-	-
Stage 2	475	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	115	375	-	-	796	-
Mov Cap-2 Maneuver	115	-	-	-	-	-
Stage 1	433	-	-	-	-	-
Stage 2	437	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	84.2	0	0.9
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	115	375	796	-
HCM Lane V/C Ratio	-	-	0.939	0.233	0.079	-
HCM Control Delay (s)	-	-	138.3	17.5	9.9	-
HCM Lane LOS	-	-	F	C	A	-
HCM 95th %tile Q(veh)	-	-	5.9	0.9	0.3	-

Intersection	
Int Delay, s/veh	0.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	25	712	7	9	620
Future Vol, veh/h	15	25	712	7	9	620
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	25	-	200	225	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	28	791	8	10	689

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1500	791	0	0	799	0
Stage 1	791	-	-	-	-	-
Stage 2	709	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	134	390	-	-	824	-
Stage 1	447	-	-	-	-	-
Stage 2	488	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	132	390	-	-	824	-
Mov Cap-2 Maneuver	132	-	-	-	-	-
Stage 1	447	-	-	-	-	-
Stage 2	482	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	22.9	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	132	390	824	-
HCM Lane V/C Ratio	-	-	0.126	0.071	0.012	-
HCM Control Delay (s)	-	-	36.2	14.9	9.4	-
HCM Lane LOS	-	-	E	B	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0.2	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	2	56	163	1	201	78	495	123	152	446	37
Future Volume (veh/h)	23	2	56	163	1	201	78	495	123	152	446	37
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	29	3	72	209	1	258	100	635	158	195	572	47
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	62	32	73	238	1	323	369	787	667	339	844	715
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.06	0.42	0.42	0.09	0.45	0.45
Sat Flow, veh/h	0	160	359	696	3	1585	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	104	0	0	210	0	258	100	635	158	195	572	47
Grp Sat Flow(s),veh/h/ln	519	0	0	699	0	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	11.6	2.3	22.2	4.8	4.5	18.1	1.3
Cycle Q Clear(g_c), s	15.2	0.0	0.0	15.2	0.0	11.6	2.3	22.2	4.8	4.5	18.1	1.3
Prop In Lane	0.28		0.69	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	167	0	0	238	0	323	369	787	667	339	844	715
V/C Ratio(X)	0.62	0.00	0.00	0.88	0.00	0.80	0.27	0.81	0.24	0.58	0.68	0.07
Avail Cap(c_a), veh/h	167	0	0	238	0	323	520	1070	906	436	1070	906
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.0	0.0	0.0	32.2	0.0	28.3	12.6	18.9	13.9	14.7	16.2	11.6
Incr Delay (d2), s/veh	6.9	0.0	0.0	29.3	0.0	13.3	0.4	3.3	0.2	1.5	1.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.3	0.0	0.0	9.5	0.0	9.1	1.5	14.3	2.9	3.0	11.5	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.9	0.0	0.0	61.5	0.0	41.6	13.0	22.3	14.1	16.2	17.4	11.6
LnGrp LOS	C	A	A	E	A	D	B	C	B	B	B	B
Approach Vol, veh/h		104			468			893			814	
Approach Delay, s/veh		32.9			50.5			19.8			16.8	
Approach LOS		C			D			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.9	38.7		22.0	11.7	41.0		22.0				
Change Period (Y+Rc), s	7.3	7.3		* 6.8	7.3	7.3		* 6.8				
Max Green Setting (Gmax), s	10.7	42.7		* 15	10.7	42.7		* 15				
Max Q Clear Time (g_c+I1), s	6.5	24.2		17.2	4.3	20.1		17.2				
Green Ext Time (p_c), s	0.3	7.2		0.0	0.1	6.8		0.0				

Intersection Summary

HCM 6th Ctrl Delay	25.6
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection: 1: Rio Road & John Warner Parkway & CATEC Driveway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	R	LT	R	LT	R
Maximum Queue (ft)	105	379	356	611	441	21	124	210	22	6
Average Queue (ft)	18	231	203	328	190	1	103	163	3	0
95th Queue (ft)	74	336	314	522	367	11	148	215	13	3
Link Distance (ft)		1309		956	956			162	309	
Upstream Blk Time (%)								14		
Queuing Penalty (veh)								107		
Storage Bay Dist (ft)	200		300			500	75			125
Storage Blk Time (%)		17	1		0		39	26		
Queuing Penalty (veh)		58	2		0		261	30		

Intersection: 2: Rio Road & Dunlora Drive

Movement	WB	WB	NB	B12	SB	SB
Directions Served	L	R	TR	T	L	T
Maximum Queue (ft)	302	223	315	289	85	163
Average Queue (ft)	96	83	134	30	33	11
95th Queue (ft)	245	195	320	175	75	77
Link Distance (ft)	506		236	573		162
Upstream Blk Time (%)	1		7			0
Queuing Penalty (veh)	0		52			3
Storage Bay Dist (ft)		200			50	
Storage Blk Time (%)	3	7			7	
Queuing Penalty (veh)	2	6			37	

Intersection: 3: Rio Road & Dunlora Forest Drive

Movement	WB	WB	SB	SB
Directions Served	L	R	L	T
Maximum Queue (ft)	47	39	33	12
Average Queue (ft)	14	14	6	0
95th Queue (ft)	38	35	25	12
Link Distance (ft)	138			268
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		25	225	
Storage Blk Time (%)	11	5		
Queuing Penalty (veh)	3	1		

Intersection: 4: Rio Road & Waldorf School Road/Pen Park Road

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	121	207	158	156	397	225	224	337	126
Average Queue (ft)	48	90	61	43	158	48	73	129	18
95th Queue (ft)	102	166	121	113	307	144	152	256	78
Link Distance (ft)	744		1307		976			546	
Upstream Blk Time (%)								0	
Queuing Penalty (veh)								0	
Storage Bay Dist (ft)		350		75		125	225		100
Storage Blk Time (%)				1	23			9	
Queuing Penalty (veh)				5	48			19	

Network Summary

Network wide Queuing Penalty: 634

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	1035	48	656	785	31	47	4	722	5	1	4
Future Volume (veh/h)	17	1035	48	656	785	31	47	4	722	5	1	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	18	1113	52	705	844	33	51	4	776	5	1	4
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	41	994	46	726	1257	1093	198	16	835	26	5	28
Arrive On Green	0.02	0.29	0.29	0.41	0.67	0.67	0.12	0.12	0.12	0.02	0.02	0.02
Sat Flow, veh/h	1781	3457	161	1781	1870	1585	1657	130	1585	1496	299	1585
Grp Volume(v), veh/h	18	572	593	705	844	33	55	0	776	6	0	4
Grp Sat Flow(s),veh/h/ln	1781	1777	1841	1781	1870	1585	1787	0	1585	1796	0	1585
Q Serve(g_s), s	1.8	52.4	52.4	70.7	49.1	1.2	5.1	0.0	21.8	0.6	0.0	0.5
Cycle Q Clear(g_c), s	1.8	52.4	52.4	70.7	49.1	1.2	5.1	0.0	21.8	0.6	0.0	0.5
Prop In Lane	1.00		0.09	1.00		1.00	0.93		1.00	0.83		1.00
Lane Grp Cap(c), veh/h	41	511	529	726	1257	1093	214	0	835	31	0	28
V/C Ratio(X)	0.44	1.12	1.12	0.97	0.67	0.03	0.26	0.00	0.93	0.19	0.00	0.14
Avail Cap(c_a), veh/h	72	511	529	757	1259	1095	214	0	835	106	0	94
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	87.9	64.9	64.9	52.9	17.9	9.0	72.9	0.0	39.9	88.3	0.0	88.2
Incr Delay (d2), s/veh	7.3	76.8	76.4	25.3	1.5	0.0	0.8	0.0	16.6	3.5	0.0	2.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	34.5	35.7	36.5	21.3	0.5	2.4	0.0	35.8	0.3	0.0	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	95.1	141.7	141.4	78.3	19.3	9.0	73.6	0.0	56.5	91.8	0.0	91.0
LnGrp LOS	F	F	F	E	B	A	E	A	E	F	A	F
Approach Vol, veh/h		1183			1582			831			10	
Approach Delay, s/veh		140.8			45.4			57.6			91.5	
Approach LOS		F			D			E			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	81.8	60.0		30.0	11.8	130.1		10.4				
Change Period (Y+Rc), s	* 7.6	* 7.6		* 8.2	* 7.6	* 7.6		7.2				
Max Green Setting (Gmax), s	* 77	* 52		* 22	* 7.4	* 1.2E2		10.8				
Max Q Clear Time (g_c+I1), s	72.7	54.4		23.8	3.8	51.1		2.6				
Green Ext Time (p_c), s	1.5	0.0		0.0	0.0	20.4		0.0				

Intersection Summary

HCM 6th Ctrl Delay	79.7
HCM 6th LOS	E

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	2.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	37	31	742	59	83	622
Future Vol, veh/h	37	31	742	59	83	622
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	200	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	40	33	798	63	89	669

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1677	830	0	0	861	0
Stage 1	830	-	-	-	-	-
Stage 2	847	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	105	370	-	-	781	-
Stage 1	428	-	-	-	-	-
Stage 2	420	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	93	370	-	-	781	-
Mov Cap-2 Maneuver	93	-	-	-	-	-
Stage 1	428	-	-	-	-	-
Stage 2	372	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	45.2	0	1.2
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	93	370	781	-
HCM Lane V/C Ratio	-	-	0.428	0.09	0.114	-
HCM Control Delay (s)	-	-	70	15.7	10.2	-
HCM Lane LOS	-	-	F	C	B	-
HCM 95th %tile Q(veh)	-	-	1.8	0.3	0.4	-

Intersection	
Int Delay, s/veh	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	12	789	10	21	638
Future Vol, veh/h	7	12	789	10	21	638
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	25	-	200	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	13	877	11	23	709

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1632	877	0	0	888	0
Stage 1	877	-	-	-	-	-
Stage 2	755	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	111	348	-	-	763	-
Stage 1	407	-	-	-	-	-
Stage 2	464	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	108	348	-	-	763	-
Mov Cap-2 Maneuver	108	-	-	-	-	-
Stage 1	407	-	-	-	-	-
Stage 2	450	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	25	0	0.3
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	108	348	763	-
HCM Lane V/C Ratio	-	-	0.072	0.038	0.031	-
HCM Control Delay (s)	-	-	40.9	15.8	9.9	-
HCM Lane LOS	-	-	E	C	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.1	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	1	12	54	1	83	7	710	98	115	526	4
Future Volume (veh/h)	6	1	12	54	1	83	7	710	98	115	526	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	7	1	13	59	1	91	8	780	108	126	578	4
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	98	28	85	234	3	139	448	963	816	339	1073	909
Arrive On Green	0.09	0.09	0.09	0.09	0.09	0.09	0.01	0.52	0.52	0.07	0.57	0.57
Sat Flow, veh/h	278	322	975	1421	35	1585	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	21	0	0	60	0	91	8	780	108	126	578	4
Grp Sat Flow(s),veh/h/ln	1574	0	0	1456	0	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.0	0.0	0.0	1.7	0.0	3.6	0.1	22.6	2.3	2.1	12.4	0.1
Cycle Q Clear(g_c), s	0.8	0.0	0.0	2.4	0.0	3.6	0.1	22.6	2.3	2.1	12.4	0.1
Prop In Lane	0.33		0.62	0.98		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	211	0	0	237	0	139	448	963	816	339	1073	909
V/C Ratio(X)	0.10	0.00	0.00	0.25	0.00	0.66	0.02	0.81	0.13	0.37	0.54	0.00
Avail Cap(c_a), veh/h	429	0	0	442	0	370	722	1227	1039	509	1227	1039
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.5	0.0	0.0	28.2	0.0	28.8	7.9	13.1	8.2	11.0	8.6	5.9
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.6	0.0	5.2	0.0	3.3	0.1	0.7	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0	0.9	0.0	1.5	0.0	8.4	0.7	0.7	4.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.7	0.0	0.0	28.7	0.0	34.0	8.0	16.4	8.3	11.6	9.0	5.9
LnGrp LOS	C	A	A	C	A	C	A	B	A	B	A	A
Approach Vol, veh/h		21			151			896			708	
Approach Delay, s/veh		27.7			31.9			15.4			9.4	
Approach LOS		C			C			B			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.8	40.8		12.5	8.0	44.7		12.5				
Change Period (Y+Rc), s	7.3	7.3		* 6.8	7.3	7.3		* 6.8				
Max Green Setting (Gmax), s	10.7	42.7		* 15	10.7	42.7		* 15				
Max Q Clear Time (g_c+I1), s	4.1	24.6		2.8	2.1	14.4		5.6				
Green Ext Time (p_c), s	0.2	8.9		0.0	0.0	7.4		0.3				

Intersection Summary

HCM 6th Ctrl Delay	14.6
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection: 1: Rio Road & John Warner Parkway & CATEC Driveway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	R	LT	R	LT	R
Maximum Queue (ft)	249	1325	400	839	628	30	124	190	31	8
Average Queue (ft)	36	901	385	479	198	3	62	169	5	1
95th Queue (ft)	166	1511	443	804	548	17	129	198	19	5
Link Distance (ft)		1309		956	956			162	309	
Upstream Blk Time (%)		13		2	1			23		
Queuing Penalty (veh)		0		0	0			177		
Storage Bay Dist (ft)	200		300			500	75			125
Storage Blk Time (%)		53	38				14	40		
Queuing Penalty (veh)		308	205				105	21		

Intersection: 2: Rio Road & Dunlora Drive

Movement	WB	WB	NB	B12	SB	SB
Directions Served	L	R	TR	T	L	T
Maximum Queue (ft)	144	162	324	313	98	188
Average Queue (ft)	43	51	212	53	53	50
95th Queue (ft)	149	135	377	210	99	173
Link Distance (ft)	506		236	563		162
Upstream Blk Time (%)			14			2
Queuing Penalty (veh)			112			12
Storage Bay Dist (ft)		200			50	
Storage Blk Time (%)	3	2			17	0
Queuing Penalty (veh)	1	1			105	0

Intersection: 3: Rio Road & Dunlora Forest Drive

Movement	WB	WB	NB	SB
Directions Served	L	R	R	L
Maximum Queue (ft)	32	30	2	48
Average Queue (ft)	6	6	0	13
95th Queue (ft)	24	22	2	39
Link Distance (ft)	117			
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		25	200	250
Storage Blk Time (%)	5	1		
Queuing Penalty (veh)	1	0		

Intersection: 4: Rio Road & Waldorf School Road/Pen Park Road

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	45	84	80	72	368	192	117	248	40
Average Queue (ft)	10	30	27	5	168	36	48	92	2
95th Queue (ft)	31	65	58	38	301	121	91	202	24
Link Distance (ft)	738		1306		976			549	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		350		75		125	225		100
Storage Blk Time (%)					19			4	
Queuing Penalty (veh)					20			5	

Network Summary

Network wide Queuing Penalty: 1072

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	573	43	566	819	8	142	3	691	4	1	1
Future Volume (veh/h)	15	573	43	566	819	8	142	3	691	4	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	17	637	48	629	910	9	158	3	768	4	1	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	43	839	63	669	1126	973	264	5	834	17	4	19
Arrive On Green	0.02	0.25	0.25	0.38	0.60	0.60	0.15	0.15	0.15	0.01	0.01	0.01
Sat Flow, veh/h	1781	3350	252	1781	1870	1585	1750	33	1585	1439	360	1585
Grp Volume(v), veh/h	17	338	347	629	910	9	161	0	768	5	0	1
Grp Sat Flow(s),veh/h/ln	1781	1777	1825	1781	1870	1585	1783	0	1585	1798	0	1585
Q Serve(g_s), s	1.4	25.4	25.5	49.3	54.6	0.3	12.2	0.0	21.8	0.4	0.0	0.1
Cycle Q Clear(g_c), s	1.4	25.4	25.5	49.3	54.6	0.3	12.2	0.0	21.8	0.4	0.0	0.1
Prop In Lane	1.00		0.14	1.00		1.00	0.98		1.00	0.80		1.00
Lane Grp Cap(c), veh/h	43	445	457	669	1126	973	269	0	834	21	0	19
V/C Ratio(X)	0.40	0.76	0.76	0.94	0.81	0.01	0.60	0.00	0.92	0.23	0.00	0.05
Avail Cap(c_a), veh/h	91	644	661	953	1586	1363	269	0	834	134	0	118
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	69.6	50.2	50.2	43.6	22.3	10.8	57.4	0.0	31.5	70.8	0.0	70.7
Incr Delay (d2), s/veh	5.9	3.6	3.6	13.3	2.4	0.0	4.0	0.0	15.5	6.6	0.0	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.2	17.3	17.7	31.9	31.5	0.2	9.7	0.0	36.3	0.4	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.5	53.8	53.8	56.9	24.7	10.9	61.4	0.0	47.0	77.5	0.0	72.1
LnGrp LOS	E	D	D	E	C	B	E	A	D	E	A	E
Approach Vol, veh/h		702			1548			929			6	
Approach Delay, s/veh		54.3			37.7			49.5			76.6	
Approach LOS		D			D			D			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	61.9	43.9		30.0	11.1	94.7		8.9				
Change Period (Y+Rc), s	* 7.6	* 7.6		* 8.2	* 7.6	* 7.6		7.2				
Max Green Setting (Gmax), s	* 77	* 52		* 22	* 7.4	* 1.2E2		10.8				
Max Q Clear Time (g_c+I1), s	51.3	27.5		23.8	3.4	56.6		2.4				
Green Ext Time (p_c), s	3.0	8.8		0.0	0.0	23.1		0.0				

Intersection Summary

HCM 6th Ctrl Delay	44.9	
HCM 6th LOS	D	

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	12.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	95	77	759	35	55	554
Future Vol, veh/h	95	77	759	35	55	554
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	108	88	863	40	63	630

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1639	883	0	0	903	0
Stage 1	883	-	-	-	-	-
Stage 2	756	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	110	345	-	-	753	-
Stage 1	404	-	-	-	-	-
Stage 2	464	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 101	345	-	-	753	-
Mov Cap-2 Maneuver	~ 101	-	-	-	-	-
Stage 1	404	-	-	-	-	-
Stage 2	425	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	112.3	0	0.9
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	101	345	753	-
HCM Lane V/C Ratio	-	-	1.069	0.254	0.083	-
HCM Control Delay (s)	-	-	188	18.9	10.2	-
HCM Lane LOS	-	-	F	C	B	-
HCM 95th %tile Q(veh)	-	-	6.8	1	0.3	-

Notes

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

Intersection	
Int Delay, s/veh	0.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	25	723	7	9	650
Future Vol, veh/h	15	25	723	7	9	650
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	25	-	200	225	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	28	803	8	10	722

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1545	803	0	0	811	0
Stage 1	803	-	-	-	-	-
Stage 2	742	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	126	383	-	-	815	-
Stage 1	441	-	-	-	-	-
Stage 2	471	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	124	383	-	-	815	-
Mov Cap-2 Maneuver	124	-	-	-	-	-
Stage 1	441	-	-	-	-	-
Stage 2	465	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	23.9	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	124	383	815	-
HCM Lane V/C Ratio	-	-	0.134	0.073	0.012	-
HCM Control Delay (s)	-	-	38.5	15.1	9.5	-
HCM Lane LOS	-	-	E	C	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0.2	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	2	56	163	1	202	78	505	123	154	473	38
Future Volume (veh/h)	23	2	56	163	1	202	78	505	123	154	473	38
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	29	3	72	209	1	259	100	647	158	197	606	49
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	61	32	72	235	1	319	352	797	675	336	854	724
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.06	0.43	0.43	0.09	0.46	0.46
Sat Flow, veh/h	0	160	359	696	3	1585	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	104	0	0	210	0	259	100	647	158	197	606	49
Grp Sat Flow(s),veh/h/ln	519	0	0	699	0	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	11.8	2.3	22.9	4.8	4.6	19.6	1.3
Cycle Q Clear(g_c), s	15.2	0.0	0.0	15.2	0.0	11.8	2.3	22.9	4.8	4.6	19.6	1.3
Prop In Lane	0.28		0.69	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	166	0	0	236	0	319	352	797	675	336	854	724
V/C Ratio(X)	0.63	0.00	0.00	0.89	0.00	0.81	0.28	0.81	0.23	0.59	0.71	0.07
Avail Cap(c_a), veh/h	166	0	0	236	0	319	501	1059	898	431	1059	898
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.4	0.0	0.0	32.6	0.0	28.7	12.9	19.0	13.8	14.9	16.5	11.5
Incr Delay (d2), s/veh	7.3	0.0	0.0	31.2	0.0	14.5	0.4	3.7	0.2	1.6	1.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.4	0.0	0.0	9.7	0.0	9.3	1.5	14.7	2.9	3.1	12.4	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.7	0.0	0.0	63.8	0.0	43.2	13.4	22.7	14.0	16.5	18.2	11.5
LnGrp LOS	C	A	A	E	A	D	B	C	B	B	B	B
Approach Vol, veh/h		104			469			905			852	
Approach Delay, s/veh		33.7			52.4			20.1			17.4	
Approach LOS		C			D			C			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.0	39.4		22.0	11.7	41.7		22.0				
Change Period (Y+Rc), s	7.3	7.3		* 6.8	7.3	7.3		* 6.8				
Max Green Setting (Gmax), s	10.7	42.7		* 15	10.7	42.7		* 15				
Max Q Clear Time (g_c+I1), s	6.6	24.9		17.2	4.3	21.6		17.2				
Green Ext Time (p_c), s	0.3	7.2		0.0	0.1	7.0		0.0				

Intersection Summary

HCM 6th Ctrl Delay	26.2
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	57	30	11	737	629	9
Future Vol, veh/h	57	30	11	737	629	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	1
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	100	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	62	30	12	801	684	10

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1509	684	694	0	-	0
Stage 1	684	-	-	-	-	-
Stage 2	825	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	133	449	901	-	-	-
Stage 1	501	-	-	-	-	-
Stage 2	430	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	131	449	901	-	-	-
Mov Cap-2 Maneuver	131	-	-	-	-	-
Stage 1	494	-	-	-	-	-
Stage 2	430	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	41.5	0.1	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	901	-	131	449	-	-
HCM Lane V/C Ratio	0.013	-	0.473	0.067	-	-
HCM Control Delay (s)	9	-	55	13.6	-	-
HCM Lane LOS	A	-	F	B	-	-
HCM 95th %tile Q(veh)	0	-	2.2	0.2	-	-

Intersection: 1: Rio Road & John Warner Parkway & CATEC Driveway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	R	LT	R	LT	R
Maximum Queue (ft)	201	441	380	556	582	26	124	218	18	7
Average Queue (ft)	23	250	219	324	212	3	112	173	3	0
95th Queue (ft)	105	367	334	506	433	15	146	228	13	3
Link Distance (ft)		1309		956	956			164	309	
Upstream Blk Time (%)					0			22		
Queuing Penalty (veh)					0			192		
Storage Bay Dist (ft)	200		300			500	75			125
Storage Blk Time (%)		21	1		0		51	21		
Queuing Penalty (veh)		73	3		0		356	30		

Intersection: 2: Rio Road & Dunlora Drive

Movement	WB	WB	NB	SB	SB
Directions Served	L	R	TR	L	T
Maximum Queue (ft)	468	500	229	87	136
Average Queue (ft)	143	216	153	33	15
95th Queue (ft)	420	544	292	74	87
Link Distance (ft)	519	519	213		164
Upstream Blk Time (%)	12	21	15		0
Queuing Penalty (veh)	0	0	123		1
Storage Bay Dist (ft)				50	
Storage Blk Time (%)				8	0
Queuing Penalty (veh)				42	0

Intersection: 3: Rio Road & Dunlora Forest Drive

Movement	WB	WB	NB	NB	SB
Directions Served	L	R	T	R	L
Maximum Queue (ft)	54	56	153	30	31
Average Queue (ft)	13	17	19	2	6
95th Queue (ft)	49	46	172	43	25
Link Distance (ft)	148		548		
Upstream Blk Time (%)	0		0		
Queuing Penalty (veh)	0		2		
Storage Bay Dist (ft)		25		200	225
Storage Blk Time (%)	9	8	1		
Queuing Penalty (veh)	2	1	0		

Intersection: 4: Rio Road & Waldorf School Road/Pen Park Road

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	134	208	151	174	381	224	225	377	188
Average Queue (ft)	42	89	64	42	159	46	61	136	16
95th Queue (ft)	95	173	122	112	292	134	135	283	83
Link Distance (ft)	747		1307		976			548	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		350		75		125	225		100
Storage Blk Time (%)				0	23	0		9	
Queuing Penalty (veh)				4	48	0		19	

Intersection: 5: Right-in Driveway & Rio Road

Movement	NB	B16
Directions Served	T	T
Maximum Queue (ft)	176	284
Average Queue (ft)	75	86
95th Queue (ft)	204	275
Link Distance (ft)	90	184
Upstream Blk Time (%)	18	10
Queuing Penalty (veh)	145	77
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Full-movement Driveway

Movement	EB	EB	NB	NB	B10	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	180	57	63	219	159	2
Average Queue (ft)	62	22	7	44	26	0
95th Queue (ft)	164	50	38	194	165	2
Link Distance (ft)	369	369		191	260	
Upstream Blk Time (%)	1		0	5	2	
Queuing Penalty (veh)	0		0	40	18	
Storage Bay Dist (ft)			100			1
Storage Blk Time (%)				6		
Queuing Penalty (veh)				1		

Network Summary

Network wide Queuing Penalty: 1177

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	1035	74	683	785	31	63	5	739	5	2	4
Future Volume (veh/h)	17	1035	74	683	785	31	63	5	739	5	2	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	18	1113	80	734	844	33	68	5	795	5	2	4
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	41	949	68	743	1265	1102	195	14	847	24	10	30
Arrive On Green	0.02	0.28	0.28	0.42	0.68	0.68	0.12	0.12	0.12	0.02	0.02	0.02
Sat Flow, veh/h	1781	3362	242	1781	1870	1585	1665	122	1585	1290	516	1585
Grp Volume(v), veh/h	18	588	605	734	844	33	73	0	795	7	0	4
Grp Sat Flow(s),veh/h/ln	1781	1777	1827	1781	1870	1585	1787	0	1585	1806	0	1585
Q Serve(g_s), s	1.9	52.4	52.4	75.9	49.4	1.2	7.0	0.0	21.8	0.7	0.0	0.5
Cycle Q Clear(g_c), s	1.9	52.4	52.4	75.9	49.4	1.2	7.0	0.0	21.8	0.7	0.0	0.5
Prop In Lane	1.00		0.13	1.00		1.00	0.93		1.00	0.71		1.00
Lane Grp Cap(c), veh/h	41	501	516	743	1265	1102	210	0	847	34	0	30
V/C Ratio(X)	0.44	1.17	1.17	0.99	0.67	0.03	0.35	0.00	0.94	0.21	0.00	0.14
Avail Cap(c_a), veh/h	71	501	516	743	1265	1102	210	0	847	105	0	92
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	89.6	66.6	66.6	53.7	17.7	8.8	75.4	0.0	40.4	89.7	0.0	89.6
Incr Delay (d2), s/veh	7.4	97.0	97.1	30.0	1.4	0.0	1.2	0.0	17.9	3.6	0.0	2.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.7	52.0	53.4	50.2	29.0	0.8	5.9	0.0	48.0	0.7	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	97.0	163.7	163.8	83.7	19.2	8.8	76.6	0.0	58.3	93.4	0.0	92.1
LnGrp LOS	F	F	F	F	B	A	E	A	E	F	A	F
Approach Vol, veh/h		1211			1611			868			11	
Approach Delay, s/veh		162.7			48.4			59.9			92.9	
Approach LOS		F			D			E			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	85.0	60.0		30.0	11.8	133.2		10.7				
Change Period (Y+Rc), s	* 7.6	* 7.6		* 8.2	* 7.6	* 7.6		7.2				
Max Green Setting (Gmax), s	* 77	* 52		* 22	* 7.4	* 1.2E2		10.8				
Max Q Clear Time (g_c+I1), s	77.9	54.4		23.8	3.9	51.4		2.7				
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	20.3		0.0				

Intersection Summary

HCM 6th Ctrl Delay	88.6	
HCM 6th LOS	F	

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	2.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	38	31	776	60	83	676
Future Vol, veh/h	38	31	776	60	83	676
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	200	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	41	33	834	65	89	727

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1772	867	0	0	899	0
Stage 1	867	-	-	-	-	-
Stage 2	905	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	91	352	-	-	756	-
Stage 1	411	-	-	-	-	-
Stage 2	395	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	80	352	-	-	756	-
Mov Cap-2 Maneuver	80	-	-	-	-	-
Stage 1	411	-	-	-	-	-
Stage 2	348	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	56.8	0	1.1
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	80	352	756	-
HCM Lane V/C Ratio	-	-	0.511	0.095	0.118	-
HCM Control Delay (s)	-	-	89.8	16.3	10.4	-
HCM Lane LOS	-	-	F	C	B	-
HCM 95th %tile Q(veh)	-	-	2.2	0.3	0.4	-

Intersection	
Int Delay, s/veh	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	12	819	10	21	657
Future Vol, veh/h	7	12	819	10	21	657
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	25	-	200	225	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	13	910	11	23	730

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1686	910	0	0	921	0
Stage 1	910	-	-	-	-	-
Stage 2	776	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	103	333	-	-	741	-
Stage 1	393	-	-	-	-	-
Stage 2	454	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	100	333	-	-	741	-
Mov Cap-2 Maneuver	100	-	-	-	-	-
Stage 1	393	-	-	-	-	-
Stage 2	440	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	26.5	0	0.3
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	100	333	741	-
HCM Lane V/C Ratio	-	-	0.078	0.04	0.031	-
HCM Control Delay (s)	-	-	44	16.3	10	-
HCM Lane LOS	-	-	E	C	B	-
HCM 95th %tile Q(veh)	-	-	0.2	0.1	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	1	12	54	1	85	7	737	98	116	543	5
Future Volume (veh/h)	7	1	12	54	1	85	7	737	98	116	543	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	8	1	13	59	1	93	8	810	108	127	597	5
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	100	30	82	232	3	140	441	981	831	326	1088	922
Arrive On Green	0.09	0.09	0.09	0.09	0.09	0.09	0.01	0.52	0.52	0.07	0.58	0.58
Sat Flow, veh/h	305	337	928	1423	35	1585	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	22	0	0	60	0	93	8	810	108	127	597	5
Grp Sat Flow(s),veh/h/ln	1570	0	0	1458	0	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.0	0.0	0.0	1.7	0.0	3.8	0.1	24.3	2.3	2.1	13.1	0.1
Cycle Q Clear(g_c), s	0.8	0.0	0.0	2.5	0.0	3.8	0.1	24.3	2.3	2.1	13.1	0.1
Prop In Lane	0.36		0.59	0.98		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	212	0	0	235	0	140	441	981	831	326	1088	922
V/C Ratio(X)	0.10	0.00	0.00	0.25	0.00	0.67	0.02	0.83	0.13	0.39	0.55	0.01
Avail Cap(c_a), veh/h	417	0	0	431	0	360	707	1194	1012	490	1194	1012
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.2	0.0	0.0	28.9	0.0	29.5	7.9	13.4	8.1	11.6	8.6	5.9
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.6	0.0	5.3	0.0	4.1	0.1	0.8	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.6	0.0	0.0	1.6	0.0	2.8	0.1	14.3	1.2	1.2	7.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.4	0.0	0.0	29.4	0.0	34.9	7.9	17.5	8.2	12.3	9.0	5.9
LnGrp LOS	C	A	A	C	A	C	A	B	A	B	A	A
Approach Vol, veh/h		22			153			926			729	
Approach Delay, s/veh		28.4			32.7			16.3			9.6	
Approach LOS		C			C			B			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.8	42.4		12.7	8.0	46.2		12.7				
Change Period (Y+Rc), s	7.3	7.3		* 6.8	7.3	7.3		* 6.8				
Max Green Setting (Gmax), s	10.7	42.7		* 15	10.7	42.7		* 15				
Max Q Clear Time (g_c+I1), s	4.1	26.3		2.8	2.1	15.1		5.8				
Green Ext Time (p_c), s	0.2	8.8		0.0	0.0	7.7		0.3				

Intersection Summary

HCM 6th Ctrl Delay	15.1
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	35	19	30	801	659	25
Future Vol, veh/h	35	19	30	801	659	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	1
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	21	33	871	716	27

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1653	716	743	0	-	0
Stage 1	716	-	-	-	-	-
Stage 2	937	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	108	430	864	-	-	-
Stage 1	484	-	-	-	-	-
Stage 2	381	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	104	430	864	-	-	-
Mov Cap-2 Maneuver	104	-	-	-	-	-
Stage 1	466	-	-	-	-	-
Stage 2	381	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	42.7	0.3	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	864	-	104	430	-	-
HCM Lane V/C Ratio	0.038	-	0.366	0.048	-	-
HCM Control Delay (s)	9.3	-	58.4	13.8	-	-
HCM Lane LOS	A	-	F	B	-	-
HCM 95th %tile Q(veh)	0.1	-	1.5	0.2	-	-

Intersection: 1: Rio Road & John Warner Parkway & CATEC Driveway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	R	LT	R	LT	R
Maximum Queue (ft)	299	1351	400	942	899	36	124	200	31	11
Average Queue (ft)	44	1106	390	586	295	5	85	175	5	1
95th Queue (ft)	185	1675	439	952	787	23	145	195	20	7
Link Distance (ft)		1309		956	956			173	309	
Upstream Blk Time (%)		31		5	3			23		
Queuing Penalty (veh)		0		0	0			182		
Storage Bay Dist (ft)	200		300			500	75			125
Storage Blk Time (%)		55	45		0		27	41		
Queuing Penalty (veh)		333	243		0		199	27		

Intersection: 2: Rio Road & Dunlora Drive

Movement	WB	WB	NB	SB	SB
Directions Served	L	R	TR	L	T
Maximum Queue (ft)	141	143	210	96	188
Average Queue (ft)	36	52	169	51	46
95th Queue (ft)	105	134	265	93	166
Link Distance (ft)	523		198		173
Upstream Blk Time (%)			12		1
Queuing Penalty (veh)			102		8
Storage Bay Dist (ft)		200		50	
Storage Blk Time (%)	1	1		17	0
Queuing Penalty (veh)	0	0		113	0

Intersection: 3: Rio Road & Dunlora Forest Drive

Movement	WB	WB	NB	SB
Directions Served	L	R	T	L
Maximum Queue (ft)	33	40	8	42
Average Queue (ft)	8	10	0	10
95th Queue (ft)	28	32	9	34
Link Distance (ft)	114		545	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		25		225
Storage Blk Time (%)	6	4		
Queuing Penalty (veh)	1	0		

Intersection: 4: Rio Road & Waldorf School Road/Pen Park Road

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	52	90	89	87	384	209	119	228	5
Average Queue (ft)	13	35	32	7	177	41	46	88	0
95th Queue (ft)	39	72	66	48	320	141	94	189	4
Link Distance (ft)	745		1307		976			545	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		350		75		125	225		100
Storage Blk Time (%)					21		0	4	
Queuing Penalty (veh)					22		0	5	

Intersection: 5: Right-in Driveway & Rio Road

Movement	NB	B16
Directions Served	T	T
Maximum Queue (ft)	186	263
Average Queue (ft)	83	56
95th Queue (ft)	205	209
Link Distance (ft)	93	174
Upstream Blk Time (%)	13	4
Queuing Penalty (veh)	113	37
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Full-movement Driveway

Movement	EB	EB	NB	NB	B10	SB	SB
Directions Served	L	R	L	T	T	T	R
Maximum Queue (ft)	115	38	72	164	88	2	14
Average Queue (ft)	37	12	17	18	7	0	1
95th Queue (ft)	97	35	51	115	74	0	9
Link Distance (ft)	370	370		198	273	174	
Upstream Blk Time (%)				1	0		
Queuing Penalty (veh)				10	2		
Storage Bay Dist (ft)			100				1
Storage Blk Time (%)				2			0
Queuing Penalty (veh)				1			0

Network Summary

Network wide Queuing Penalty: 1398

Intersection	
Int Delay, s/veh	2.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	172	703	34	0	629
Future Vol, veh/h	0	172	703	34	0	629
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	195	799	39	0	715

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	819	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	375	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	375	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	24.6	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	375	-
HCM Lane V/C Ratio	-	-	0.521	-
HCM Control Delay (s)	-	-	24.6	-
HCM Lane LOS	-	-	C	-
HCM 95th %tile Q(veh)	-	-	2.9	-

Intersection: 1: Rio Road & John Warner Parkway & CATEC Driveway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	R	LT	R	LT	R
Maximum Queue (ft)	158	399	372	599	464	26	124	208	22	9
Average Queue (ft)	19	237	213	325	197	2	102	165	3	1
95th Queue (ft)	83	342	320	522	377	14	147	210	15	4
Link Distance (ft)		1309		956	956			169	309	
Upstream Blk Time (%)				0				11		
Queuing Penalty (veh)				0				102		
Storage Bay Dist (ft)	200		300			500	75			125
Storage Blk Time (%)		19	1		0		40	26		
Queuing Penalty (veh)		64	2		0		264	31		

Intersection: 2: Rio Road & Dunlora Drive

Movement	WB	NB	B12
Directions Served	R	TR	T
Maximum Queue (ft)	468	315	210
Average Queue (ft)	255	102	16
95th Queue (ft)	568	276	132
Link Distance (ft)	508	243	573
Upstream Blk Time (%)	21	4	
Queuing Penalty (veh)	0	30	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Rio Road & Dunlora Forest Drive

Movement	WB	WB	SB	SB
Directions Served	L	R	L	T
Maximum Queue (ft)	44	45	33	13
Average Queue (ft)	11	16	4	0
95th Queue (ft)	36	37	22	10
Link Distance (ft)	138			268
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		25	225	
Storage Blk Time (%)	9	5		
Queuing Penalty (veh)	2	1		

Intersection: 4: Rio Road & Waldorf School Road/Pen Park Road

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	121	212	183	164	426	162	264	392	153
Average Queue (ft)	45	89	56	39	155	40	81	143	22
95th Queue (ft)	90	178	124	103	311	119	178	297	102
Link Distance (ft)	744		1307		976			546	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		350		75		125	225		100
Storage Blk Time (%)		0	0	1	22		0	10	
Queuing Penalty (veh)		1	0	4	46		0	19	

Network Summary

Network wide Queuing Penalty: 566

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	68	742	59	0	659
Future Vol, veh/h	0	68	742	59	0	659
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	73	798	63	0	709

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	830	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	370	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	370	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.1	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	370	-
HCM Lane V/C Ratio	-	-	0.198	-
HCM Control Delay (s)	-	-	17.1	-
HCM Lane LOS	-	-	C	-
HCM 95th %tile Q(veh)	-	-	0.7	-

Intersection: 1: Rio Road & John Warner Parkway & CATEC Driveway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	R	LT	R	LT	R
Maximum Queue (ft)	276	1346	400	742	435	31	124	187	33	8
Average Queue (ft)	45	995	388	423	161	4	72	173	4	1
95th Queue (ft)	190	1611	438	672	352	20	138	189	21	6
Link Distance (ft)		1309		956	956			169	309	
Upstream Blk Time (%)		21		0				23		
Queuing Penalty (veh)		0		0				188		
Storage Bay Dist (ft)	200		300			500	75			125
Storage Blk Time (%)		53	41		0		19	40		
Queuing Penalty (veh)		309	219		0		136	21		

Intersection: 2: Rio Road & Dunlora Drive

Movement	WB	NB	B12
Directions Served	R	TR	T
Maximum Queue (ft)	335	331	254
Average Queue (ft)	138	210	38
95th Queue (ft)	354	371	175
Link Distance (ft)	508	243	563
Upstream Blk Time (%)	3	11	0
Queuing Penalty (veh)	0	89	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Rio Road & Dunlora Forest Drive

Movement	WB	WB	NB	SB
Directions Served	L	R	R	L
Maximum Queue (ft)	32	26	2	50
Average Queue (ft)	5	7	0	11
95th Queue (ft)	23	22	2	37
Link Distance (ft)	117			
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		25	200	250
Storage Blk Time (%)	5	1		
Queuing Penalty (veh)	1	0		

Intersection: 4: Rio Road & Waldorf School Road/Pen Park Road

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	39	78	76	44	435	190	133	252	56
Average Queue (ft)	10	32	28	5	175	36	49	99	3
95th Queue (ft)	29	67	59	29	330	119	100	216	37
Link Distance (ft)	738		1306		976			549	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		350		75		125	225		100
Storage Blk Time (%)					20			5	
Queuing Penalty (veh)					21			6	

Network Summary

Network wide Queuing Penalty: 989

Intersection	
Int Delay, s/veh	3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	172	759	35	0	649
Future Vol, veh/h	0	172	759	35	0	649
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	195	863	40	0	738

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	883	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	345	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	345	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	28.2	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	345	-
HCM Lane V/C Ratio	-	-	0.567	-
HCM Control Delay (s)	-	-	28.2	-
HCM Lane LOS	-	-	D	-
HCM 95th %tile Q(veh)	-	-	3.3	-

Intersection: 1: Rio Road & John Warner Parkway & CATEC Driveway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	R	LT	R	LT	R
Maximum Queue (ft)	153	414	370	578	507	20	124	218	20	8
Average Queue (ft)	21	253	224	339	212	2	110	177	3	0
95th Queue (ft)	95	362	332	545	409	12	144	217	13	4
Link Distance (ft)		1309		956	956			171	309	
Upstream Blk Time (%)				0	0			18		
Queuing Penalty (veh)				0	0			171		
Storage Bay Dist (ft)	200		300			500	75			125
Storage Blk Time (%)		21	1		0		52	22		
Queuing Penalty (veh)		74	3		0		361	33		

Intersection: 2: Rio Road & Dunlora Drive

Movement	WB	NB
Directions Served	R	TR
Maximum Queue (ft)	552	230
Average Queue (ft)	334	135
95th Queue (ft)	643	277
Link Distance (ft)	520	219
Upstream Blk Time (%)	34	8
Queuing Penalty (veh)	0	61
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Rio Road & Dunlora Forest Drive

Movement	WB	WB	SB	SB
Directions Served	L	R	L	T
Maximum Queue (ft)	52	43	44	6
Average Queue (ft)	12	15	6	0
95th Queue (ft)	38	38	29	4
Link Distance (ft)	148			260
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		25	225	
Storage Blk Time (%)	10	5		
Queuing Penalty (veh)	3	1		

Intersection: 4: Rio Road & Waldorf School Road/Pen Park Road

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	127	217	165	174	395	193	247	387	200
Average Queue (ft)	42	93	61	47	152	39	70	145	22
95th Queue (ft)	92	178	118	123	286	113	165	295	104
Link Distance (ft)	747		1307		976			548	
Upstream Blk Time (%)								0	
Queuing Penalty (veh)								0	
Storage Bay Dist (ft)		350		75		125	225		100
Storage Blk Time (%)				0	23	0	0	10	
Queuing Penalty (veh)				3	48	0	0	20	

Intersection: 5: Right-in Driveway & Rio Road

Movement	NB	B16
Directions Served	T	T
Maximum Queue (ft)	159	201
Average Queue (ft)	45	33
95th Queue (ft)	154	161
Link Distance (ft)	90	184
Upstream Blk Time (%)	7	3
Queuing Penalty (veh)	60	21
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Full-movement Driveway

Movement	EB	EB	NB	NB	B10	SB	SB
Directions Served	L	R	L	T	T	T	R
Maximum Queue (ft)	128	72	47	137	44	3	4
Average Queue (ft)	45	22	6	13	2	0	0
95th Queue (ft)	108	55	33	97	27	4	4
Link Distance (ft)	369	369		191	260	184	
Upstream Blk Time (%)				1			
Queuing Penalty (veh)				5			
Storage Bay Dist (ft)			100				1
Storage Blk Time (%)				1		0	
Queuing Penalty (veh)				0		0	

Network Summary

Network wide Queuing Penalty: 864

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	69	776	60	0	714
Future Vol, veh/h	0	69	776	60	0	714
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	74	834	65	0	768

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	867	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	352	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	352	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.9	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	352	-
HCM Lane V/C Ratio	-	-	0.211	-
HCM Control Delay (s)	-	-	17.9	-
HCM Lane LOS	-	-	C	-
HCM 95th %tile Q(veh)	-	-	0.8	-

Intersection: 1: Rio Road & John Warner Parkway & CATEC Driveway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	R	LT	R	LT	R
Maximum Queue (ft)	250	1356	400	837	566	40	124	201	31	9
Average Queue (ft)	43	1062	390	468	185	5	82	181	5	1
95th Queue (ft)	181	1664	435	757	423	24	145	209	20	5
Link Distance (ft)		1309		956	956			180	309	
Upstream Blk Time (%)		28		0	0			22		
Queuing Penalty (veh)		0		0	0			189		
Storage Bay Dist (ft)	200		300			500	75			125
Storage Blk Time (%)		54	43		0		28	41		
Queuing Penalty (veh)		329	232		0		205	28		

Intersection: 2: Rio Road & Dunlora Drive

Movement	WB	NB
Directions Served	R	TR
Maximum Queue (ft)	287	217
Average Queue (ft)	113	169
95th Queue (ft)	250	266
Link Distance (ft)	524	204
Upstream Blk Time (%)		10
Queuing Penalty (veh)		81
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Rio Road & Dunlora Forest Drive

Movement	WB	WB	NB	SB
Directions Served	L	R	R	L
Maximum Queue (ft)	35	31	4	44
Average Queue (ft)	6	10	0	12
95th Queue (ft)	25	31	3	37
Link Distance (ft)	114			
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		25	200	225
Storage Blk Time (%)	5	4		
Queuing Penalty (veh)	1	0		

Intersection: 4: Rio Road & Waldorf School Road/Pen Park Road

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	46	80	85	44	441	190	122	247	35
Average Queue (ft)	15	31	33	4	177	36	47	93	2
95th Queue (ft)	41	66	67	27	333	121	95	204	22
Link Distance (ft)	745		1307		976			545	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		350		75		125	225		100
Storage Blk Time (%)					21			4	
Queuing Penalty (veh)					22			5	

Intersection: 5: Right-in Driveway & Rio Road

Movement	NB	B16	SB
Directions Served	T	T	R
Maximum Queue (ft)	176	220	23
Average Queue (ft)	79	36	1
95th Queue (ft)	196	150	11
Link Distance (ft)	93	174	
Upstream Blk Time (%)	11	2	
Queuing Penalty (veh)	91	14	
Storage Bay Dist (ft)			1
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Full-movement Driveway

Movement	EB	EB	NB	NB	B10	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	82	35	67	84	14	16
Average Queue (ft)	31	12	13	6	1	1
95th Queue (ft)	71	34	47	65	16	10
Link Distance (ft)	370	370		198	273	
Upstream Blk Time (%)				0		
Queuing Penalty (veh)				2		
Storage Bay Dist (ft)			100			1
Storage Blk Time (%)				0		0
Queuing Penalty (veh)				0		0

Network Summary

Network wide Queuing Penalty: 1199

LANE SUMMARY

Site: [Rio Road at John Warner - No-Build 2023 AM (Site Folder: General)]

Rio Road at John Warner Parkway / CATEC Driveway
No-Build (2023) Conditions
AM Peak Hour
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: Rio Road (NB)													
Lane 1[d]	230	3.0	745	0.309	100	8.5	LOS A	1.2	31.0	Short	125	0.0	NA
Lane 2	721	3.0	1626	0.443	100	7.2	LOS A	0.0	0.0	Full	1600	0.0	0.0
Approach	951	3.0		0.443		7.5	LOS A	1.2	31.0				
East: Rio Road (WB)													
Lane 1	752	3.0	1094	0.687	100	13.6	LOS B	9.9	253.5	Full	1600	0.0	0.0
Lane 2[d]	752	3.0	1094	0.687	100	13.6	LOS B	9.9	253.5	Full	1600	0.0	0.0
Approach	1503	3.0		0.687		13.6	LOS B	9.9	253.5				
North: CATEC Driveway (SB)													
Lane 1[d]	7	3.0	305	0.021	100	12.2	LOS B	0.1	1.6	Full	1600	0.0	0.0
Approach	7	3.0		0.021		12.2	LOS B	0.1	1.6				
West: John Warner Parkway (EB)													
Lane 1	320	3.0	707	0.452	100	11.5	LOS B	2.5	64.2	Full	1600	0.0	0.0
Lane 2[d]	320	3.0	707	0.452	100	11.5	LOS B	2.5	64.2	Full	1600	0.0	0.0
Lane 3	36	3.0	1626	0.022	100	3.2	LOS A	0.0	0.0	Short	300	0.0	NA
Approach	675	3.0		0.452		11.0	LOS B	2.5	64.2				
Intersection	3136	3.0		0.687		11.2	LOS B	9.9	253.5				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Rio Road (NB)

Mov. From S To Exit:	U S	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	103	125	2	-	230	3.0	745	0.309	100	0.0	2
Lane 2	-	-	-	721	721	3.0	1626	0.443	100	NA	NA
Approach	103	125	2	721	951	3.0		0.443			

East: Rio Road (WB)

Mov.	U	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From E To Exit:	E	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	60	545	147	-	752	3.0	1094	0.687	100	NA	NA
Lane 2	-	-	743	9	752	3.0	1094	0.687	100	NA	NA
Approach	60	545	890	9	1503	3.0		0.687			

North: CATEC Driveway (SB)

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	4	1	1	7	3.0		305	0.021	100	NA	NA
Approach	4	1	1	7	3.0			0.021			

West: John Warner Parkway (EB)

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	16	303	-	320	3.0		707	0.452	100	NA	NA
Lane 2	-	320	-	320	3.0		707	0.452	100	NA	NA
Lane 3	-	-	36	36	3.0		1626	0.022	100	0.0	2
Approach	16	623	36	675	3.0			0.452			

	Total	%HV	Deg.Satn (v/c)
Intersection	3136	3.0	0.687

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Rio Road (NB) Merge Type: **Priority**												
Exit Short Lane	2	300	0.0	649	668	3.00	2.00	36	1235	0.029	2.9	3.1
Merge Lane	1	-	100.0	Merge Lane is not Opposed				649	1800	0.361	0.0	0.0
East Exit: Rio Road (WB) Merge Type: **Priority**												
Exit Short Lane	3	300	0.0	320	329	3.00	2.00	721	1497	0.481	2.4	7.0
Merge Lane	2	-	100.0	Merge Lane is not Opposed				320	1800	0.178	0.0	0.0
North Exit: CATEC Driveway (SB) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: John Warner Parkway (EB) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

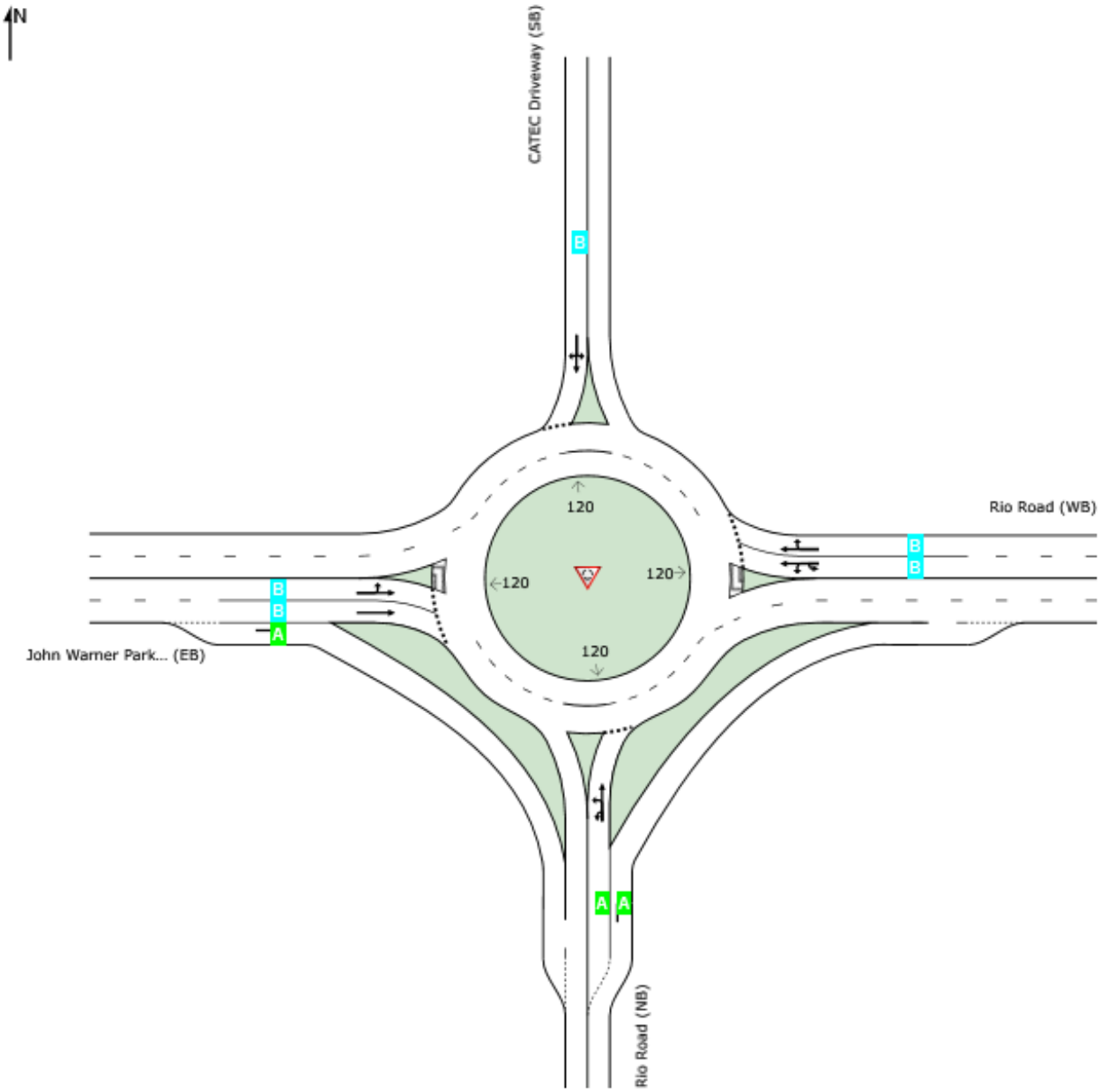
LANE LEVEL OF SERVICE

Lane Level of Service

Site: [Rio Road at John Warner - No-Build 2023 AM (Site Folder: General)]

Rio Road at John Warner Parkway / CATEC Driveway
No-Build (2023) Conditions
AM Peak Hour
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	B	B	B	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: [Rio Road at John Warner - No-Build 2023 PM (Site Folder: General)]

Rio Road at John Warner Parkway / CATEC Driveway
No-Build (2023) Conditions
PM Peak Hour
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: Rio Road (NB)													
Lane 1[d]	96	3.0	466	0.205	100	10.7	LOS B	0.7	17.4	Short	125	0.0	NA
Lane 2	785	3.0	1626	0.483	100	10.2	LOS B	0.0	0.0	Full	1600	0.0	0.0
Approach	880	3.0		0.483		10.3	LOS B	0.7	17.4				
East: Rio Road (WB)													
Lane 1	800	3.0	1239	0.646	100	11.3	LOS B	5.5	139.9	Full	1600	0.0	0.0
Lane 2[d]	800	3.0	1239	0.646	100	11.3	LOS B	5.5	139.9	Full	1600	0.0	0.0
Approach	1600	3.0		0.646		11.3	LOS B	5.5	139.9				
North: CATEC Driveway (SB)													
Lane 1[d]	11	3.0	323	0.034	100	11.7	LOS B	0.1	2.6	Full	1600	0.0	0.0
Approach	11	3.0		0.034		11.7	LOS B	0.1	2.6				
West: John Warner Parkway (EB)													
Lane 1	572	3.0	676	0.845	100	31.6	LOS D	11.4	292.2	Full	1600	0.0	0.0
Lane 2[d]	572	3.0	676	0.845	100	31.6	LOS D	11.4	292.2	Full	1600	0.0	0.0
Lane 3	52	3.0	1626	0.032	100	3.3	LOS A	0.0	0.0	Short	300	0.0	NA
Approach	1196	3.0		0.845		30.4	LOS D	11.4	292.2				
Intersection	3687	3.0		0.845		17.2	LOS C	11.4	292.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Rio Road (NB)

Mov. From S To Exit:	U S	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	40	51	4	-	96	3.0	466	0.205	100	0.0	2
Lane 2	-	-	-	785	785	3.0	1626	0.483	100	NA	NA
Approach	40	51	4	785	880	3.0		0.483			

East: Rio Road (WB)

Mov.	U	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From E To Exit:	E	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	90	623	87	-	800	3.0	1239	0.646	100	NA	NA
Lane 2	-	-	766	34	800	3.0	1239	0.646	100	NA	NA
Approach	90	623	853	34	1600	3.0		0.646			

North: CATEC Driveway (SB)

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	5	1	4	11	3.0		323	0.034	100	NA	NA
Approach	5	1	4	11	3.0			0.034			

West: John Warner Parkway (EB)

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	18	553	-	572	3.0		676	0.845	100	NA	NA
Lane 2	-	572	-	572	3.0		676	0.845	100	NA	NA
Lane 3	-	-	52	52	3.0		1626	0.032	100	0.0	2
Approach	18	1125	52	1196	3.0			0.845			

	Total	%HV	Deg.Satn (v/c)
Intersection	3687	3.0	0.845

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Rio Road (NB) Merge Type: **Priority**												
Exit Short Lane	2	300	0.0	664	684	3.00	2.00	52	1224	0.043	2.9	3.3
Merge Lane	1	-	100.0	Merge Lane is not Opposed				664	1800	0.369	0.0	0.0
East Exit: Rio Road (WB) Merge Type: **Priority**												
Exit Short Lane	3	300	0.0	572	589	3.00	2.00	785	1292	0.607	2.8	10.0
Merge Lane	2	-	100.0	Merge Lane is not Opposed				572	1800	0.318	0.0	0.0
North Exit: CATEC Driveway (SB) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: John Warner Parkway (EB) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

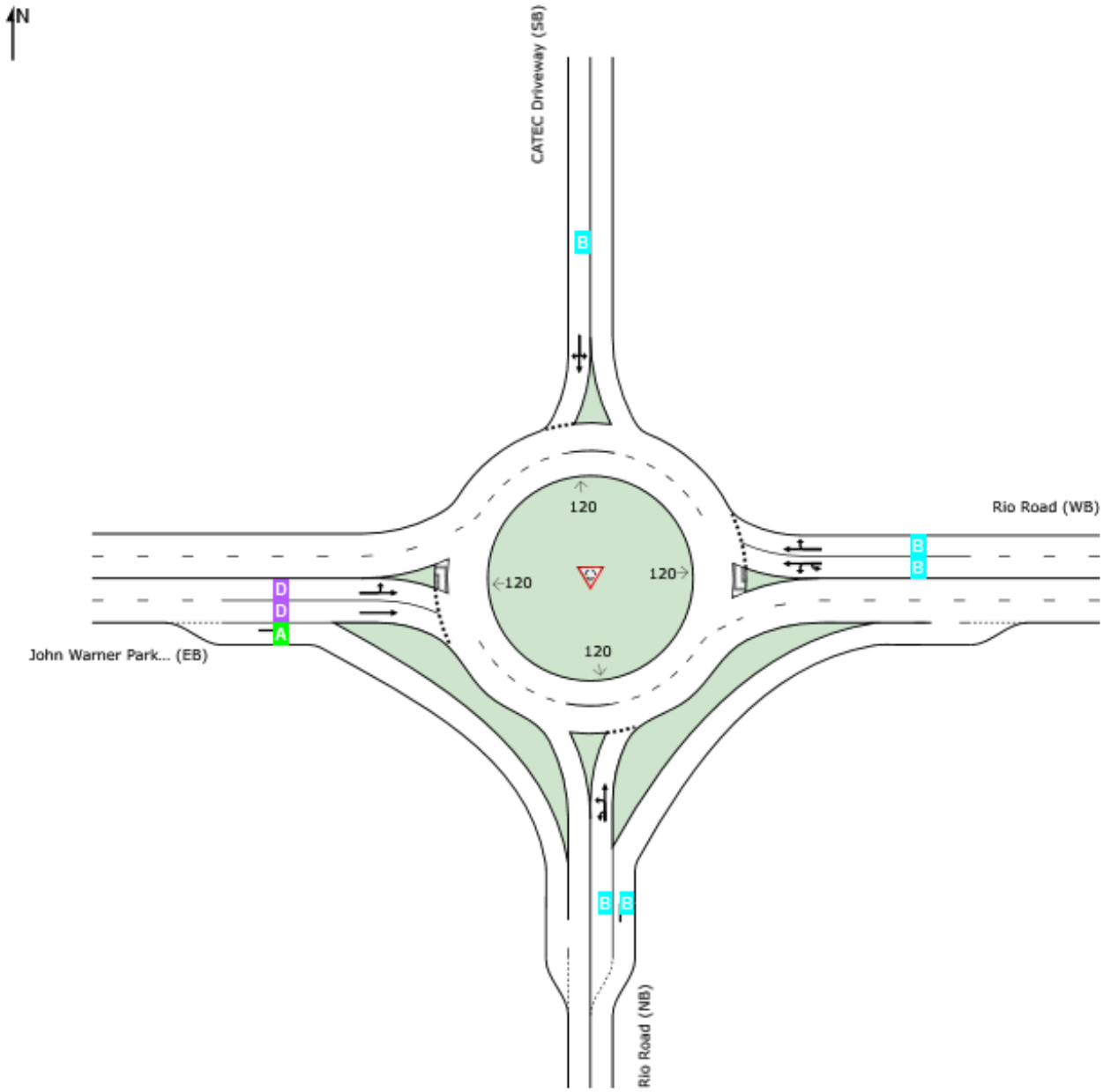
LANE LEVEL OF SERVICE

Lane Level of Service

Site: [Rio Road at John Warner - No-Build 2023 PM (Site Folder: General)]

Rio Road at John Warner Parkway / CATEC Driveway
No-Build (2023) Conditions
PM Peak Hour
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	B	B	B	D	C



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: [Rio Road at John Warner - Build 2023 AM (Site Folder: General)]

Rio Road at John Warner Parkway / CATEC Driveway
Build (2023) Conditions
AM Peak Hour
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: Rio Road (NB)													
Lane 1[d]	261	3.0	745	0.350	100	9.2	LOS A	1.5	38.9	Short	125	0.0	NA
Lane 2	751	3.0	1626	0.462	100	7.5	LOS A	0.0	0.0	Full	1600	0.0	0.0
Approach	1012	3.0		0.462		7.9	LOS A	1.5	38.9				
East: Rio Road (WB)													
Lane 1	757	3.0	1063	0.712	100	14.8	LOS B	11.3	290.5	Full	1600	0.0	0.0
Lane 2[d]	757	3.0	1063	0.712	100	14.8	LOS B	11.3	290.5	Full	1600	0.0	0.0
Approach	1514	3.0		0.712		14.8	LOS B	11.3	290.5				
North: CATEC Driveway (SB)													
Lane 1[d]	7	3.0	295	0.022	100	12.6	LOS B	0.1	1.7	Full	1600	0.0	0.0
Approach	7	3.0		0.022		12.6	LOS B	0.1	1.7				
West: John Warner Parkway (EB)													
Lane 1	320	3.0	699	0.457	100	11.7	LOS B	2.5	65.1	Full	1600	0.0	0.0
Lane 2[d]	320	3.0	699	0.457	100	11.7	LOS B	2.5	65.1	Full	1600	0.0	0.0
Lane 3	47	3.0	1626	0.029	100	3.2	LOS A	0.0	0.0	Short	300	0.0	NA
Approach	686	3.0		0.457		11.1	LOS B	2.5	65.1				
Intersection	3218	3.0		0.712		11.8	LOS B	11.3	290.5				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Rio Road (NB)

Mov. From S To Exit:	U S	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	103	154	3	-	261	3.0	745	0.350	100	0.0	2
Lane 2	-	-	-	751	751	3.0	1626	0.462	100	NA	NA
Approach	103	154	3	751	1012	3.0		0.462			

East: Rio Road (WB)

Mov.	U	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From E To Exit:	E	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	60	555	142	-	757	3.0	1063	0.712	100	NA	NA
Lane 2	-	-	748	9	757	3.0	1063	0.712	100	NA	NA
Approach	60	555	890	9	1514	3.0		0.712			

North: CATEC Driveway (SB)

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	4	1	1	7	3.0		295	0.022	100	NA	NA
Approach	4	1	1	7	3.0			0.022			

West: John Warner Parkway (EB)

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	16	303	-	320	3.0		699	0.457	100	NA	NA
Lane 2	-	320	-	320	3.0		699	0.457	100	NA	NA
Lane 3	-	-	47	47	3.0		1626	0.029	100	0.0	2
Approach	16	623	47	686	3.0			0.457			

	Total	%HV	Deg.Satn (v/c)
Intersection	3218	3.0	0.712

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Rio Road (NB) Merge Type: **Priority**												
Exit Short Lane	2	300	0.0	660	680	3.00	2.00	47	1227	0.038	2.9	3.2
Merge Lane	1	-	100.0	Merge Lane is not Opposed				660	1800	0.367	0.0	0.0
East Exit: Rio Road (WB) Merge Type: **Priority**												
Exit Short Lane	3	300	0.0	320	329	3.00	2.00	751	1497	0.502	2.4	7.3
Merge Lane	2	-	100.0	Merge Lane is not Opposed				320	1800	0.178	0.0	0.0
North Exit: CATEC Driveway (SB) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: John Warner Parkway (EB) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

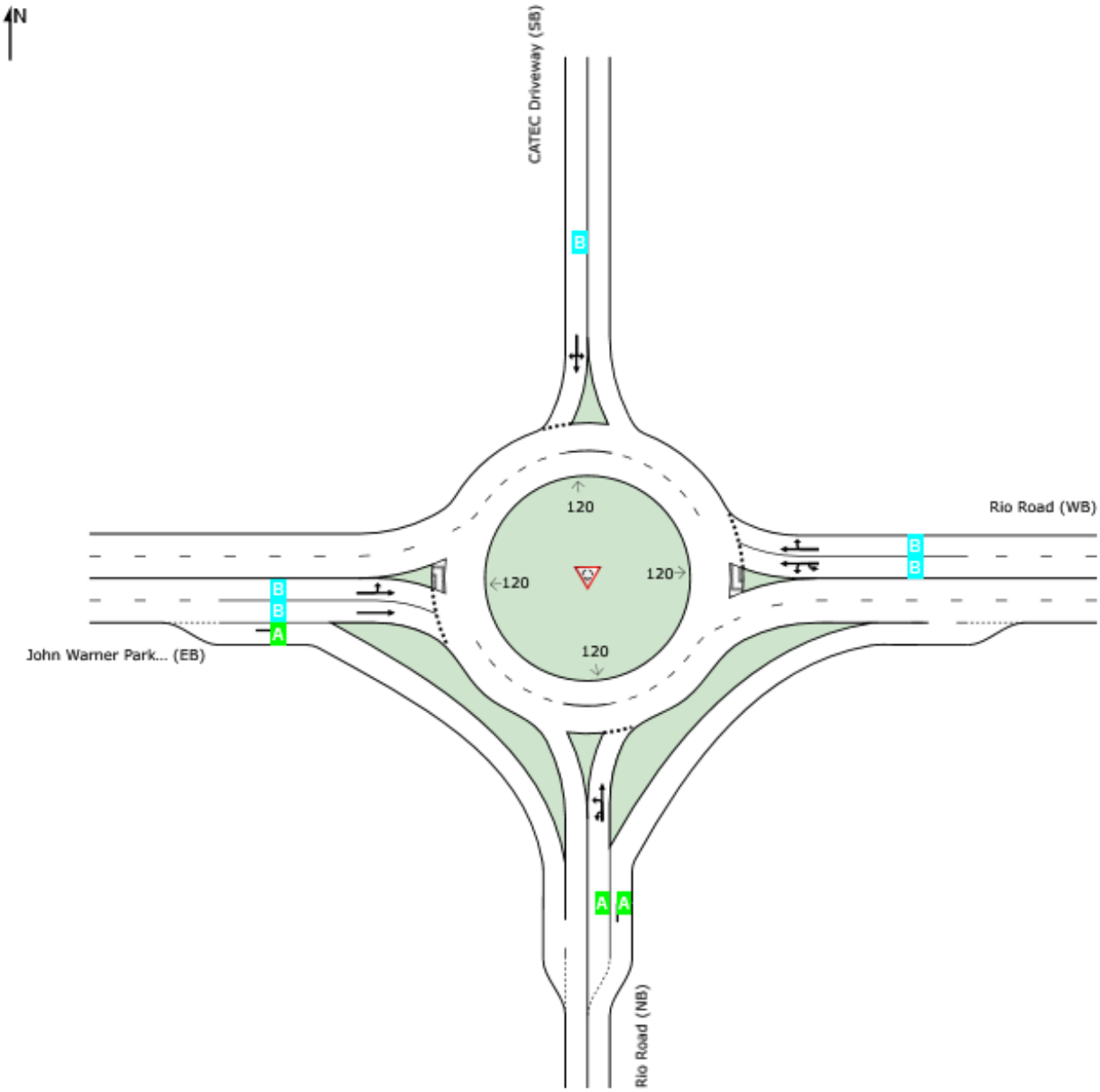
LANE LEVEL OF SERVICE

Lane Level of Service

Site: [Rio Road at John Warner - Build 2023 AM (Site Folder: General)]

Rio Road at John Warner Parkway / CATEC Driveway
Build (2023) Conditions
AM Peak Hour
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	B	B	B	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: [Rio Road at John Warner - Build 2023 PM (Site Folder: General)]

Rio Road at John Warner Parkway / CATEC Driveway
Build (2023) Conditions
PM Peak Hour
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: Rio Road (NB)													
Lane 1[d]	115	3.0	466	0.247	100	11.5	LOS B	0.8	21.5	Short	125	0.0	NA
Lane 2	803	3.0	1626	0.494	100	10.6	LOS B	0.0	0.0	Full	1600	0.0	0.0
Approach	918	3.0		0.494		10.7	LOS B	0.8	21.5				
East: Rio Road (WB)													
Lane 1	815	3.0	1216	0.670	100	12.1	LOS B	5.8	148.3	Full	1600	0.0	0.0
Lane 2[d]	815	3.0	1216	0.670	100	12.1	LOS B	5.8	148.3	Full	1600	0.0	0.0
Approach	1629	3.0		0.670		12.1	LOS B	5.8	148.3				
North: CATEC Driveway (SB)													
Lane 1[d]	12	3.0	310	0.039	100	12.3	LOS B	0.1	2.9	Full	1600	0.0	0.0
Approach	12	3.0		0.039		12.3	LOS B	0.1	2.9				
West: John Warner Parkway (EB)													
Lane 1	572	3.0	657	0.871	100	35.5	LOS E	12.4	317.9	Full	1600	0.0	0.0
Lane 2[d]	572	3.0	657	0.871	100	35.5	LOS E	12.4	317.9	Full	1600	0.0	0.0
Lane 3	80	3.0	1626	0.049	100	3.6	LOS A	0.0	0.0	Short	300	0.0	NA
Approach	1224	3.0		0.871		33.4	LOS D	12.4	317.9				
Intersection	3784	3.0		0.871		18.6	LOS C	12.4	317.9				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Rio Road (NB)

Mov. From S To Exit:	U S	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	41	68	5	-	115	3.0	466	0.247	100	0.0	2
Lane 2	-	-	-	803	803	3.0	1626	0.494	100	NA	NA
Approach	41	68	5	803	918	3.0		0.494			

East: Rio Road (WB)

Mov.	U	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From E To Exit:	E	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	90	652	72	-	815	3.0	1216	0.670	100	NA	NA
Lane 2	-	-	781	34	815	3.0	1216	0.670	100	NA	NA
Approach	90	652	853	34	1629	3.0		0.670			

North: CATEC Driveway (SB)

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	5	2	4	12	3.0		310	0.039	100	NA	NA
Approach	5	2	4	12	3.0			0.039			

West: John Warner Parkway (EB)

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	18	553	-	572	3.0		657	0.871	100	NA	NA
Lane 2	-	572	-	572	3.0		657	0.871	100	NA	NA
Lane 3	-	-	80	80	3.0		1626	0.049	100	0.0	2
Approach	18	1125	80	1224	3.0			0.871			

	Total	%HV	Deg.Satn (v/c)
Intersection	3784	3.0	0.871

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Rio Road (NB) Merge Type: **Priority**												
Exit Short Lane	2	300	0.0	696	717	3.00	2.00	80	1201	0.067	3.0	3.5
Merge Lane	1	-	100.0	Merge Lane is not Opposed				696	1800	0.386	0.0	0.0
East Exit: Rio Road (WB) Merge Type: **Priority**												
Exit Short Lane	3	300	0.0	572	589	3.00	2.00	803	1292	0.622	2.8	10.4
Merge Lane	2	-	100.0	Merge Lane is not Opposed				572	1800	0.318	0.0	0.0
North Exit: CATEC Driveway (SB) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: John Warner Parkway (EB) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

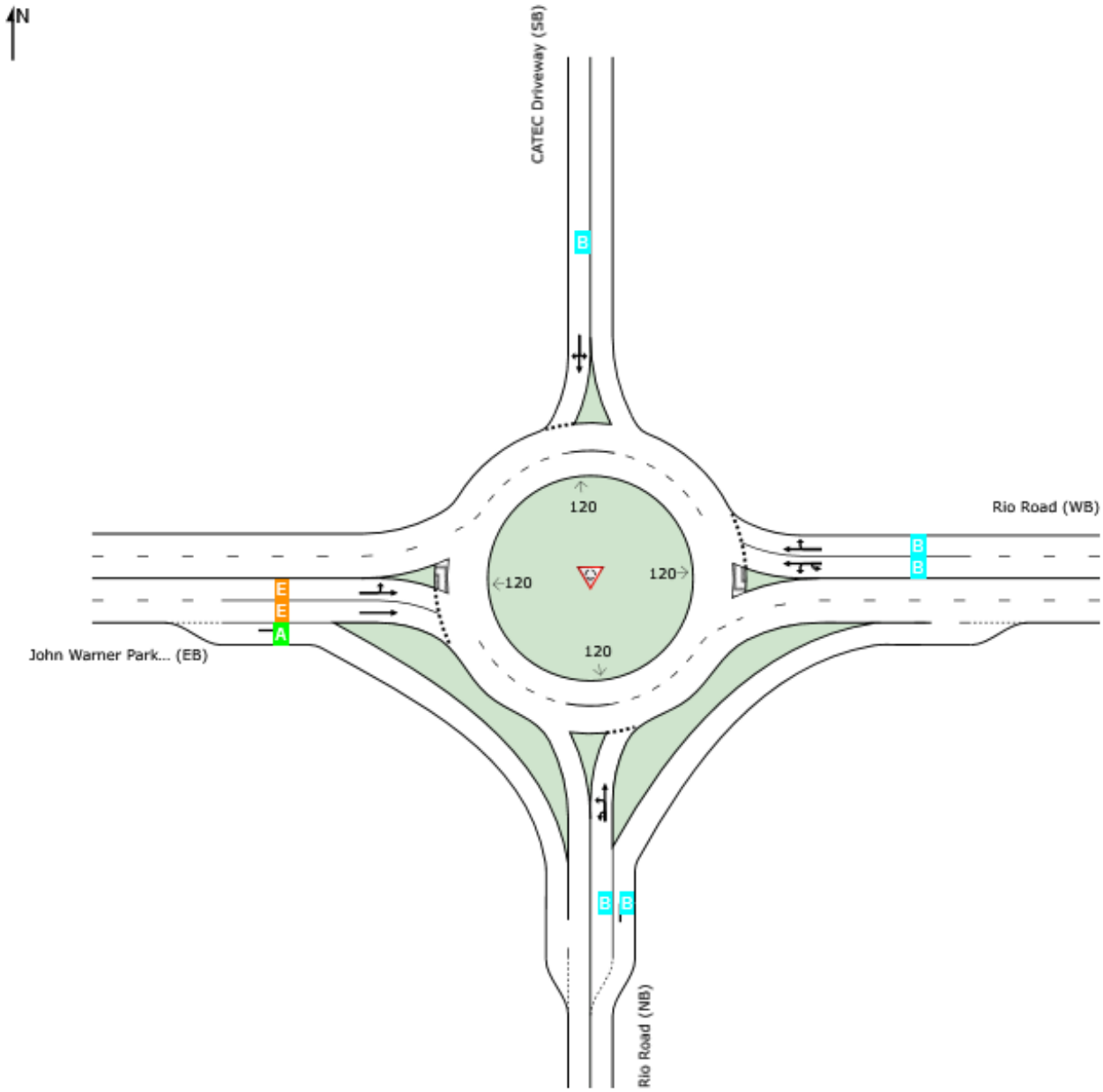
LANE LEVEL OF SERVICE

Lane Level of Service

Site: [Rio Road at John Warner - Build 2023 PM (Site Folder: General)]

Rio Road at John Warner Parkway / CATEC Driveway
Build (2023) Conditions
PM Peak Hour
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	B	B	B	D	C



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

RAMEY KEMP ASSOCIATES
Moving forward.

T 804 217 8560

4343 Cox Road
Glen Allen, VA 23060

May 27, 2021

Mr. Kevin McDermott
Albemarle County
401 McIntire Road
Charlottesville, Virginia 22902
Phone: (434) 296-5832

Subject: Rio Road Multi-Family – Traffic Impact Analysis (TIA)

Dear Mr. McDermott,

Enclosed for your review and approval is the revised Traffic Impact Analysis (TIA) we have prepared for the proposed neighborhood located on the southwest corner of the Rio Road at John Warner Parkway intersection. The original TIA was submitted in April 2021.

Following is a brief response to each review comment:

Comments Provided by VDOT – letter dated May 10, 2021:

1. Signal timing will need to be adjusted to reflect existing timing in the controller at Rio Rd and John Warner Pkwy including Control Type (actuated uncoordinated), minimum green times for all phases, yellow change and all red clearance times for all phases, and flash don't walk time for phase 4. Signal timings for this intersection are attached. The intersection is currently running FYA but that feature is omitted during the peak hours so it should not be included in the Synchro models.
    - Signal timings have been updated in Synchro analysis.

2. At the intersection of Rio Rd and John Warner Pkwy, the queue length values shown in the Appendix (pg 79) do not match the values listed in the summary Table 7 (pg 7). Given that Synchro was not used to analyze the roundabout at this intersection, the Synchro queue report should be removed, leaving the Sidra report in place. The same is true for the Build condition with Roundabout as well. Also, why is there a reduction in delay in the SBR movement under the 2023 Build condition (with no Roundabout)?
    - The Synchro/SimTraffic queue report is included as it is used to analyze the queuing at Rio Road and Dunlora Drive for the "with roundabout" conditions. The report shows the queuing data from Sidra for the Rio Rd and John Warner Pkwy roundabout condition, and any SimTraffic data for this intersection under the "with roundabout" condition should be ignored. The reduction in delay is no longer shown, as all analysis data has been updated with the new timings.

3. The Department is currently running FYA on phases 1 and 5 at the intersection of Rio Rd and Pen Pk but they are not shown in the Synchro models. Please make this adjustment.
    - The FYA has been added to the Rio Rd and Pen Park intersection. This change to the analysis actual improves certain movements at this intersection.

4. It is understood that the proposed roundabout at Rio Road and John Warner Pkwy will not be included in the Rio Point development. Based on RKA's analysis using projected traffic counts for Year 2023, the roundabout is anticipated to operate at LOS C. It is important to note that this proposed roundabout project is not expected to be constructed within the next few years, so the County should anticipate traffic operations to reflect the "no-build" condition in the study.
    - Noted. This scenario was included to reflect the ultimate operation of the intersection, with the build-out of the proposed neighborhood and the planned roundabout.

Comments Provided by the County – letter dated May 10, 2021:

1. Build w/roundabout shows increase in queuing and delay for JWP traffic over the no-build w/roundabout. This is the worst operating movement. Is there any way to address this? Possibly a slip lane.
    - Additional slip lanes have been added and the suggested design for the roundabout has been revised to provide the optimal configuration that would be possible to build at this intersection with its current layout.

2. A left-in from Rio to Dunlora Drive is shown in the concept plan for the Roundabout. Please address in more detail the removal of this movement from the analysis. Are we confident that will not be included despite the fact that it is shown in the concept, why, how will the desire for that movement be?
    - The left-in from Rio to Dunlora does not seem feasible upon completion of the roundabout. Allowing this movement would require a break in the splitter of the roundabout, and it would leave potential for this movement to queue back into the roundabout, inhibiting its proper operation. However, the left-in movement can be rerouted to a right-in on the northern Dunlora Dr and Rio Rd intersection, using the roundabout for necessary U-turns. The roundabout also allows for left-out traffic to turn right onto Rio Rd and U-turn at the roundabout to head south on Rio Rd. Figures 17 and 21 show the "with roundabout" condition, with all Dunlora left-turn traffic re-routed accordingly.

3. Why show the w/roundabout for the Dunlora Forest Dr intersection? The roundabout improvements at JWP/CATEC/Rio Rd do not appear to have any effect on operations at this intersection. Any recommendation to address the continued issue with the WBL at this intersection understanding that the Rio Point development does not make a noticeable change to that problem, but it is still a problem.
    - The scenario was shown at all intersections to provide consistency, but it has been omitted from the revised report, as it does not have any impact on the analysis of this intersection. As Mr. McDermott points out, there would be no significant change to the operations at this intersection with a roundabout.

4. Same question on inclusion of the roundabout at Pen Park Rd analysis. It doesn't appear to have any effect on operations. Minor increases in delays for the WB movements at this intersection between the Build and No-build. Any thoughts on ways to address this?
    - The "with roundabout" scenario does provide the same results for this intersection and has been omitted from the revised report.

5. The Rio Rd intersection at the proposed full movement driveway would operate with a failing movement for vehicles leaving the site wishing to turn left. This issue should be addressed to prevent people from turning right and attempting U-turns somewhere further south on Rio Rd East or taking unnecessary risks to get out between traffic.
    - While the eastbound left-turn movement shows a level of service - F, the report shows a maximum queue of less than 8 vehicles, and an average delay of 55 seconds, which is less than 1/3 of the cycle length at the Rio Rd and John Warner Parkway intersection. The delay is a measure of the *average* time it takes for a vehicle to complete the movement. So drivers would stand to wait a shorter amount of time to turn left out of the site than they would pulling up to the Rio Rd and John Warner Parkway signal halfway through the cycle. It is important to point out that this LOS for a side street or entrance to a major collector is not at all unusual. There is no indication from experience that this proposed entrance would pose an undue safety hazard.

6. Staff's only concerns about traffic operations are the JWP, Dunlora Forest Dr, and full movement driveway queuing and delays. As requested above any recommendations to address these issues would be appreciated.
    - Responses and recommendations have been provided for the aforementioned issues. Thanks for your feedback, and let us know if there is anything that still needs to be addressed.

We appreciate your time and assistance to this point, and trust that we have addressed all of the review comments. Please contact me if you have any questions or need anything else to complete the review.

Sincerely,
Ramey Kemp Associates

Michael Bailey, P.E., PTOE
State Traffic Operations Lead

Enclosure

Copy to: Mr. Adam Moore, P.E., VDOT