

VENTURE AT LASTER FARMS MULTIFAMILY KNOX COUNTY, TENNESSEE

TRAFFIC IMPACT STUDY

OUTLET DRIVE
KNOX COUNTY, TENNESSEE

CCI PROJECT NO. 01852-0000.000

PREPARED FOR:

Trinitas Development LLC
8900 Keystone Crossing
Suite 1225
Indianapolis, IN 46240

SUBMITTED BY:

Cannon & Cannon, Inc.
10025 Investment Drive
Suite 120
Knoxville, TN 37932



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EXECUTIVE SUMMARY

This report provides a summary of a traffic impact study that was performed for a proposed multi-family residential development to be located at 11471 Outlet Drive in west Knox County, Tennessee. The project site is located on the north side of Outlet Drive just east of Snyder Road. The development plan for this site proposes a multi-family residential development with 240 multifamily apartment units and 80 townhouse units. The proposed development will have three full accesses on a newly proposed public roadway that will intersect Outlet Drive approximately 500 feet east of Snyder Road.

The purpose of this study was the evaluation of the traffic operational and safety impacts of the proposed development upon roadways in the vicinity of the project site. Comments received from Knox County Engineering, the Town of Farragut, and Knoxville-Knox County Planning resulted in the existing intersections of Campbell Station Road at Snyder Road, Snyder Road at Outlet Drive, and Lovell Road at Outlet Drive being identified for detailed study. Appropriate intersection evaluations such as capacity analyses were conducted at the study intersections for existing and future conditions, both with and without site generated traffic, in order to determine the anticipated impacts and to establish recommended measures to mitigate these impacts. Additionally, the proposed new public roadway at Outlet Drive was evaluated for capacity analysis, turn lane warrants and sight distance.

The primary conclusion of this study is that the traffic generated from the proposed development will have some impacts at the study intersections. Congestion and queueing issues during peak hours do currently exist at the intersection of Campbell Station Road at Snyder Road, and the proposed development is expected to worsen the potential issues. The northbound approach is currently the worst leg of this intersection and will continue to experience increasing queues. Addition of a northbound right lane with an overlap phase will greatly impact the functionality and capacity of this intersection. Furthermore, delays and queue lengths at the intersection of Lovell Road at Outlet Drive are anticipated to worsen particularly during the PM peak hour. However, these impacts could likely be reduced to an acceptable level with optimized signal timing at this intersection.

The following is a list of recommendations developed with this traffic impact study:

- 1) Addition of an exclusive northbound right turn lane with storage of 100 feet and a taper length of 140 feet at the intersection of Campbell Station Road at Snyder Road; this will require removal of the concrete island and pole location to outside the intersection.
- 2) Replace a 3 section signal head for the northbound approach of Campbell Station Road at Snyder Road with a 5 section right turn signal head.
- 3) Addition of a westbound right turn lane with storage of 75 feet and a taper of 140 feet at the intersection of Outlet Drive at the site access.
- 4) Upon full buildout of the development, update the traffic signal timing at the intersections of Campbell Station Road at Snyder Road and Lovell Road at Outlet Drive.
- 5) Ensure that grading, landscaping, signing, and other site features do not restrict lines of sight exiting the development along Outlet Drive.

INTRODUCTION & PURPOSE OF STUDY

This report provides a summary of a traffic impact study that was performed for a proposed multi-family residential development to be located at 11471 Outlet Drive in west Knox County, Tennessee. The project site is located on the north side of Outlet Drive just east of Snyder Road. FIGURE 1 is a location map showing the major roadways in the project site vicinity.

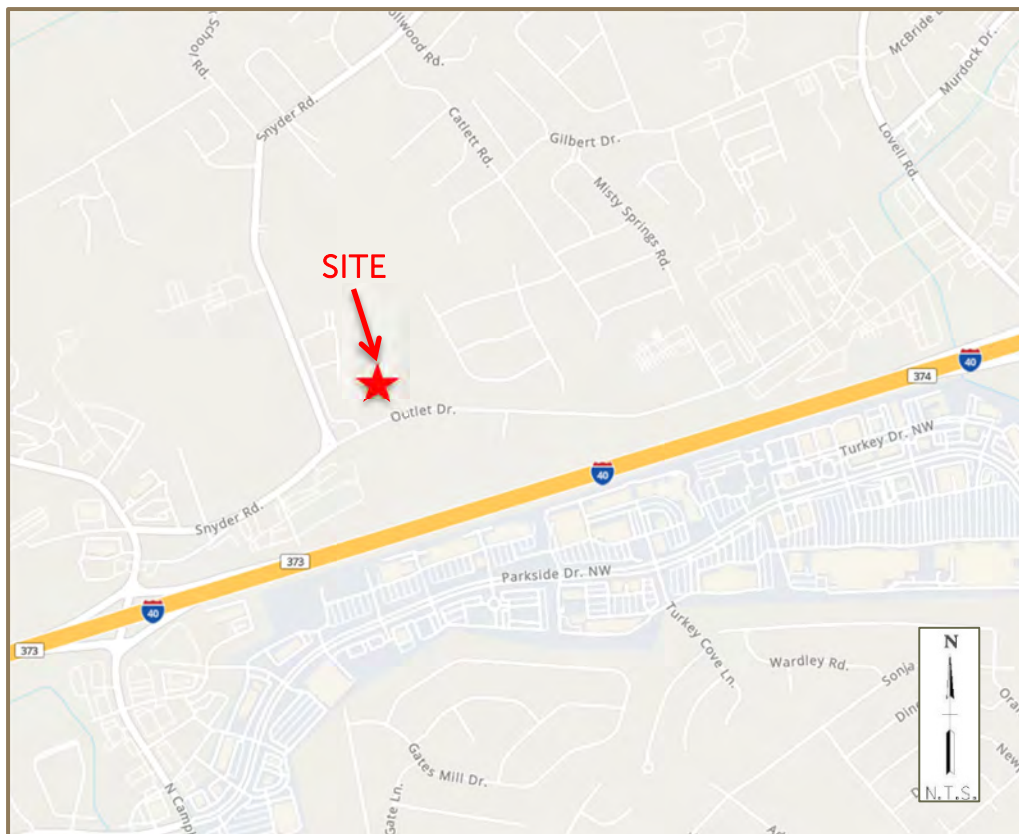


FIGURE 1
LOCATION MAP

The development plan for this site proposes a multi-family residential development with 240 multifamily apartment units and 80 townhouse units. The proposed development will have three full accesses on a newly proposed public roadway that will intersect Outlet Drive approximately 500 feet east of Snyder Road. FIGURE 2 is a Conceptual Site Plan detailing the proposed site.

The purpose of this study was the evaluation of the traffic operational and safety impacts of the proposed development upon roadways in the vicinity of the project site. Comments received from Knox County Engineering, the Town of Farragut, and Knoxville-Knox County Planning resulted in the existing intersections of Campbell Station Road at Snyder Road, Snyder Road at Outlet Drive, and Lovell Road at Outlet Drive being identified for detailed study. Appropriate intersection evaluations such as capacity analyses were conducted at the study intersections for existing and future conditions, both with and without site generated traffic, in order to determine the anticipated impacts and to

establish recommended measures to mitigate these impacts. Additionally, the proposed new public roadway at Outlet Drive was evaluated for capacity analysis, turn lane warrants and sight distance.

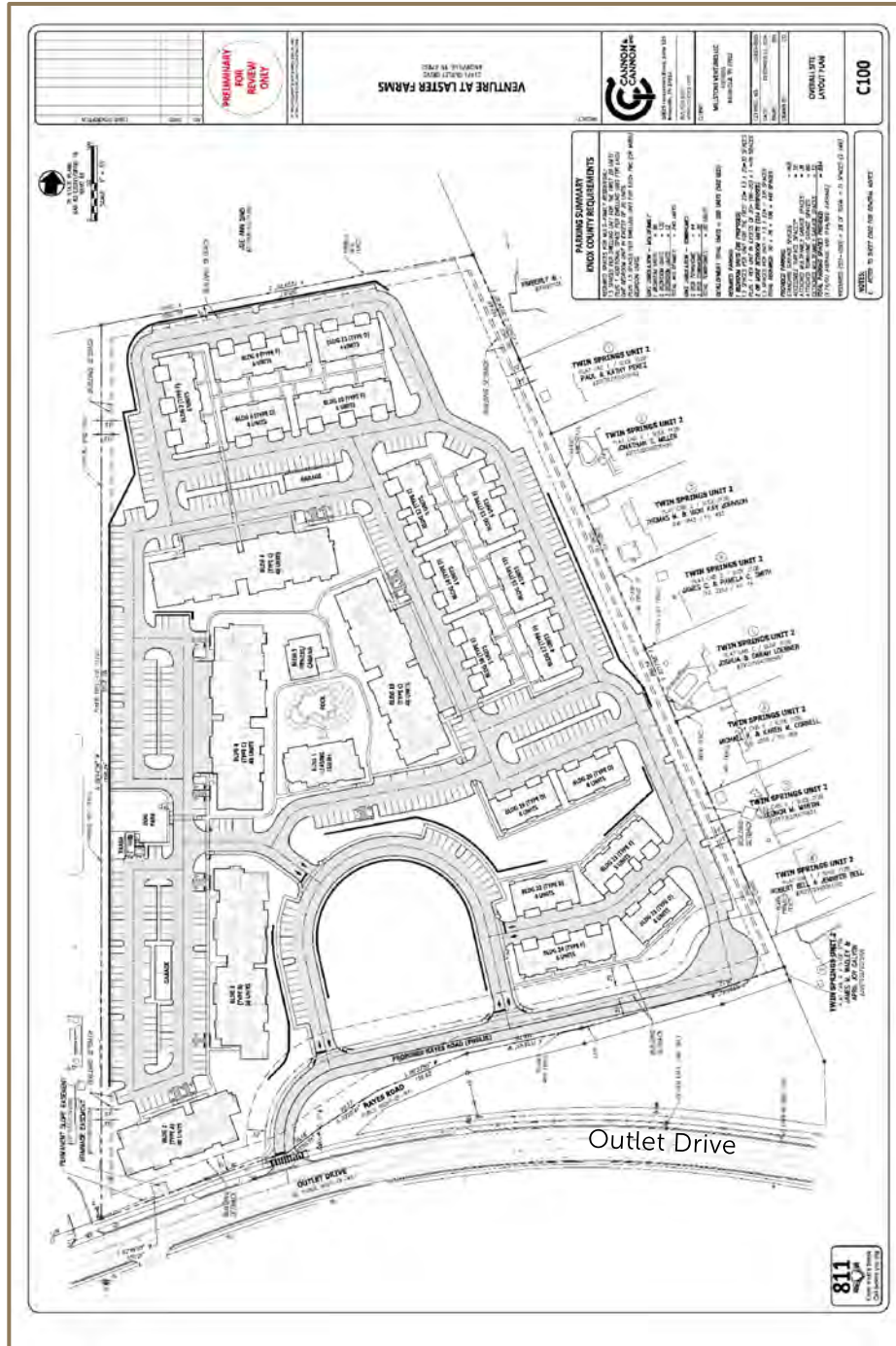


FIGURE 2
CONCEPTUAL SITE PLAN

EXISTING CONDITIONS

EXISTING ROADWAY CONDITIONS

Outlet Drive is classified as a Major Collector per the Knoxville-Knox County Major Road Plan and runs west to east from Snyder Road to Lovell Road. Within the study limits, Outlet Drive is an undivided three-lane roadway with one travel lane in each direction and a center two-way left turn lane. In front of the proposed site, Outlet Drive has 12-foot travel lanes and a posted speed limit of 35 mph on the west side and 30 mph on the east side. Outlet Drive has curb and gutter, bike lanes, and sidewalk on both sides of the roadway in front of the proposed site.

Snyder Road is classified as a Minor Collector per the Knoxville-Knox County Major Road Plan and runs west to east connecting Campbell Station Road and Lovell Road. Snyder Road consists of two sections; one from Campbell Station Road to Outlet Drive and the other from Outlet Drive to Lovell Road. From Campbell Station Road to Outlet Drive, Snyder Road is an undivided three-lane roadway with one travel lane in each direction and a center two-way left turn lane. Within this section, Snyder Road has 12-foot travel lanes and a posted speed limit of 35 mph. Snyder Road has curb and gutter, bike lanes, and sidewalk on both sides of the roadway from Campbell Station Road to Outlet Drive. From Outlet Drive to Lovell Road, Snyder Road is an undivided two-lane roadway with one travel lane in each direction. Within this section, Snyder Road has 9-foot travel lanes and a posted speed limit of 30 mph. Curb and gutter and sidewalk exist only in minimal, sporadic lengths of this portion of Snyder Road.

The existing intersection of Campbell Station Road at Snyder Road is a four-legged signalized intersection. Snyder Road is considered the east-west street, and Campbell Station Road is considered the north-south street. The eastbound Snyder Road approach contains one exclusive left turn lane, and a shared through / right turn lane. The left turn lane has a storage length of approximately 75 feet. The westbound Snyder Road approach contains one exclusive left turn lane and one shared through / left turn lane / right turn lane. The left turn lane has a storage length of approximately 160 feet. The northbound Campbell Station Road approach contains one exclusive left turn lane and one shared through / right turn lane with a channelized, yield controlled right turn. The left turn lane has a storage length of approximately 60 feet. The southbound Campbell Station Road approach contains one exclusive left turn lane and one shared through / right turn lane. The left turn lane has a storage length of approximately 115 feet. The traffic signal phasing includes a protected-permissive left turn phase for the southbound approach, and split phasing for the eastbound and westbound approaches. Marked crosswalks and protected pedestrian signal phases exist crossing the east, west, and north legs.

The existing intersection of Snyder Road at Outlet Drive is a three-legged side street stop-controlled intersection, with Snyder Road being both the west and north legs. Snyder Road is considered the north-south street and Outlet Drive / Snyder Road are considered the east-west streets. The eastbound Snyder Road approach contains one exclusive left turn lane and one exclusive through lane. The left turn lane has a storage length of approximately 200 feet. The westbound Outlet Drive approach contains one shared through / right turn lane with a channelized, yield controlled right turn. The Snyder Road southbound approach contains one exclusive left turn lane and one exclusive right turn lane. The right turn lane is yield controlled and has a storage length of approximately 110 feet. Marked crosswalks exist crossing the north leg.

The existing intersection of Lovell Road at Outlet Drive is a three-legged signalized intersection. Lovell Road is considered the north-south street and Outlet Drive is considered the east-west street. The eastbound Outlet Drive approach contains one exclusive left turn lane and one exclusive right turn lane. The left turn lane has a storage length of approximately 125 feet. The northbound Lovell Road approach contains one exclusive left turn lane and two exclusive through lanes. The left turn lane has a storage length of approximately 95 feet. The Lovell Road southbound approach contains one exclusive through lane and one shared through / right turn lane. The traffic signal phasing includes a protected-permissive left turn phase for the northbound approach and a right turn overlap for the eastbound approach. Marked crosswalks and protected pedestrian signal phases exist crossing the west and south legs.

EXISTING SITE CONDITIONS

The project site is located along the north side of Outlet Drive just east of the intersection with Snyder Road. The area of the site is approximately 18.24 acres, and it is currently zoned Office. The site is relatively flat and a mix of wooded and grass, with a few existing structures including homes and barns. FIGURE 3 provides an aerial view of the project site and the surrounding area.



FIGURE 3
EXISTING SITE CONDITIONS

EXISTING TRAFFIC DATA

Two types of traffic data were gathered for this study. The Tennessee Department of Transportation (TDOT) collects annual average daily traffic (AADT) data on roadways in the study area. Three count stations, located on Outlet Drive, Snyder Road, and Lovell Road, were found near the project site that were felt to have particular relevance for this study. The most currently available data from this station can be found in TABLE 1.

TABLE 1: ANNUAL AVERAGE DAILY TRAFFIC COUNT SUMMARY

COUNT YEAR	TDOT COUNT STATION 47000559 OUTLET DRIVE	TDOT COUNT STATION 47000555 SNYDER ROAD	TDOT COUNT STATION 47000285 LOVELL ROAD
2018	5,065	2,019	17,532
2019	5,288	3,013	14,630
2020	5,527	2,688	15,512
2021	5,932	4,023	17,443
2022	6,595	3,850	17,251
2023	7,851	3,777	18,763

In addition to the available AADT data, intersection turning movement counts (TMC) were conducted at the existing study intersections to determine the current morning (AM) and evening (PM) peak hour operating volumes. These peak hour volumes are the traffic volumes with which the study’s capacity analyses are based. The intersection TMC data were collected on January 31, 2024. The 2024 existing peak hour traffic volumes are summarized in FIGURE 4, and the raw data traffic count summary sheets are contained in APPENDIX A.

EXISTING CAPACITY ANALYSES

Capacity analyses employing the methods of the *Highway Capacity Manual* were conducted for the existing conditions at the study intersections. These analyses were performed with the 2024 existing traffic volumes, shown in FIGURE 4, and existing intersection geometry, traffic control, and signal timing. *Synchro 11* software was utilized for the capacity analyses for all intersections. The EVALUATIONS section of this report may be referenced for discussion and tabular summaries of these analyses, while more detailed summaries are presented on the computer printouts contained in APPENDIX C. Also contained in APPENDIX C is a section titled “Capacity and Level of Service Concepts,” which provides a description of the utilized procedures.

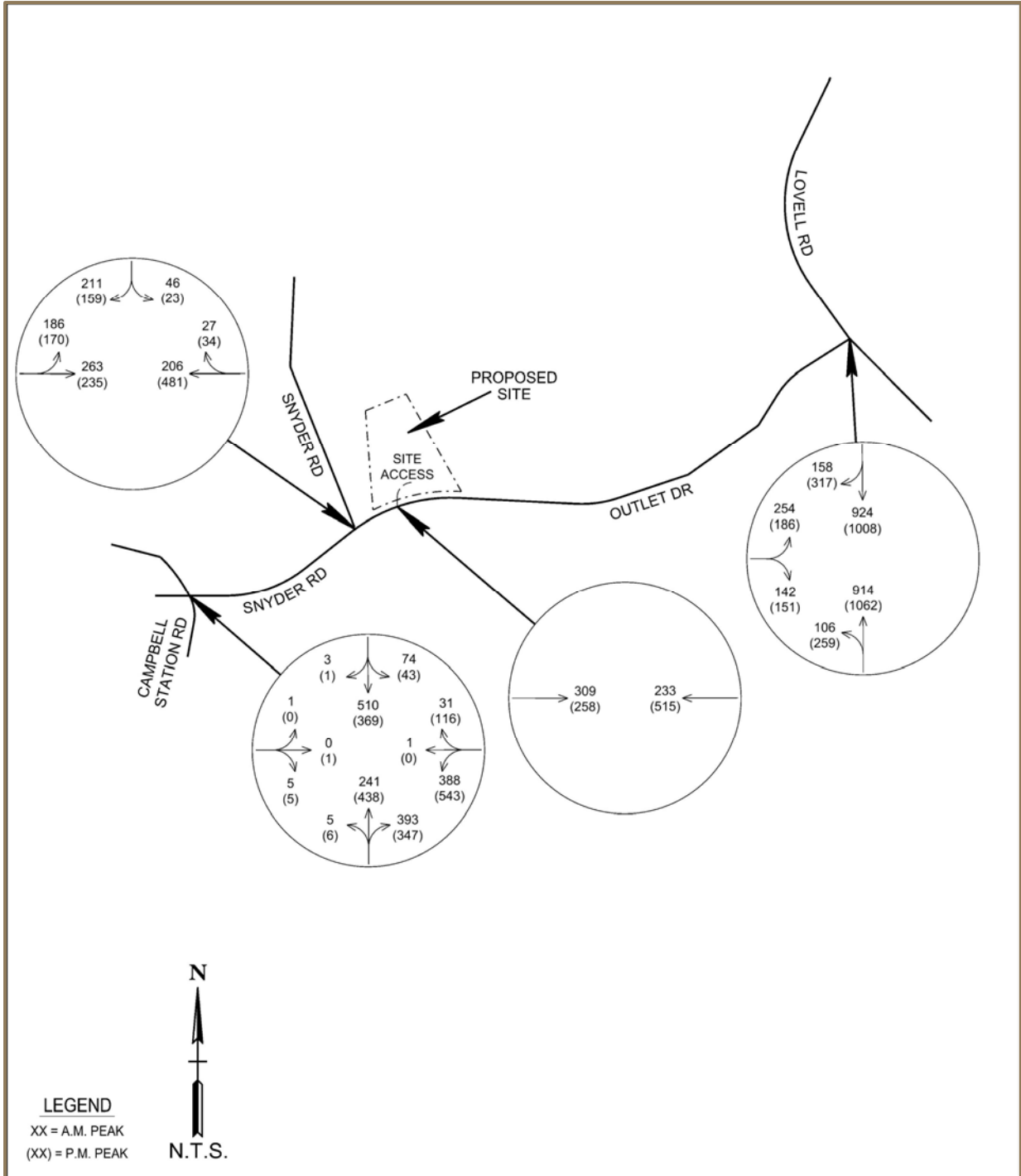


FIGURE 4
2024 EXISTING TRAFFIC VOLUMES

BACKGROUND CONDITIONS**BACKGROUND TRAFFIC GROWTH**

The proposed development is anticipated to be constructed in two phases with full buildout completion anticipated by 2027. Therefore, Year 2027 was established as the appropriate design / analysis year for the study. In order to determine traffic volumes resulting solely from background traffic growth to Year 2027, it was necessary to establish an annual growth rate for existing traffic. The TDOT AADT values previously discussed, as well as knowledge of the area, were used to determine an approximate annual growth rate. Based on the available data, a background annual growth rate of 4.0% was assumed. FIGURE 5 contains the background traffic volumes that would result from this annual growth rate from Year 2024, when the counts were conducted, to Year 2027.

BACKGROUND CAPACITY ANALYSES / LEVELS-OF-SERVICE

Capacity analyses as described in the EXISTING CONDITIONS section of this report were conducted utilizing the Year 2027 background volumes shown in FIGURE 5 and existing intersection geometry, traffic control, and signal timing. The EVALUATIONS section of this report may be referenced for discussion and tabular summaries of these analyses, while more detailed summaries are presented on the computer printouts contained in APPENDIX C.

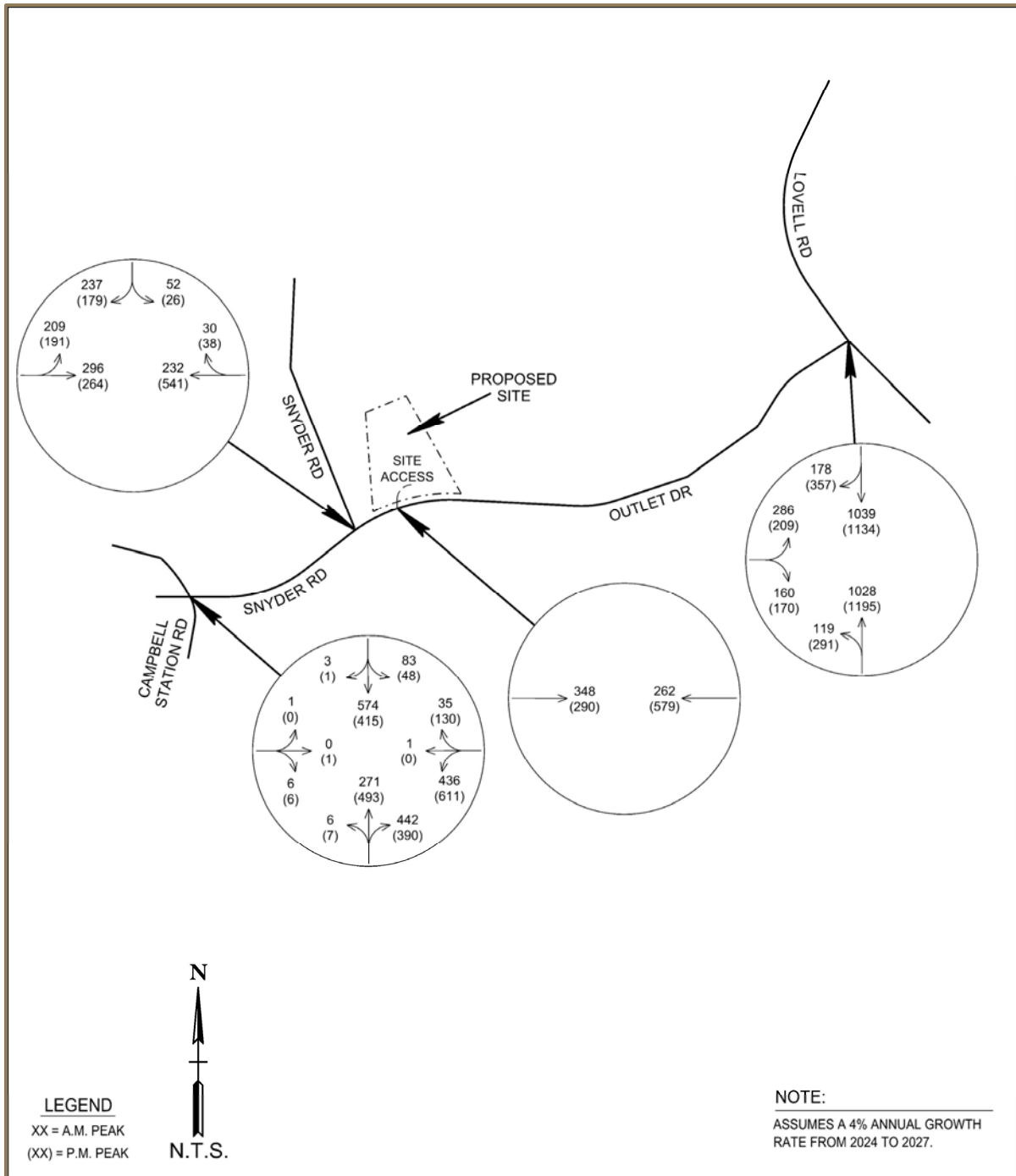


FIGURE 5
 2027 BACKGROUND TRAFFIC VOLUMES

FUTURE CONDITIONS

TRIP GENERATION

In order to estimate the expected traffic volumes to be generated by the proposed development, the procedures recommended by the Institute of Transportation Engineers (ITE) were utilized. The proposed development will include 320 total dwelling units, of which 240 are residential apartment units and 80 are single family attached residential units. A previous version of this study was performed for the originally-proposed 438 residential apartment units. A quick analysis of the effects of the reduced number of units and change in land use determined that the reduction would result in minimally decreased trips and no changes to the study's recommendations. Therefore, the remainder of this report continues to reference the originally-proposed 438 units. This development is proposed within Knox County; therefore, Knox County's *Local Apartment Trip Generation Study* was used to estimate development-generated traffic. The generated traffic volumes were determined based on the data for the peak hours of adjacent street traffic. See TABLE 2 for a summary of the traffic generated for this development. More detailed information is contained in APPENDIX B.

TABLE 2: TRIP GENERATION SUMMARY

LAND USE	SIZE	WEEKDAY (TRIPS/DAY)	AM PEAK HOUR (TRIPS/HOUR)	PM PEAK HOUR (TRIPS/HOUR)
Local Apartment	438 Dwelling Units	3,600	209	303
Entering Trips		1,800 (50%)	46 (22%)	167 (55%)
Exiting Trips		1,800 (50%)	163 (78%)	136 (45%)

A.M. Peak Hour trip generation is based on Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.
P.M. Peak Hour trip generation is based on Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.

TRIP DISTRIBUTION AND ASSIGNMENT

The proposed trip distribution for this development was determined through a review of existing travel patterns, local knowledge of the study area, proposed site location in relation to the surrounding roadway network, and engineering judgment. FIGURE 6 provides a summary of how the above site generated trips would be distributed to the study intersections. FIGURE 7 provides the proposed trip assignment volumes to the study intersections.

FUTURE TRAFFIC VOLUMES

Future projected traffic volumes for the study intersections were developed by adding the generated and assigned trips shown in FIGURE 7 to the 2027 background traffic volumes developed in the previous section and shown in FIGURE 5. These combined 2027 volumes reflect the existing traffic, the background traffic growth, and the generated traffic from the proposed development. These future

volumes are shown on FIGURE 8 and are the combined volumes used in the analyses of future conditions with the proposed development.

FUTURE CAPACITY ANALYSES / LEVELS-OF-SERVICE

Capacity analyses as described in the EXISTING CONDITIONS section of this report were conducted utilizing the Year 2027 combined volumes shown in FIGURE 8 and existing intersection geometry, traffic control, and signal timing. Tabular summaries of the analyses results and associated discussion are also contained in the EVALUATIONS section. In addition, detailed computer printout summaries of the analyses are contained in APPENDIX C.

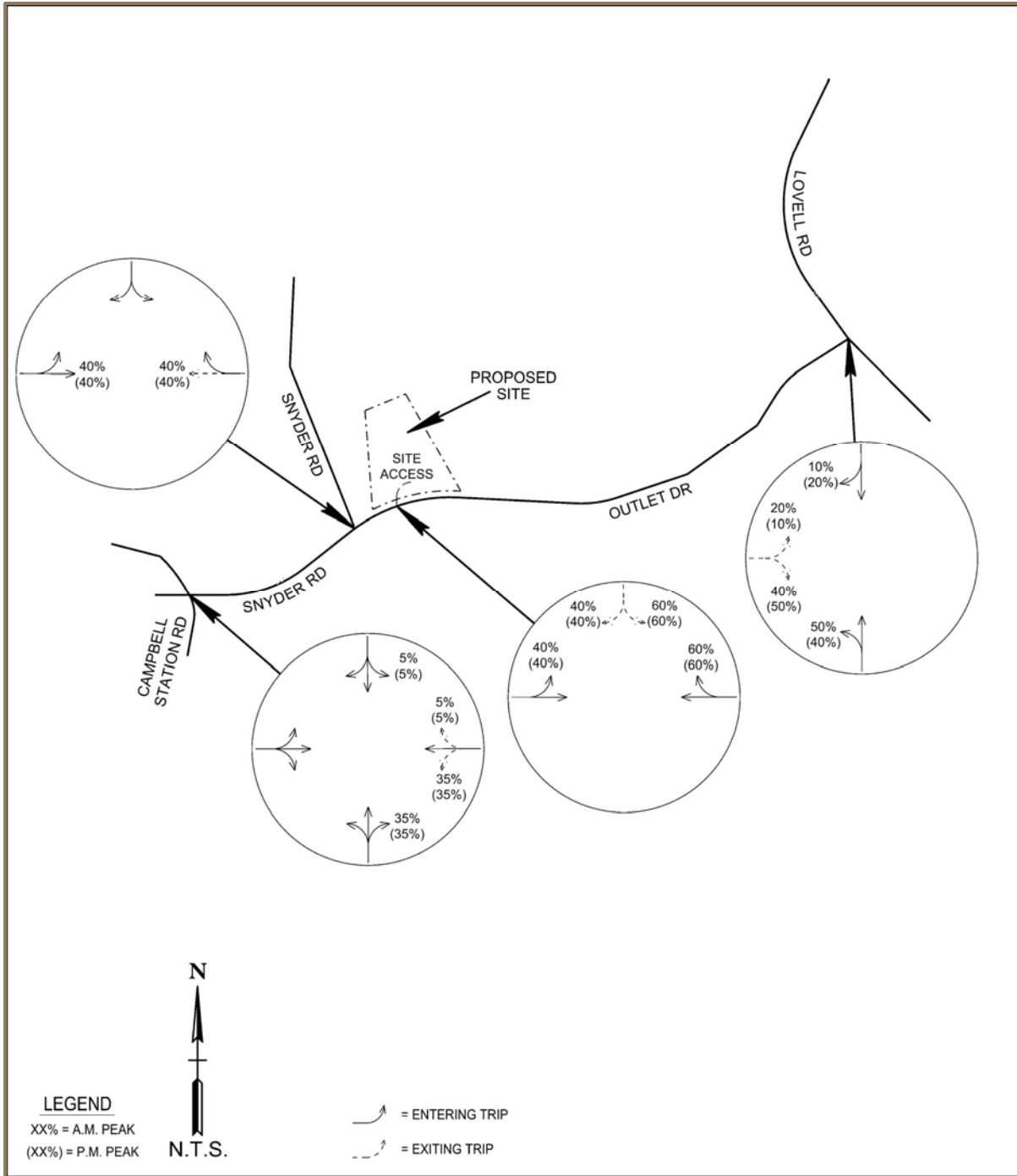


FIGURE 6
TRIP DISTRIBUTION

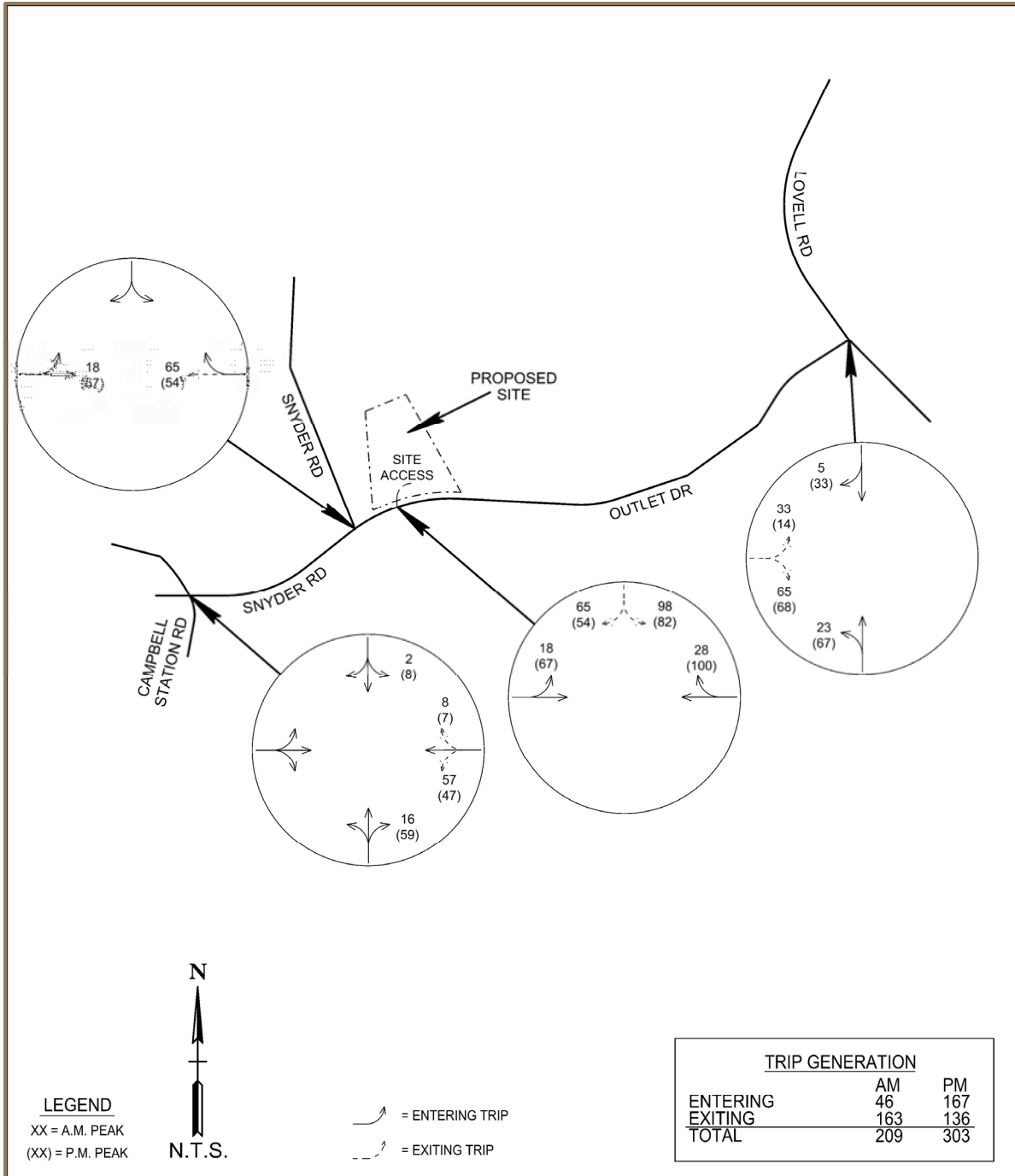


FIGURE 7
TRIP ASSIGNMENT

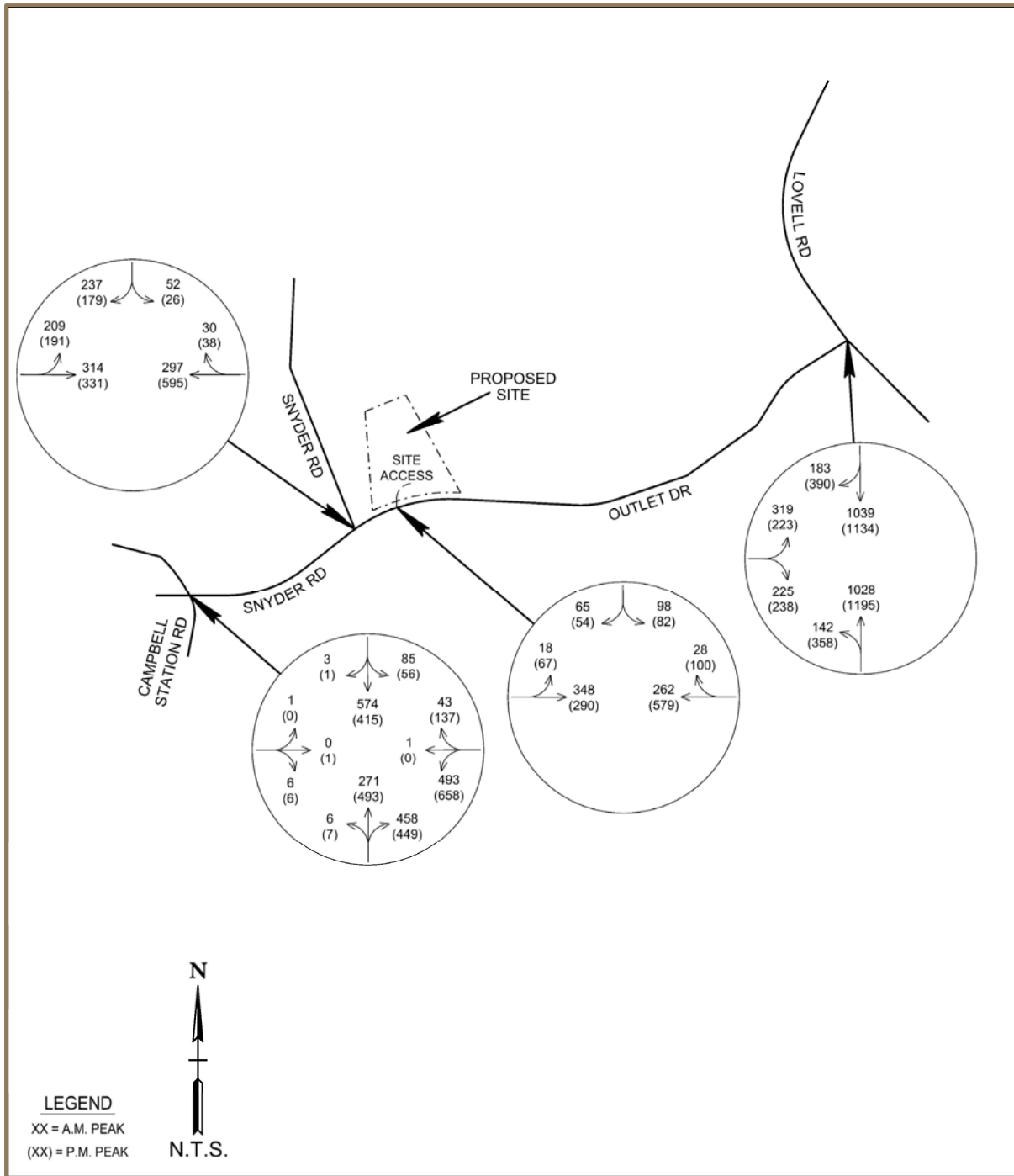


FIGURE 8
2027 COMBINED TRAFFIC VOLUMES

EVALUATIONS

INTERSECTION CAPACITY ANALYSES

Intersection capacity analyses were performed for the study intersections. The capacity analyses employed the procedures of the *Highway Capacity Manual* utilizing *Synchro 11* software. A description of the fundamentals of these procedures is contained in the APPENDIX C section titled "Capacity and Level-of-Service Concepts." The results of these analyses for the existing, background and combined future traffic conditions are presented and discussed by individual intersection in the subsections below. Capacity analyses summaries are presented for each intersection in these individual subsections, which are accompanied by tables showing level-of-service (LOS) and queuing results. More detailed information is contained on the capacity software output summaries contained in APPENDIX C.

Potential mitigation measures were identified at intersections experiencing poor LOS or where vehicle queuing may become an issue. These mitigation strategies, where applicable, are described for each intersection in their respective subsections. The accompanying LOS and queue length tables show comparisons between the intersections under existing geometry, traffic control, and signal timing to these mitigation strategies in order to provide a quantitative measure of effectiveness of the mitigation.

Intersection #1: Campbell Station Road at Snyder Road

As shown in TABLE 3, this intersection currently operates at overall LOS "C" during the AM and PM peak hours. The intersection is expected to worsen to LOS "D" under the background condition. The PM peak hour is expected to further worsen to LOS "E" under the combined condition and full buildout, while the AM peak hour continues to operate at LOS "D". The proposed development has a significant impact on this intersection particularly during the PM peak hour.

The westbound and northbound approaches of this intersection merit special attention due to their levels-of-service and excessive queue lengths. However, the *Synchro 11* model does not account for the fact that additional vehicles can queue in the two-way left-turn lane for the westbound Snyder Road approach. The northbound through and right movements share a lane, causing the theoretical queue length for this lane to extend through the I-40 interchange. This issue is of high concern and requires mitigation.

The mitigation strategies analyzed at this intersection were optimized splits with existing conditions, adding a right turn lane to the northbound approach, adding an additional left turn lane to the westbound approach under existing signal phasing, and adding an additional left turn lane to the westbound approach with protected only phasing, all of which were developed utilizing *Synchro 11's* signal timing optimization tool. Although final signal timings are not suggested through use of this optimization tool, the tool does provide a general gauge on what benefit might be expected from re-timing the traffic signal. TABLE 3 indicates that adding a northbound right lane upon full buildout of the development could improve overall intersection operations and decrease average vehicle delays by up to 47 seconds during the peak hours, resulting in LOS "C".

TABLE 3: CAPACITY ANALYSES SUMMARY – CAMPBELL STATION ROAD AT SNYDER ROAD

SCENARIO		MOVEMENT/ APPROACH	AM PEAK (LOS/DELAY)	PM PEAK (LOS/DELAY)
2024 Existing	Existing Geometry, Traffic Control & Signal Timing	EB	A 4.9	C 27.2
		WB	E 56.3	D 48.4
		NB	C 27.8	C 33.7
		SB	B 11.0	B 10.7
		Overall	C 29.0	C 33.8
2027 Background	Existing Geometry, Traffic Control & Signal Timing	EB	A 4.4	C 26.4
		WB	E 65.8	E 67.1
		NB	D 39.4	D 50.5
		SB	B 12.2	B 11.2
		Overall	D 36.3	D 47.6
2027 Combined	Existing Geometry, Traffic Control & Signal Timing	EB	A 4.4	C 26.4
		WB	F 92.7	F 83.8
		NB	D 42.9	F 90.7
		SB	B 12.2	B 11.2
		Overall	D 46.1	E 71.2
2027 Combined	Existing Geometry & Traffic Control with Optimized Splits	EB	A 4.4	C 26.7
		WB	F 149.1	F 114.4
		NB	C 31.3	E 67.4
		SB	B 10.9	B 10.0
		Overall	E 56.8	E 71.9
2027 Combined	Northbound Right Turn Lane & Optimized Splits	EB	A 4.4	C 26.7
		WB	D 45.2	D 41.3
		NB	A 8.5	B 14.7
		SB	B 15.6	B 14.0
		Overall	C 21.0	C 24.1
2027 Combined	Westbound Dual Left Turn Lanes Current Phasing	EB	A 4.4	C 26.7
		WB	F 166.0	F 136.0
		NB	C 26.4	D 48.3
		SB	A 9.7	A 8.5
		Overall	E 59.2	E 71.2
2027 Combined	Westbound Dual Left Turn Lanes Protected Phasing	EB	A 4.4	C 26.7
		WB	F 165.7	F 136.0
		NB	C 26.4	D 48.3
		SB	A 9.7	A 8.5
		Overall	E 59.2	E 71.2

TABLE 4: 95TH PERCENTIAL QUEUE SUMMARY – CAMPBELL STATION ROAD AT SNYDER ROAD

SCENARIO		MOVEMENT/ APPROACH	AM PEAK	PM PEAK
2024 Existing	Existing Geometry, Traffic Control & Signal Timing	EBL	5'	0'
		EBT/R	0'	13'
		WBL	243'	383'
		WBL/T/R	226'	151'
		NBL	10'	11'
		NBT/R	611'	808'
		SBL	41'	29'
2027 Background	Existing Geometry, Traffic Control & Signal Timing	EBL	5'	0'
		EBT/R	0'	14'
		WBL	282'	445'
		WBL/T/R	266'	191'
		NBL	12'	13'
		NBT/R	717'	940'
		SBL	45'	31'
2027 Combined	Existing Geometry, Traffic Control & Signal Timing	EBL	5'	0'
		EBT/R	0'	14'
		WBL	329'	487'
		WBL/T/R	315'	245'
		NBL	12'	13'
		NBT/R	736'	1017'
		SBL	46'	35'
2027 Combined	Existing Geometry & Traffic Control with Optimized Splits	EBL	5'	0'
		EBT/R	0'	14'
		WBL	352'	511'
		WBL/T/R	340'	263'
		NBL	10'	12'
		NBT/R	670'	959'
		SBL	45'	33'
2027 Combined	Northbound Right Turn Lane & Optimized Splits	EBL	5'	0'
		EBT/R	0'	14'
		WBL	270'	428'
		WBL/T/R	254'	198'
		NBL	12'	13'
		NBT	209'	457'
		NBR	32'	30'
2027 Combined	Westbound Dual Left Turn Lanes Current Phasing	EBL	5'	0'
		EBT/R	0'	14'
		WBL	277'	356'
		WBT/R	30'	0'
		NBL	10'	11'
		NBT/R	647'	923'
		SBL	45'	30'
		SBT/R	310'	196'

TABLE 4: 95TH PERCENTIAL QUEUE SUMMARY – CAMPBELL STATION ROAD AT SNYDER ROAD CONTINUED

SCENARIO		MOVEMENT/ APPROACH	AM PEAK	PM PEAK
2027 Combined	Westbound Dual Left Turn Lanes Protected Phasing	EBL	5'	0'
		EBT/R	0'	14'
		WBL	277'	356'
		WBT/R	24'	0'
		NBL	10'	11'
		NBT/R	647'	923'
		SBL	45'	30'
SBT/R	310'	196'		

Intersection #2: Snyder Road at Outlet Drive

TABLES 3A and 4A indicate that the worst movement of this intersection, southbound left, currently operates at a LOS "C" during both of the peak hours and has relatively short queues compared to available storage. Under the background scenario, the southbound left movement will continue to operate at LOS "C" during both peak hours. The southbound left movement worsens to a LOS "D" under the combined scenario during the AM peak hour. However, the background LOS "C" is on the very upper threshold of that range, and the jump from "C" with background traffic to "D" with combined traffic is done with only a two second increase in average vehicle delay. The queue lengths only marginally increase between the background scenario and the combined scenario with the worst being an increase of 13 feet. The development is expected to have a minimal impact on the operation of this intersection upon full buildout.

TABLE 3A: CAPACITY ANALYSES SUMMARY – SNYDER ROAD AT OUTLET DRIVE

SCENARIO		MOVEMENT/ APPROACH	AM PEAK (LOS/DELAY)	PM PEAK (LOS/DELAY)
2024 Existing	Existing Geometry & Traffic Control	EBL SBL SBR	A 8.5 C 20.0 B 12.8	A 9.0 C 16.7 B 13.9
2027 Background	Existing Geometry & Traffic Control	EBL SBL SBR	A 8.7 C 23.6 B 14.2	A 9.4 C 18.5 C 15.6
2027 Combined	Existing Geometry & Traffic Control	EBL SBL SBR	A 9.1 D 25.9 C 16.4	A 9.6 C 20.1 C 16.9

TABLE 4A: 95TH PERCENTIAL QUEUE SUMMARY – SNYDER ROAD AT OUTLET DRIVE

SCENARIO		MOVEMENT/ APPROACH	AM PEAK	PM PEAK
2024 Existing	Existing Geometry & Traffic Control	EBL SBL SBR	18' 20' 45'	15' 5' 30'
2027 Background	Existing Geometry & Traffic Control	EBL SBL SBR	23' 25' 60'	18' 8' 40'
2027 Combined	Existing Geometry & Traffic Control	EBL SBL SBR	25' 30' 73'	18' 8' 43'

Intersection #3: Lovell Road at Outlet Drive

As shown in TABLES 3B and 4B, the development will have minor traffic operational impacts at this intersection during the AM peak hour, but effects the PM peak hour significantly. For the PM peak hour, the overall intersection LOS is expected to increase from “B” to “C” between existing and background conditions and further worsen to “D” under combined conditions. The AM peak LOS is expected to remain at “C” through development buildout.

The northbound approach to this intersection will see the bulk of the study area impacts, particularly during the PM peak when the majority of traffic enters the development from Lovell Road. The existing storage length for the northbound left turn movement may be exceeded at times during the PM peak period, although updating the signal timing should mitigate that as shown in the tables.

The mitigation strategy studied for this intersection was updated signal timing, which showed to have a significant positive impact on the overall intersection LOS and delay experienced by vehicles particularly during the PM peak hour.

TABLE 3B: CAPACITY ANALYSES SUMMARY – LOVELL ROAD AT OUTLET DRIVE

SCENARIO		MOVEMENT/ APPROACH	AM PEAK (LOS/DELAY)	PM PEAK (LOS/DELAY)
2024 Existing	Existing Geometry, Traffic Control & Signal Timing	EB NB SB Overall	D 41.7 B 10.1 C 21.4 C 20.0	D 48.8 B 11.9 B 15.2 B 17.5
2027 Background	Existing Geometry, Traffic Control & Signal Timing	EB NB SB Overall	D 44.9 B 13.2 C 27.0 C 24.2	E 56.9 C 25.0 B 18.2 C 25.6
2027 Combined	Existing Geometry, Traffic Control & Signal Timing	EB NB SB Overall	D 48.1 B 15.4 C 29.4 C 27.3	E 58.8 E 56.6 B 18.7 D 40.5
2027 Combined	Existing Geometry & Traffic Control with Optimized Splits	EB NB SB Overall	D 45.5 B 15.7 C 30.7 C 27.5	D 53.7 A 19.9 C 34.0 C 30.4

TABLE 4B: 95TH PERCENTIAL QUEUE SUMMARY – LOVELL ROAD AT OUTLET DRIVE

SCENARIO		MOVEMENT/ APPROACH	AM PEAK	PM PEAK
2024 Existing	Existing Geometry, Traffic Control & Signal Timing	EBL	245'	261'
		EBR	90'	80'
		NBL	52'	120'
		NBT	197'	162'
		SBT/R	371'	397'
2027 Background	Existing Geometry, Traffic Control & Signal Timing	EBL	278'	307'
		EBR	112'	119'
		NBL	90'	362'
		NBT	233'	192'
		SBT/R	445'	490'
2027 Combined	Existing Geometry, Traffic Control & Signal Timing	EBL	343'	333'
		EBR	163'	187'
		NBL	132'	502'
		NBT	233'	192'
		SBT/R	448'	508'
2027 Combined	Existing Geometry & Traffic Control with Optimized Splits	EBL	331'	321'
		EBR	161'	180'
		NBL	133'	405'
		NBT	240'	201'
		SBT/R	458'	745'

Intersection #4: Outlet Drive at the proposed public road

As shown in TABLE 3C, the proposed traffic control at the intersection of Outlet Drive with the proposed public road will allow the intersection to operate at no worse than LOS "C". TABLE 4C shows that queue lengths are minimal for the eastbound left turning movement and should not significantly impact the surrounding developments' existing turning movements. The closest potentially conflicting access is located approximately 250' to the west.

TABLE 3C: CAPACITY ANALYSES SUMMARY – OUTLET DRIVE AT THE PROPOSED PUBLIC ROAD

SCENARIO		MOVEMENT/ APPROACH	AM PEAK (LOS/DELAY)	PM PEAK (LOS/DELAY)
2027 Combined	Proposed Geometry & Traffic Control	EBL SB	A 7.9 B 13.9	A 9.5 C 19.7

TABLE 4C: 95TH PERCENTIAL QUEUE SUMMARY – OUTLET DRIVE AT THE PROPOSED PUBLIC ROAD

SCENARIO		MOVEMENT/ APPROACH	AM PEAK	PM PEAK
2027 Combined	Proposed Geometry & Traffic Control	EBL SB	0' 33'	8' 43'

TURN LANE WARRANT EVALUATIONS

Turn lane evaluations were conducted for a potential right turn lane onto the proposed public road from Outlet Drive under combined volume scenarios. The methods employed for the turn lane evaluations were those developed by M.D. Harmelink, as provided by in a series of tables from the Knox County publication “Access Control and Driveway Design Policy”. The results of these evaluations were that a right turn lane is warranted on Outlet Drive onto the proposed public road during the PM peak hour. Additional information can be found on the turn lane evaluation worksheets contained in APPENDIX D. Because a center two-way left turn lane exists along Outlet Drive at the development’s proposed access, left turn lane warrants were not analyzed.

SIGHT DISTANCE ASSESSMENT

Intersection sight distance was assessed via field measurements at the proposed intersection of Outlet Drive at the proposed public roadway. The measurements were taken looking right and left from the proposed public roadway approach. Based on Knox County sight distance requirements for 35 mph roadways, 350 feet of sight distance is required looking left and right from the proposed public roadway onto Outlet Drive. The field measurements indicated that sight distance looking right is approximately 500 feet, and sight distance looking left greatly exceeds 500 feet. Sight distance looking right is restricted by a crest vertical curve, and sight distance looking left is restricted by horizontal curve. However, both directions have adequate sight distance according to the field measurements.

CONCLUSIONS & RECOMMENDATIONS

The primary conclusion of this study is that the traffic generated from the proposed development will have some impacts at the study intersections. Congestion and queueing issues during peak hours do currently exist at the intersection of Campbell Station Road at Snyder Road, and the proposed development is expected to worsen the potential issues. The northbound approach is currently the worst leg of this intersection and will continue to experience increasing queues. Addition of a northbound right lane with an overlap phase will greatly impact the functionality and capacity of this intersection. Furthermore, delays and queue lengths at the intersection of Lovell Road at Outlet Drive are anticipated to worsen particularly during the PM peak hour. However, these impacts could likely be reduced to an acceptable level with optimized signal timing at this intersection.

Based on the above conclusions and other discussions throughout the report, the following is a list of recommendations developed with this traffic impact study:

- 1) Addition of an exclusive northbound right turn lane with storage of 100 feet and a taper length of 140 feet at the intersection of Campbell Station Road at Snyder Road; this will require removal of the concrete island and pole location to outside the intersection.
- 2) Replace a 3 section signal head for the northbound approach of Campbell Station Road at Snyder Road with a 5 section right turn signal head.
- 3) Addition of a westbound right turn lane with storage of 75 feet and a taper of 140 feet at the intersection of Outlet Drive at the site access.
- 4) Upon full buildout of the development, update the traffic signal timing at the intersections of Campbell Station Road at Snyder Road and Lovell Road at Outlet Drive.
- 5) Ensure that grading, landscaping, signing, and other site features do not restrict lines of sight exiting the development along Outlet Drive.

APPENDIX

A. TRAFFIC DATA

B. TRIP GENERATION INFORMATION

C. CAPACITY ANALYSES

D. TURN LANE WARRANT EVALUATIONS

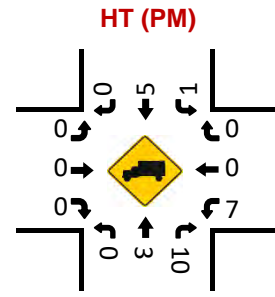
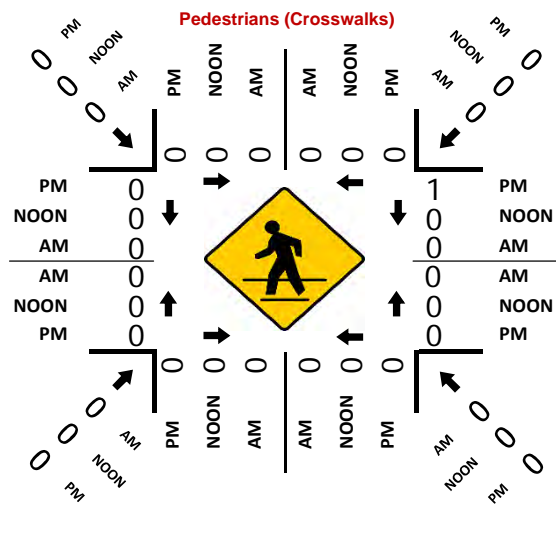
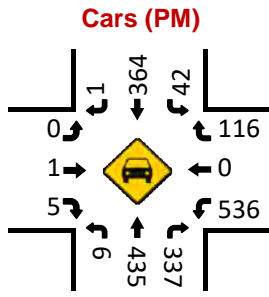
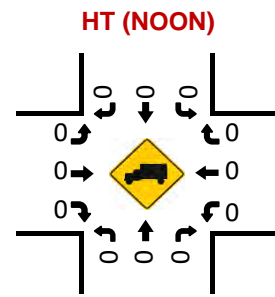
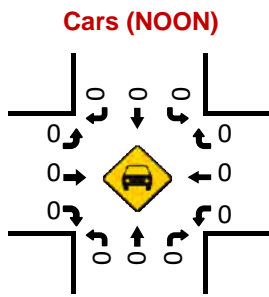
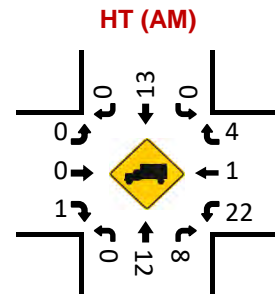
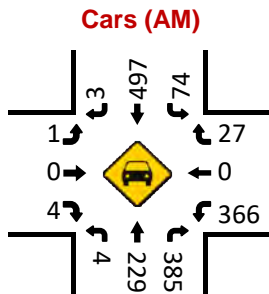
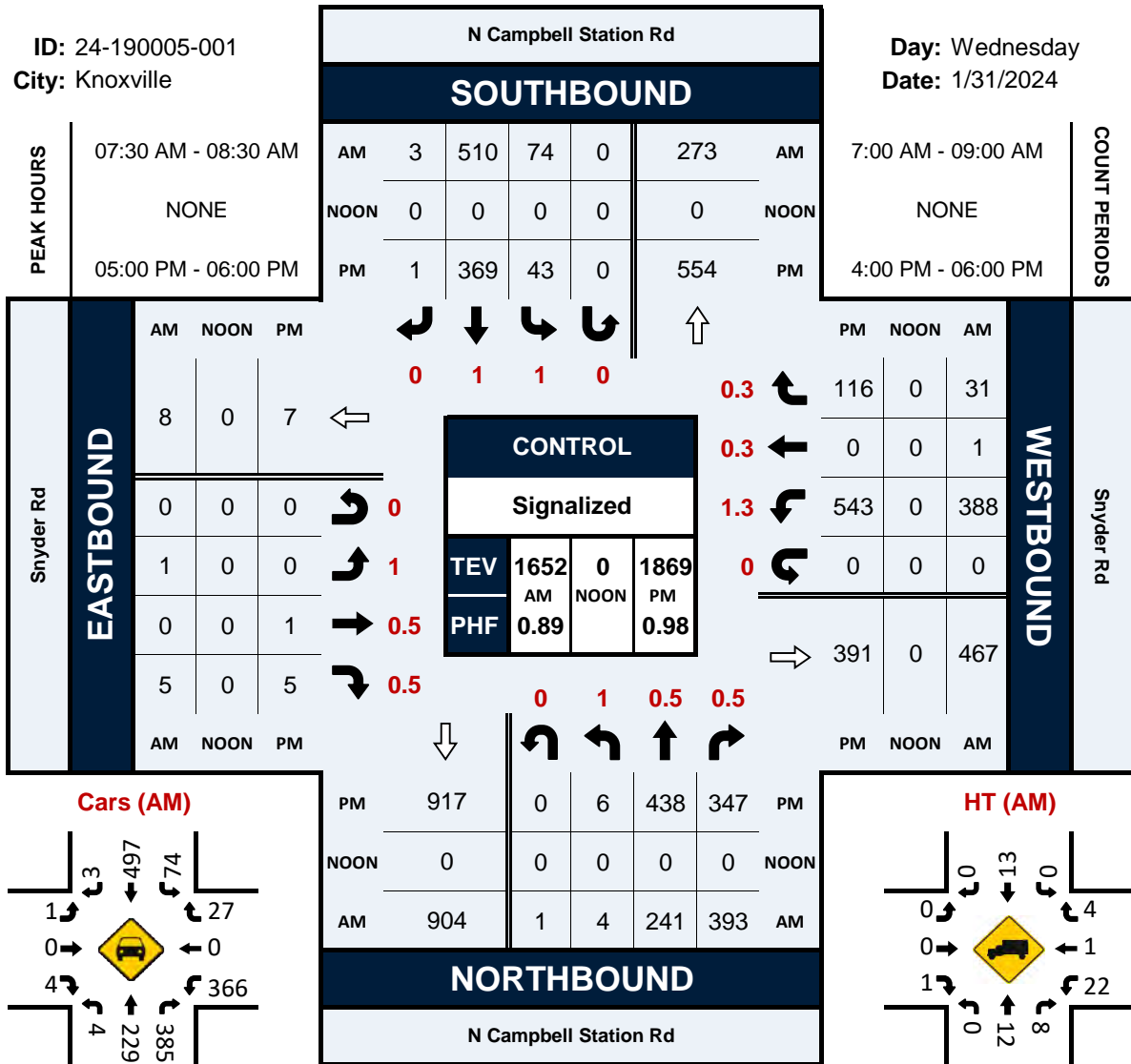
APPENDIX A – TRAFFIC DATA

N Campbell Station Rd & Snyder Rd

Peak Hour Turning Movement Count

ID: 24-190005-001
City: Knoxville

Day: Wednesday
Date: 1/31/2024



National Data & Surveying Services

Intersection Turning Movement Count

Location: N Campbell Station Rd & Snyder Rd
 City: Knoxville
 Control: Signalized

Project ID: 24-190005-001
 Date: 1/31/2024

Data - Total

NS/EW Streets:	N Campbell Station Rd						Snyder Rd						Snyder Rd								
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			EASTBOUND			WESTBOUND					
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL				
AM	1	0.5	0.5	0	1	1	0	0	1	0.5	0.5	0	1.3	0.3	0.3	0					
7:00 AM	0	46	43	0	8	92	0	0	0	0	0	0	84	0	9	0	282				
7:15 AM	0	35	50	0	20	140	0	0	0	0	0	0	107	0	7	0	359				
7:30 AM	1	56	102	0	15	155	0	0	0	0	0	0	82	0	6	0	417				
7:45 AM	1	59	120	0	29	117	1	0	0	0	1	0	126	1	7	0	462				
8:00 AM	1	70	83	1	13	137	2	0	0	0	0	0	95	0	10	0	412				
8:15 AM	1	56	88	0	17	101	0	0	1	0	4	0	85	0	8	0	361				
8:30 AM	1	47	68	1	14	113	0	0	0	0	0	0	66	0	4	0	314				
8:45 AM	1	38	65	0	8	91	0	0	0	1	1	0	80	1	5	0	291				
TOTAL VOLUMES :	6	407	619	2	124	946	3	0	1	1	6	0	725	2	56	0	2898				
APPROACH %'s :	0.58%			39.36%			59.86%			0.19%			12.50%			75.00%			0.00%		
PEAK HR :	07:30 AM - 08:30 AM			07:30 AM - 08:30 AM			07:30 AM - 08:30 AM			07:30 AM - 08:30 AM			07:30 AM - 08:30 AM			07:30 AM - 08:30 AM			07:30 AM - 08:30 AM		
PEAK HR VOL :	4	241	393	1	74	510	3	0	1	0	5	0	388	1	31	0	1652				
PEAK HR FACTOR :	1.000	0.861	0.819	0.250	0.638	0.823	0.375	0.000	0.250	0.000	0.313	0.000	0.770	0.250	0.775	0.000	0.894				
	0.888			0.863			0.300			0.784			0.000%			0.000%					

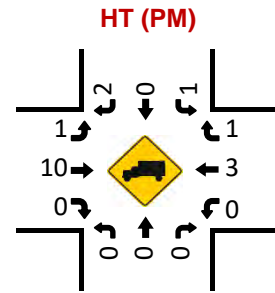
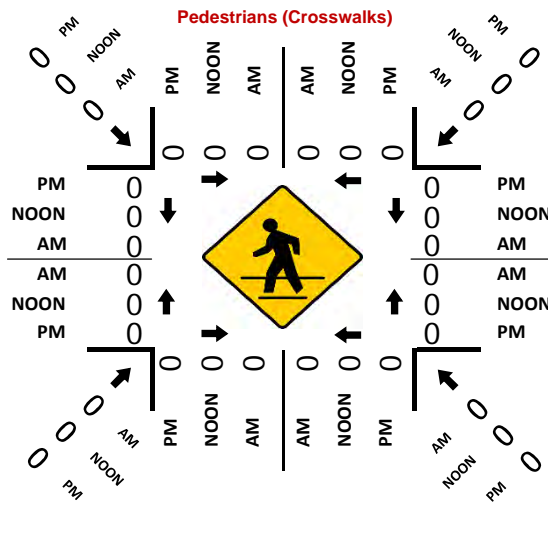
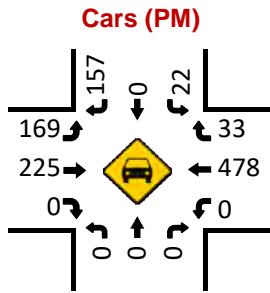
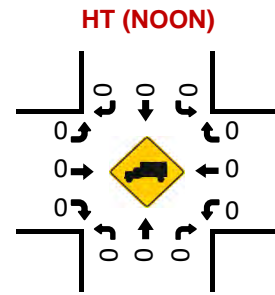
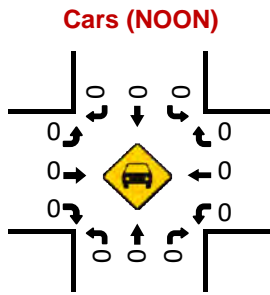
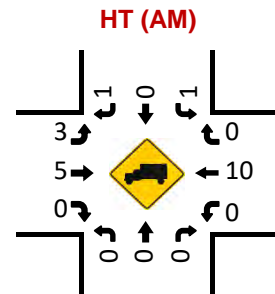
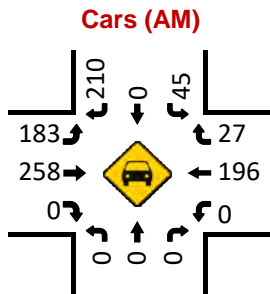
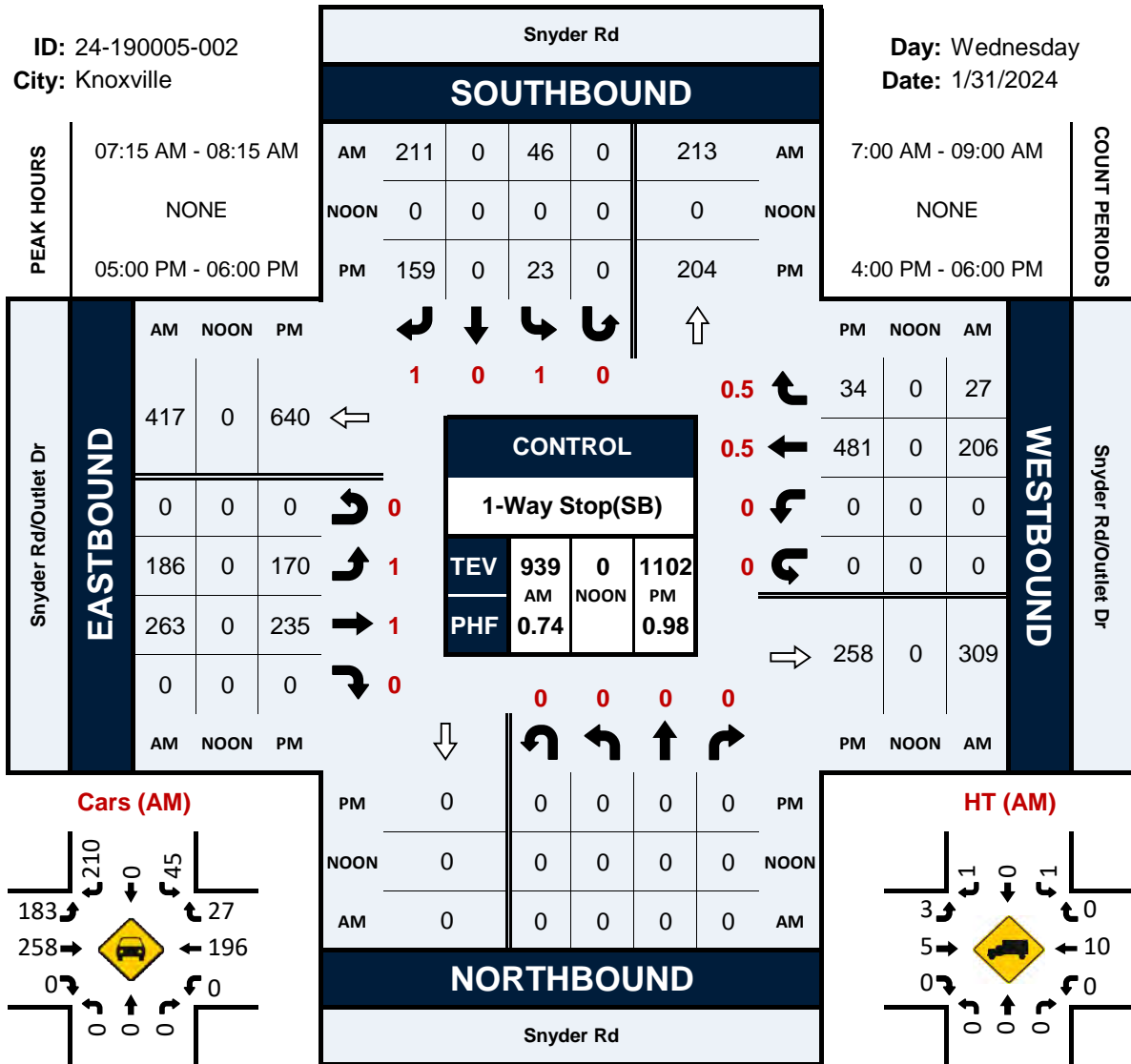
NS/EW Streets:	N Campbell Station Rd						Snyder Rd						Snyder Rd								
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			EASTBOUND			WESTBOUND					
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL				
PM	1	0.5	0.5	0	1	1	0	0	1	0.5	0.5	0	1.3	0.3	0.3	0					
4:00 PM	1	101	78	0	13	112	0	0	0	0	1	0	90	1	13	0	410				
4:15 PM	1	80	75	0	11	90	0	0	0	0	1	0	89	0	17	0	364				
4:30 PM	0	97	85	0	10	85	0	0	0	0	1	0	132	0	15	0	425				
4:45 PM	0	95	97	0	5	89	0	0	0	0	1	0	125	0	23	0	435				
5:00 PM	1	105	90	0	7	87	0	0	0	1	1	0	147	0	23	0	462				
5:15 PM	1	98	86	0	11	97	1	0	0	0	0	0	147	0	34	0	475				
5:30 PM	4	114	82	0	7	100	0	0	0	0	3	0	134	0	32	0	476				
5:45 PM	0	121	89	0	18	85	0	0	0	0	1	0	115	0	27	0	456				
TOTAL VOLUMES :	8	811	682	0	82	745	1	0	0	1	9	0	979	1	184	0	3503				
APPROACH %'s :	0.53%			54.03%			45.44%			0.00%			10.00%			90.00%			0.00%		
PEAK HR :	05:00 PM - 06:00 PM			05:00 PM - 06:00 PM			05:00 PM - 06:00 PM			05:00 PM - 06:00 PM			05:00 PM - 06:00 PM			05:00 PM - 06:00 PM			05:00 PM - 06:00 PM		
PEAK HR VOL :	6	438	347	0	43	369	1	0	0	1	5	0	543	0	116	0	1869				
PEAK HR FACTOR :	0.375	0.905	0.964	0.000	0.597	0.923	0.250	0.000	0.000	0.250	0.417	0.000	0.923	0.000	0.853	0.000	0.982				
	0.942			0.947			0.500			0.910			0.000%			0.000%					

Snyder Rd & Snyder Rd/Outlet Dr

Peak Hour Turning Movement Count

ID: 24-190005-002
City: Knoxville

Day: Wednesday
Date: 1/31/2024



National Data & Surveying Services

Intersection Turning Movement Count

Location: Snyder Rd & Snyder Rd/Outlet Dr
 City: Knoxville
 Control: 1-Way Stop(SB)

Project ID: 24-190005-002
 Date: 1/31/2024

Data - Total

NS/EW Streets:	Snyder Rd						Snyder Rd/Outlet Dr						Snyder Rd/Outlet Dr														
	NORTHBOUND			SOUTHBOUND			ER			EU			WESTBOUND			WU											
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL										
AM	0	0	0	0	1	0	1	0	1	1	0	0	0	0	0.5	0.5	0	157									
7:00 AM	0	0	0	0	7	0	28	0	9	36	0	0	0	0	71	6	0	185									
7:15 AM	0	0	0	0	4	0	45	0	24	44	0	0	0	63	5	44	244										
7:30 AM	0	0	0	0	11	0	56	0	53	70	0	0	0	40	14	0	318										
7:45 AM	0	0	0	0	27	0	64	0	80	82	0	0	0	57	8	0	192										
8:00 AM	0	0	0	0	4	0	46	0	29	67	0	0	0	46	0	0	177										
8:15 AM	0	0	0	0	2	0	28	0	18	77	0	0	0	51	1	0	159										
8:30 AM	0	0	0	0	4	0	23	0	14	70	0	0	0	46	2	0	159										
8:45 AM	0	0	0	0	3	0	31	0	19	55	0	0	0	49	2	0	192										
TOTAL VOLUMES :	0	0	0	0	62	0	321	0	246	501	0	0	0	423	38	0	1591										
APPROACH %'s :	16.19%			0.00%			83.81%			32.93%			67.07%			0.00%			91.76%			8.24%			0.00%		
PEAK HR :	07:15 AM - 08:15 AM																										
PEAK HR VOL :	0	0	0	0	46	0	211	0	186	263	0	0	0	206	27	0	939										
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.426	0.000	0.824	0.000	0.581	0.802	0.000	0.000	0.000	0.817	0.482	0.000	0.738										
																		0.857									

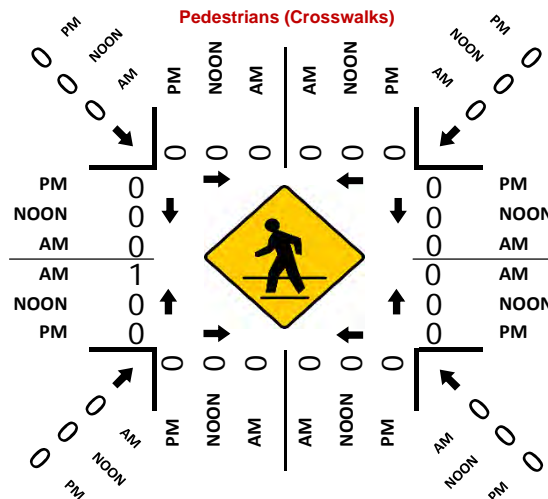
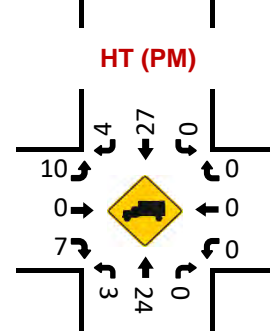
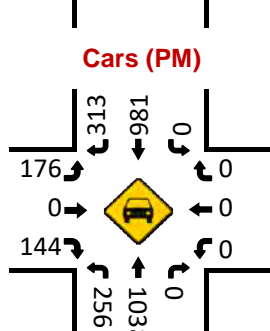
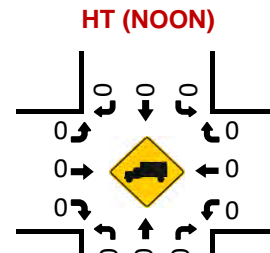
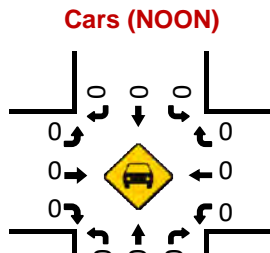
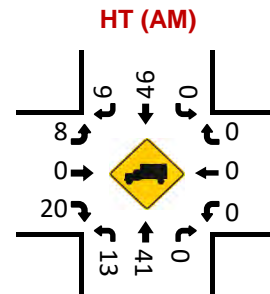
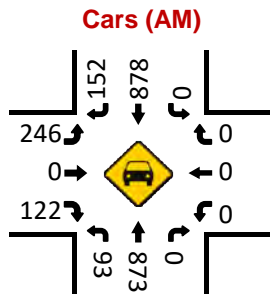
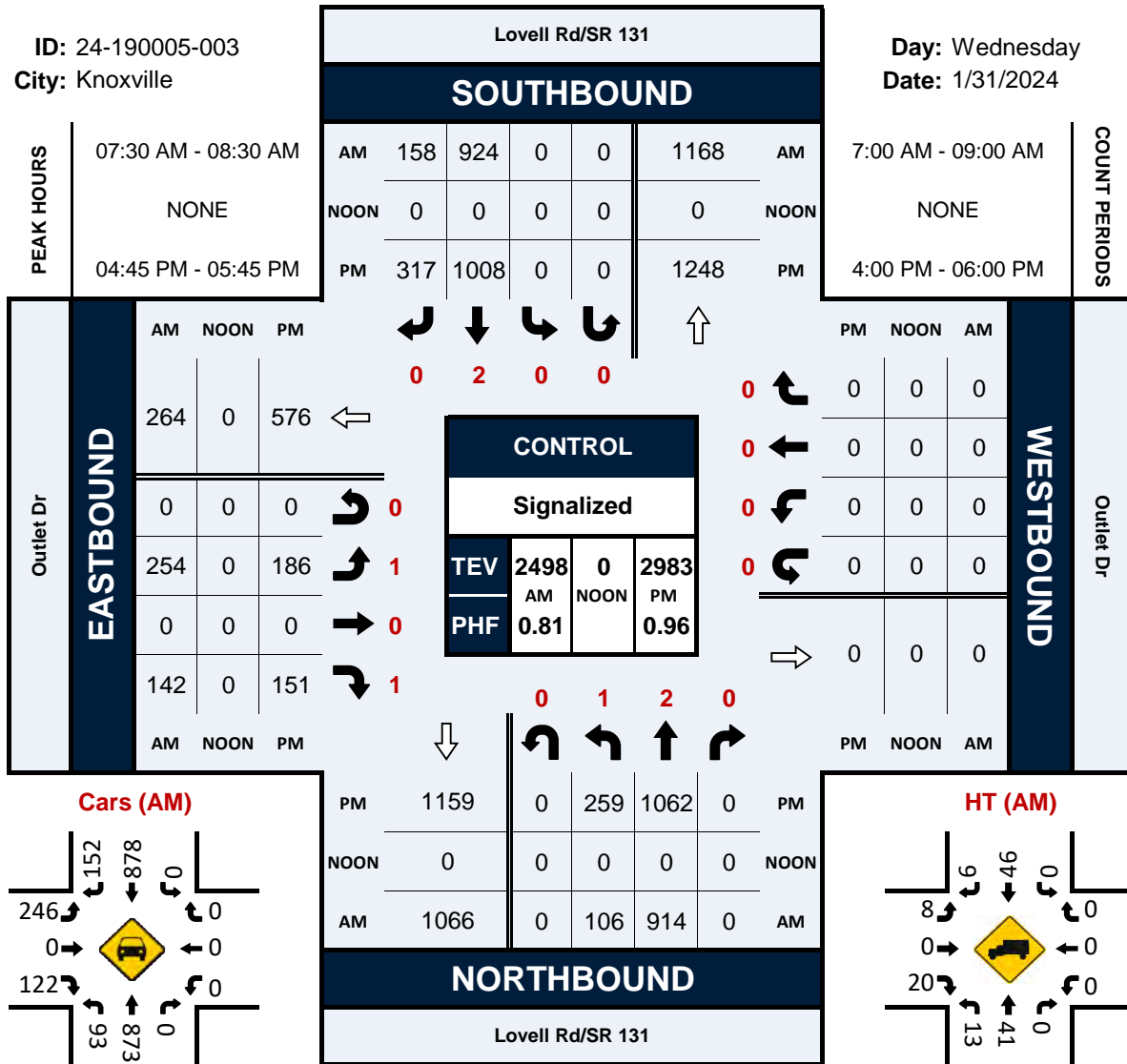
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	NORTHBOUND			SOUTHBOUND			ER			EU			WESTBOUND			WU											
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL										
PM	0	0	0	0	1	0	1	0	1	1	0	0	0	0.5	0.5	0	184										
4:00 PM	0	0	0	0	1	0	25	0	32	52	0	0	0	73	1	0	205										
4:15 PM	0	0	0	0	4	0	35	0	26	63	0	0	0	73	4	0	259										
4:30 PM	0	0	0	0	6	0	43	0	44	52	0	0	0	104	10	0	269										
4:45 PM	0	0	0	0	10	0	43	0	40	62	0	0	0	104	10	0	281										
5:00 PM	0	0	0	0	4	0	45	0	36	59	0	0	0	130	7	0	280										
5:15 PM	0	0	0	0	5	0	38	0	43	57	0	0	0	132	5	0	269										
5:30 PM	0	0	0	0	6	0	44	0	37	59	0	0	0	117	6	0	272										
5:45 PM	0	0	0	0	8	0	32	0	54	60	0	0	0	102	16	0	272										
TOTAL VOLUMES :	0	0	0	0	44	0	305	0	312	464	0	0	0	835	59	0	2019										
APPROACH %'s :	12.61%			0.00%			87.39%			40.21%			59.79%			0.00%			93.40%			6.60%			0.00%		
PEAK HR :	05:00 PM - 06:00 PM																										
PEAK HR VOL :	0	0	0	0	23	0	159	0	170	235	0	0	0	481	34	0	1102										
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.719	0.000	0.883	0.000	0.787	0.979	0.000	0.000	0.000	0.911	0.531	0.000	0.980										
																		0.940									

Lovell Rd/SR 131 & Outlet Dr

Peak Hour Turning Movement Count

ID: 24-190005-003
City: Knoxville

Day: Wednesday
Date: 1/31/2024



National Data & Surveying Services

Intersection Turning Movement Count

Location: Lovell Rd/SR 131 & Outlet Dr
 City: Knoxville
 Control: Signalized
 Project ID: 24-190005-003
 Date: 1/31/2024

Data - Total

NS/EW Streets:	Lovell Rd/SR 131						Outlet Dr						Outlet Dr					
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			EASTBOUND			WESTBOUND		
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL	
AM	1	2	0	0	0	2	0	0	1	0	1	0	0	0	0	0	0	
7:00 AM	54	136	0	0	0	125	21	0	26	0	17	0	0	0	0	0	379	
7:15 AM	44	181	0	0	0	183	22	0	38	0	22	0	0	0	0	0	490	
7:30 AM	33	256	0	0	0	213	35	0	54	0	34	0	0	0	0	0	625	
7:45 AM	38	277	0	0	0	276	52	0	76	0	50	0	0	0	0	0	769	
8:00 AM	17	197	0	0	0	271	34	0	56	0	27	0	0	0	0	0	602	
8:15 AM	18	184	0	0	0	164	37	0	68	0	31	0	0	0	0	0	502	
8:30 AM	21	179	0	0	0	199	35	0	63	0	39	0	0	0	0	0	536	
8:45 AM	31	143	0	0	0	193	32	0	50	0	38	0	0	0	0	0	487	
TOTAL VOLUMES :	256	1553	0	0	0	1624	268	0	431	0	258	0	0	0	0	0	4390	
APPROACH %'s :	14.15%	85.85%	0.00%	0.00%	0.00%	85.84%	14.16%	0.00%	62.55%	0.00%	37.45%	0.00%	0.00%	0.00%	0.00%	0.00%		
PEAK HR :	106	914	0	0	0	924	158	0	254	0	142	0	0	0	0	0	2498	
PEAK HR VOL :	0.697	0.825	0.000	0.000	0.000	0.837	0.760	0.000	0.836	0.000	0.710	0.000	0.000	0.000	0.000	0.000	0.812	
PEAK HR FACTOR :	0.810																	

NS/EW Streets:	Lovell Rd/SR 131						Outlet Dr						Outlet Dr					
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			EASTBOUND			WESTBOUND		
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL	
PM	1	2	0	0	0	2	0	0	1	0	1	0	0	0	0	0	0	
4:00 PM	34	229	0	1	0	224	65	0	44	0	55	0	0	0	0	0	652	
4:15 PM	60	250	0	0	0	258	56	0	50	0	34	0	0	0	0	0	708	
4:30 PM	50	234	0	0	0	273	77	0	46	0	42	0	0	0	0	0	722	
4:45 PM	63	243	0	0	0	243	75	0	40	0	32	0	0	0	0	0	696	
5:00 PM	66	265	0	0	0	256	75	0	57	0	56	0	0	0	0	0	775	
5:15 PM	63	271	0	0	0	262	78	0	47	0	33	0	0	0	0	0	754	
5:30 PM	67	283	0	0	0	247	89	0	42	0	30	0	0	0	0	0	758	
5:45 PM	72	240	0	0	0	229	75	0	28	0	36	0	0	0	0	0	680	
TOTAL VOLUMES :	475	2015	0	1	0	1992	590	0	354	0	318	0	0	0	0	0	5745	
APPROACH %'s :	19.07%	80.99%	0.00%	0.04%	0.00%	77.15%	22.85%	0.00%	52.68%	0.00%	47.32%	0.00%	0.00%	0.00%	0.00%	0.00%		
PEAK HR :	259	1062	0	0	0	1008	317	0	186	0	151	0	0	0	0	0	2983	
PEAK HR VOL :	0.966	0.938	0.000	0.000	0.000	0.962	0.890	0.000	0.816	0.000	0.674	0.000	0.000	0.000	0.000	0.000	0.962	
PEAK HR FACTOR :	0.944																	

APPENDIX B – TRIP GENERATION INFORMATION

KNOX COUNTY
LOCAL APARTMENT TRIP GENERATION STUDY

PURPOSE

A Traffic Impact Study (TIS) is currently required in Knox County when a proposed development is projected to generate in excess of 750 trips per day. The determinations of when the threshold is met as well as all subsequent analyses in the TIS are performed using the rates and equations given in the Institute of Transportation Engineers (ITE) Trip Generation Manual. Local governmental agencies rely heavily on the accuracy of these trip generation rates in order to correctly predict the impacts of a proposed development on the transportation system. Therefore, in certain instances, it is logical to verify whether the "national" rates and equations given in the ITE Trip Generation Manual are appropriate for use in a specific local area or region.

The decision was made to study the local trip-making characteristics of apartments because of the discrepancy between the trip generation rates for apartments and single family residential land uses as given in the ITE Trip Generation Manual. While these two land uses are similar in nature, the Trip Generation Manual predicts about three less trips per dwelling unit generated by apartments for the average weekday. Additionally the Trip Generation Manual points out that due to the age of their database, which dates back to the 1960's, "the rates for apartments probably had changed over time". It is also assumed that some of the ITE data had come from larger metropolitan areas with denser development and greater transit use than Knox County, which would contribute to lower trip generation rates. Therefore, this study will be used to either verify the rates given in the Trip Generation Manual or generate new ones that can be applied to locally proposed apartment developments.

PROCEDURE

The procedures recommended by ITE in conducting local trip generation studies were generally followed for this study, along with some important assumptions that have made. ITE has published a proposed recommended practice entitled "Trip Generation Handbook" which specifically outlines procedures for conducting local trip generation studies and establishing new rates and equations.

The first step in the study was to define the number and location of the sites to be studied, as well as the counting methodology. Initially 14 sites were selected, although one apartment complex – the College Park Apartments – was later omitted due to uncharacteristically high traffic generation numbers. The number of sites used in this study far exceeds the recommended minimum amount suggested by ITE, which is five sites. Traffic counts were taken for week-long periods at 15-minute intervals between July 22, 1996 and August 9, 1996 at the access points to the apartment complexes. A Technical Appendix to this report contains the traffic count data collected at each apartment complex.

RESULTS

The traffic count data was analyzed using spreadsheets in order to determine the weighted average rates and regression equations. In order to be considered valid, the local rates and equations for each time period of analysis that were generated must meet certain statistical criteria. First, the standard deviation of the independent variable (dwelling units) should be no more than 110 percent of the weighted average rate; and secondly, the regression equations require a computed coefficient of determination (R^2) value of at least 0.75 before good data fit is indicated. This statistical criteria is met by the local data results, and in fact it often exceeds the level of data fit given by their counterparts in the ITE Trip Generation Manual. Finally, in order to simplify the use of the local data, plots were generated that appear identical to the actual ones in the ITE Trip Generation Manual.

The resulting rates and equations calculated from the local data indicate that the average weekday trip generation of apartments in this area is well above the national rates reported in the ITE manual. For example, the locally computed average rate for number of trips generated during a weekday is 35% higher than the rate given by ITE (increase from 6.63 trips per dwelling unit to 9.03 trips per dwelling unit). The trip generation rates do not increase as much for the AM and PM peak hours however. The local rate is roughly 8% higher for the AM peak, and 16% higher for the PM peak. The plots from the ITE Trip Generation Manual are included in the Technical Appendix for comparison purposes.

ASSUMPTIONS MADE

Some important assumptions have been made which may affect the results of the local data that was collected:

- It is important to note that the local trip generation rates were computed for the *total* number of dwelling units in the apartment complex, and not necessarily for the number of *occupied* dwelling units. There are several reasons why this was done, chiefly because of the need for comparability with the rates given in ITE Trip Generation Manual, as it does not specify whether the dwelling units are occupied. According to ITE procedures the selected sites must only be of “reasonably full occupancy (i.e. at least 85%)”. The Apartment Association of Greater Knoxville (AAGK) publishes quarterly reports on occupancy levels of apartment complexes, and the report covering the period of the data collection was reviewed to determine occupancy levels. According to the AAGK report from July 1, 1996 – September 30, 1996 all of the apartment complexes surveyed in this study met the minimum 85% occupancy level, with an average occupancy rate for all sites studied of 94%.
- The count data that was collected at each apartment complex was used “raw” meaning that it was not factored for possible daily or seasonal variations. Once again, according to an ITE representative it is not known whether the data used in the Trip Generation Manual was factored or not, so therefore in order to be able to compare

local rates to those in the manual you must assume that count data should not be factored. Additionally, it was felt that apartment complexes would generally not be as susceptible to major seasonal fluctuations as other land uses might be. The local rates were also developed using count data that was collected and averaged over an entire week, which should limit some of the daily variations. Finally, reliable local daily and seasonal variation factors do not truly exist.

CONCLUSION

The local apartment study methodology and results were distributed for comment to a group of local transportation professionals who are directly responsible for either preparing or reviewing traffic impact studies. A meeting was held between this group on February 16, 2000 in order to gather comments and discuss the study in greater detail. The following conclusions are based on the discussion and consensus reached at this meeting:

1. The trip generation rates and equations meet statistical requirements and resulted from a study that followed accepted procedures; therefore they should be adopted for future use. Furthermore, the rates and equations are recommended for use in reviewing the traffic impact of any development termed as "multi-family", such as townhouse and condominium developments due to their similarity to apartment complexes.
2. The Traffic Access and Impact Study Guidelines and Procedures adopted by MPC should be amended with the language that local data should be used when available, which will allow the implementation of these new multi-family trip generation rates.
3. The following suggestions were made for future consideration:
 - This study should be updated with data collected from local townhouse and condominium developments in order to further justify the use of the new trip generation rates.
 - A statistical comparison should be made between any newly developed rates and the ITE single family trip generation rates to determine if there is a significant difference. If there is no difference then perhaps ITE single-family rates could be used for any residential development proposed in Knox County.

Local Apartment Trip Generation Study

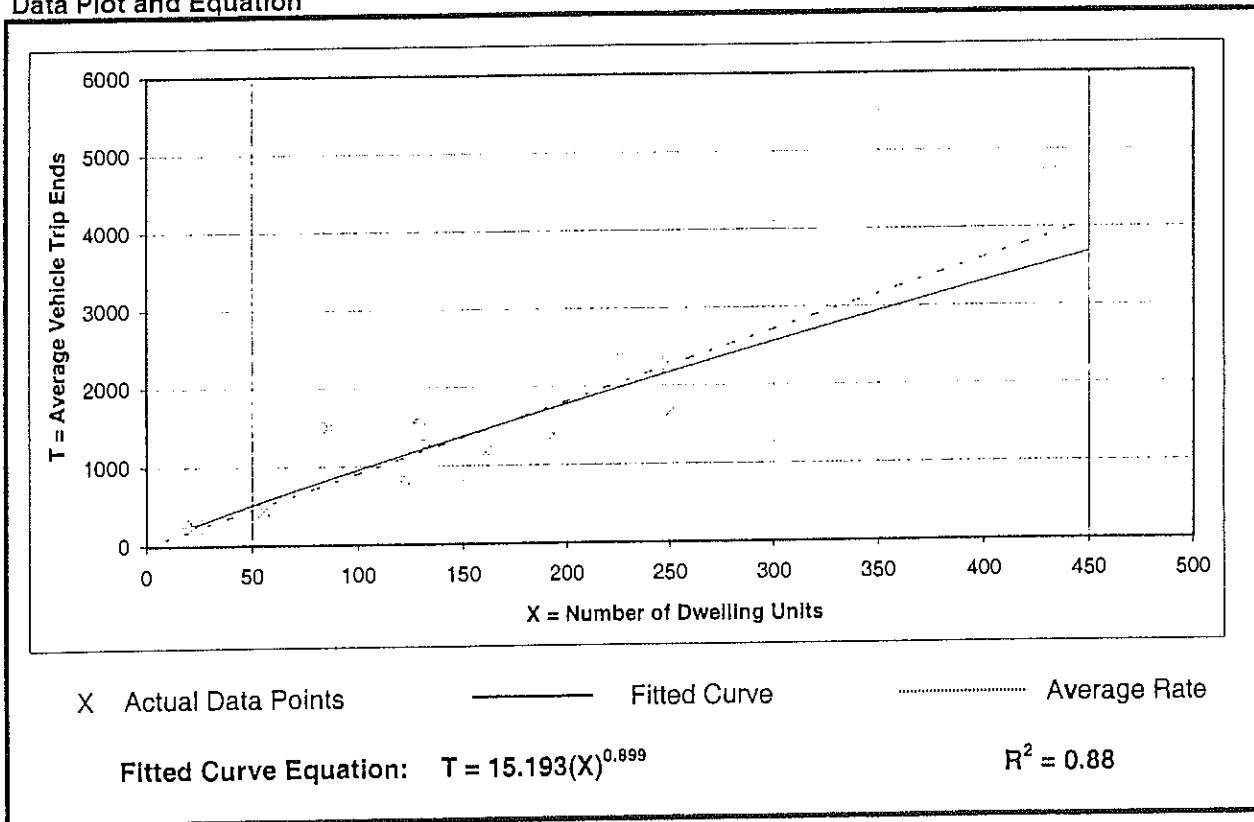
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Number of Studies: 13
Average Number of Dwelling Units: 193
Directional Distribution: 50% entering, 50% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
9.03	6.59 - 17.41	2.47

Data Plot and Equation



3,600 Trips
1,800 Enter
1,800 Exit

Local Apartment Trip Generation Study

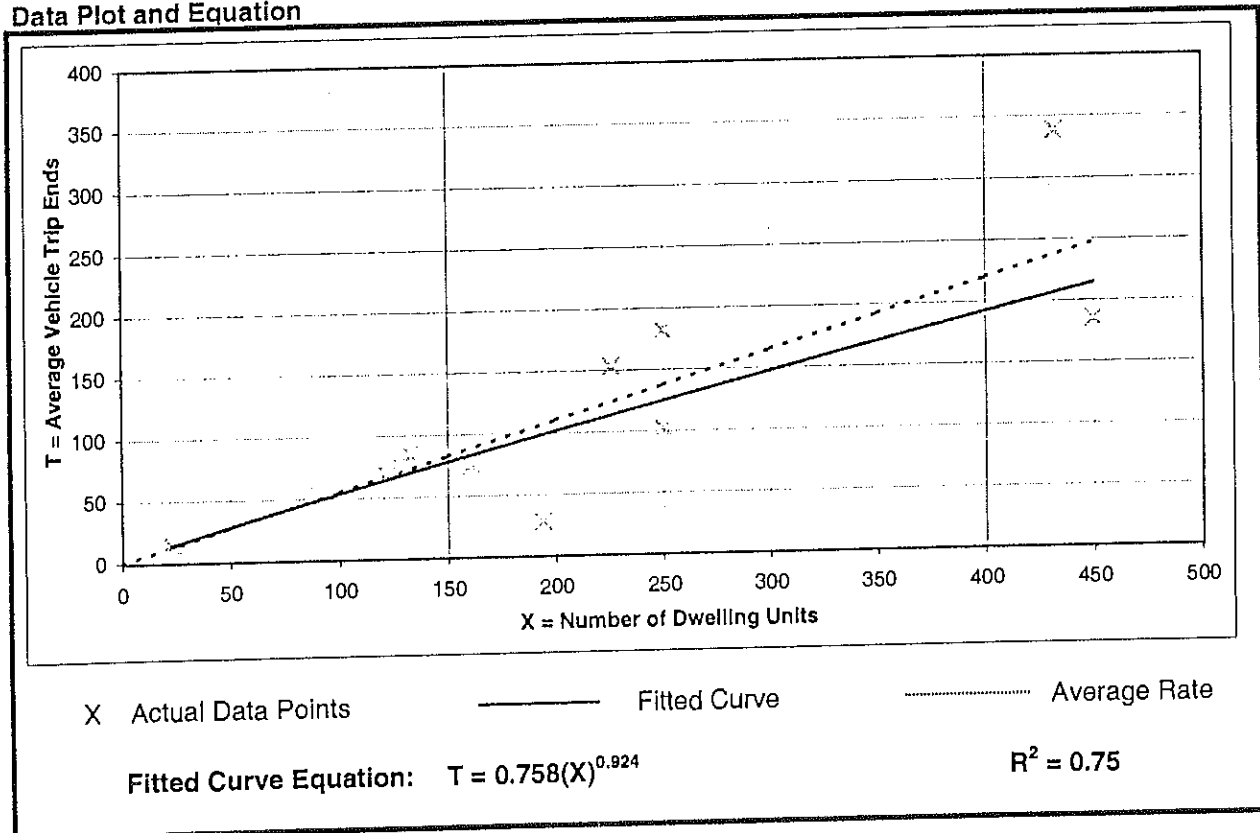
Average Vehicle Trip Ends vs: Dwelling Units
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 7 and 9 a.m.

Number of Studies: 13
 Average Number of Dwelling Units: 193
 Directional Distribution: 22% entering, 78% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.55	0.14 - 0.78	0.18

Data Plot and Equation



209 Trips
 46 Enter
 163 Exit

Local Apartment Trip Generation Study

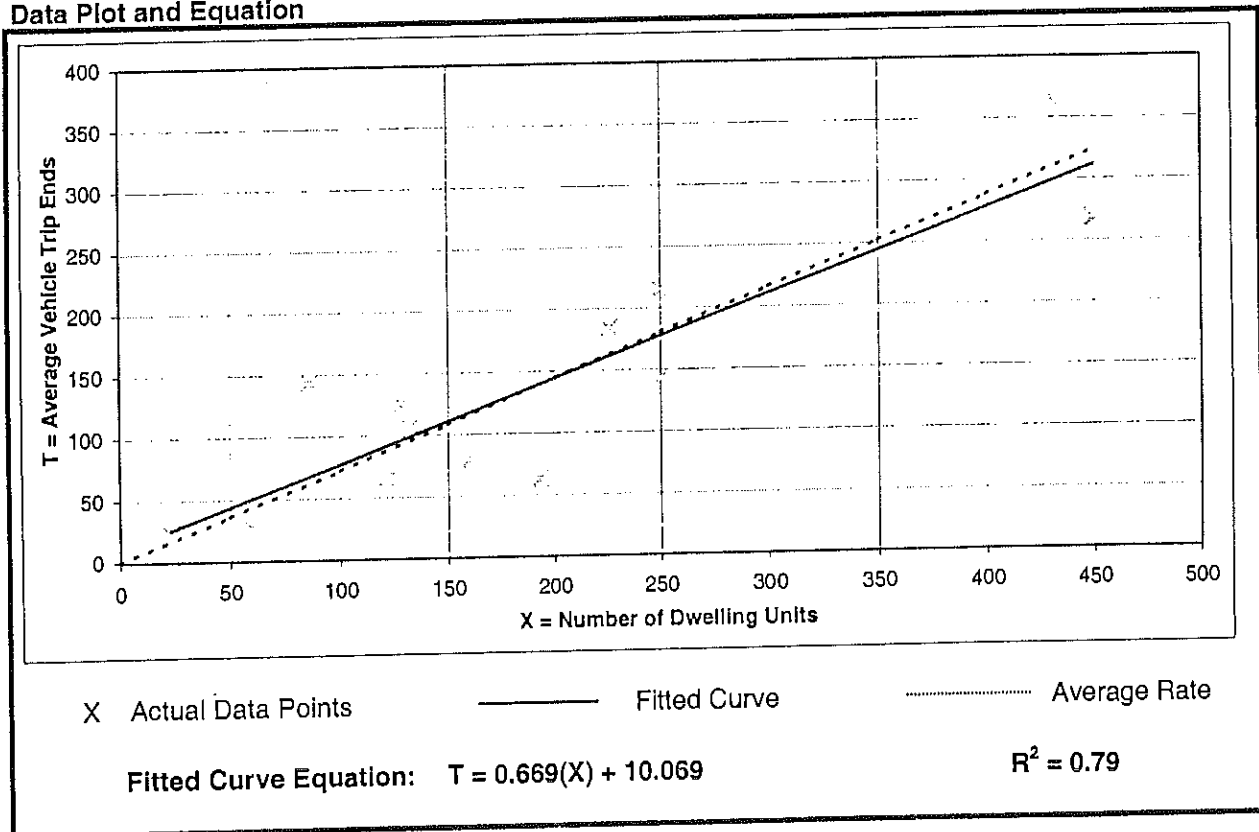
Average Vehicle Trip Ends vs: Dwelling Units
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 4 and 6 p.m.

Number of Studies: 13
 Average Number of Dwelling Units: 193
 Directional Distribution: 55% entering, 45% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.72	0.32 - 1.66	0.25

Data Plot and Equation



303 Trips
 167 Enter
 136 Exit

APPENDIX C – CAPACITY ANALYSES

CAPACITY AND LEVEL-OF-SERVICE CONCEPTS

In a general sense, a roadway is similar to a pipeline or other material carrying conduit in that it has a certain capacity for the amount of material (vehicles) that it can efficiently carry. As the number of vehicles in a given time period gradually increases, the quality of traffic flow gradually decreases. On roadway sections this results in increasing turbulence in the traffic stream, and at intersections it results in increasing stops and delay. As the volumes begin to approach the capacity of the facility, these problems rapidly magnify, with resulting serious levels of congestion, stops, delay, excess fuel consumption, pollutant emissions, etc.

The Transportation Research Board has published the Year 2010 Highway Capacity Manual (HCM2010), which establishes theoretical techniques to quantify the capacity conditions on all types of roadways, intersections, ramps, pedestrian facilities, etc. A basic concept that is applicable to most of these techniques is the idea of level of service (LOS). This concept establishes a rating system that quantifies the quality of traffic flow, as perceived by motorists and/or passengers. The general system is similar to a school grade scale, and is outlined as follows:

Level of Service (LOS)	General Quality of Traffic Flow	Description of Corresponding Conditions
A	Excellent	Roadways – Free flow, high maneuverability Intersections – Very few stops, very low delay
B	Very Good	Roadways – Free flow, slightly lower maneuverability Intersections – Minor stops, low delay
C	Good	Roadways – Stable flow, restricted maneuverability Intersections – Significant stops, significant delay
D	Fair	Roadways – Marginally stable flow, congestion seriously restricts maneuverability Intersections – High stops, long but tolerable delay
E	Poor	Roadways – Unstable flow*, lower operating speeds, congestion severely restricts maneuverability Intersections – All vehicles stop, very long queues and very long intolerable delay
F	Very Poor	Roadways – Forced flow, stoppages may be lengthy, congestion severely restricts maneuverability Intersections – All vehicles stop, extensive queues and extremely long intolerable delay

*Unstable flow is such that minor fluctuations or disruptions can result in rapid degradation to LOS F.

LOS CRITERIA: SIGNALIZED & UNSIGNALIZED INTERSECTIONS





















LOS	CONTROL DELAY (S/VEH)		
	SIGNALIZED	UNSIGNALIZED	ROUNDBABOUT
A	≤10	≤10	≤10
B	>10-20	>10-15	>10-15
C	>20-35	>15-25	>15-25
D	>35-55	>25-35	>25-35
E	>55-80	>35-50	>35-50
F	>80	>50	>50

Another measure of intersection capacity that is often used in the evaluation of intersection operations is the volume to capacity (V/C) ratio. This ratio is defined as “the ratio of flow rate to capacity”, and is a good measure of how much of an intersection’s available capacity has been used up by the analysis volumes. Conversely, it also provides an indication of the reserve capacity available for future growth in traffic volumes.

The Intersection Capacity Utilization (ICU) is another measure that expresses a value similar to the V/C ratio. Specifically, the ICU method “sums the amount of the time required to serve all movements at saturation for a given cycle length and divides by that reference cycle length.” The ICU is considered a more accurate measure of volume to capacity conditions for a signalized intersection, primarily because it accounts for the effects of the signal timing on intersection capacity.

Lanes, Volumes, Timings
1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
2024 Existing

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	5	388	1	31	5	241	393	74	510	3
Future Volume (vph)	1	0	5	388	1	31	5	241	393	74	510	3
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.977			0.907			0.999	
Flt Protected	0.950			0.950	0.959		0.950			0.950		
Satd. Flow (prot)	1770	1583	0	1681	1658	0	1770	1690	0	1770	1861	0
Flt Permitted	0.950			0.950	0.959		0.448			0.101		
Satd. Flow (perm)	1770	1583	0	1681	1658	0	835	1690	0	188	1861	0
Satd. Flow (RTOR)		245			10			101				
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Shared Lane Traffic (%)				45%								
Lane Group Flow (vph)	1	6	0	240	232	0	6	713	0	83	576	0
Turn Type	Split	NA		Split	NA		Perm	NA		pm+pt	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2			6		
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		8.0	8.0		12.0	12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0		14.0	14.0		20.0	20.0		13.0	20.0	
Total Split (s)	14.0	14.0		20.0	20.0		30.0	30.0		16.0	46.0	
Total Split (%)	17.5%	17.5%		25.0%	25.0%		37.5%	37.5%		20.0%	57.5%	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0		4.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		8.0	8.0		7.0	8.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	None		None	None		C-Max	C-Max		None	Max	
Act Effect Green (s)	6.0	6.0		13.5	13.5		38.9	38.9		51.1	50.1	
Actuated g/C Ratio	0.08	0.08		0.17	0.17		0.49	0.49		0.64	0.63	
v/c Ratio	0.01	0.02		0.85	0.81		0.01	0.82		0.33	0.49	
Control Delay	34.0	0.0		59.4	53.0		16.2	27.9		10.4	11.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	34.0	0.0		59.4	53.0		16.2	27.9		10.4	11.1	
LOS	C	A		E	D		B	C		B	B	
Approach Delay		4.9			56.3			27.8			11.0	
Approach LOS		A			E			C			B	
Queue Length 50th (ft)	1	0		123	112		2	253		13	127	
Queue Length 95th (ft)	5	0		#243	#226		10	#611		41	295	
Internal Link Dist (ft)		425			2019			960			739	
Turn Bay Length (ft)	75			160			60			115		
Base Capacity (vph)	177	378		294	298		405	873		298	1164	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.01	0.02		0.82	0.78		0.01	0.82		0.28	0.49	



Intersection Summary

Lanes, Volumes, Timings
 1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
 2024 Existing

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 24 (30%), Referenced to phase 2:NBTL, Start of Yellow
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.85
 Intersection Signal Delay: 29.0 Intersection LOS: C
 Intersection Capacity Utilization 77.7% ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Campbell Station Rd & Snyder Rd

 Ø1	 Ø2 (R)	 Ø3	 Ø4
16 s	30 s	20 s	14 s
 Ø5			
46 s			

Lanes, Volumes, Timings
1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
2024 Existing

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1	5	543	0	116	6	438	347	43	369	1
Future Volume (vph)	0	1	5	543	0	116	6	438	347	43	369	1
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.875			0.946			0.934				
Flt Protected				0.950	0.969		0.950			0.950		
Satd. Flow (prot)	1863	1630	0	1681	1622	0	1770	1740	0	1770	1863	0
Flt Permitted				0.950	0.969		0.537			0.088		
Satd. Flow (perm)	1863	1630	0	1681	1622	0	1000	1740	0	164	1863	0
Satd. Flow (RTOR)		5			218			45				
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Shared Lane Traffic (%)				38%								
Lane Group Flow (vph)	0	6	0	343	329	0	6	801	0	44	378	0
Turn Type	Split	NA		Split	NA		Perm	NA		pm+pt	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2			6		
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		8.0	8.0		12.0	12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0		14.0	14.0		20.0	20.0		13.0	20.0	
Total Split (s)	14.0	14.0		25.0	25.0		35.0	35.0		16.0	51.0	
Total Split (%)	15.6%	15.6%		27.8%	27.8%		38.9%	38.9%		17.8%	56.7%	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0		4.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		8.0	8.0		7.0	8.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	None		None	None		C-Max	C-Max		None	Max	
Act Effect Green (s)		6.1		19.0	19.0		46.3	46.3		55.5	54.5	
Actuated g/C Ratio		0.07		0.21	0.21		0.51	0.51		0.62	0.61	
v/c Ratio		0.05		0.97	0.64		0.01	0.87		0.21	0.34	
Control Delay		27.2		78.0	17.6		16.8	33.8		10.5	10.8	
Queue Delay		0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		27.2		78.0	17.6		16.8	33.8		10.5	10.8	
LOS		C		E	B		B	C		B	B	
Approach Delay		27.2			48.4			33.7			10.7	
Approach LOS		C			D			C			B	
Queue Length 50th (ft)		1		205	56		2	386		8	89	
Queue Length 95th (ft)		13		#383	151		11	#808		29	200	
Internal Link Dist (ft)		425			2019			960			739	
Turn Bay Length (ft)				160			60			115		
Base Capacity (vph)		149		354	514		514	917		261	1127	
Starvation Cap Reductn		0		0	0		0	0		0	0	
Spillback Cap Reductn		0		0	0		0	0		0	0	
Storage Cap Reductn		0		0	0		0	0		0	0	
Reduced v/c Ratio		0.04		0.97	0.64		0.01	0.87		0.17	0.34	

Intersection Summary

Intersection						
Int Delay, s/veh	5.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↑	↗		↖	↗
Traffic Vol, veh/h	186	263	206	27	46	211
Future Vol, veh/h	186	263	206	27	46	211
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Yield
Storage Length	200	-	-	-	0	110
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	74	74	74	74	74	74
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	251	355	278	36	62	285

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	278	0	-	0	1153 296
Stage 1	-	-	-	-	296 -
Stage 2	-	-	-	-	857 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1285	-	-	-	218 743
Stage 1	-	-	-	-	755 -
Stage 2	-	-	-	-	416 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1285	-	-	-	175 743
Mov Cap-2 Maneuver	-	-	-	-	301 -
Stage 1	-	-	-	-	608 -
Stage 2	-	-	-	-	416 -

Approach	EB	WB	SB
HCM Control Delay, s	3.5	0	14.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1285	-	-	-	301	743
HCM Lane V/C Ratio	0.196	-	-	-	0.207	0.384
HCM Control Delay (s)	8.5	-	-	-	20	12.8
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.7	-	-	-	0.8	1.8

Intersection						
Int Delay, s/veh	3.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	170	235	481	34	23	159
Future Vol, veh/h	170	235	481	34	23	159
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Yield
Storage Length	200	-	-	-	0	110
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	173	240	491	35	23	162

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	491	0	-	0	1095 509
Stage 1	-	-	-	-	509 -
Stage 2	-	-	-	-	586 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1072	-	-	-	236 564
Stage 1	-	-	-	-	604 -
Stage 2	-	-	-	-	556 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1072	-	-	-	198 564
Mov Cap-2 Maneuver	-	-	-	-	332 -
Stage 1	-	-	-	-	507 -
Stage 2	-	-	-	-	556 -

Approach	EB	WB	SB
HCM Control Delay, s	3.8	0	14.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1072	-	-	-	332	564
HCM Lane V/C Ratio	0.162	-	-	-	0.071	0.288
HCM Control Delay (s)	9	-	-	-	16.7	13.9
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.6	-	-	-	0.2	1.2

Lanes, Volumes, Timings
3: Lovell Rd & Outlet Dr

Snyder Road Apartments
2024 Existing



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	254	142	106	914	924	158
Future Volume (vph)	254	142	106	914	924	158
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Frt		0.850			0.978	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	3539	3461	0
Flt Permitted	0.950		0.101			
Satd. Flow (perm)	1770	1583	188	3539	3461	0
Satd. Flow (RTOR)		46			27	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Shared Lane Traffic (%)						
Lane Group Flow (vph)	314	175	131	1128	1336	0
Turn Type	Perm	pm+ov	pm+pt	NA	NA	
Protected Phases		1	1	6	2	
Permitted Phases	4	4	6			
Detector Phase	4	1	1	6	2	
Switch Phase						
Minimum Initial (s)	8.0	6.0	6.0	20.0	20.0	
Minimum Split (s)	13.0	13.0	13.0	27.0	27.0	
Total Split (s)	30.0	15.0	15.0	70.0	55.0	
Total Split (%)	30.0%	15.0%	15.0%	70.0%	55.0%	
Yellow Time (s)	3.0	4.5	4.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	6.5	6.5	6.5	6.5	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Recall Mode	None	None	None	C-Max	C-Max	
Act Effct Green (s)	21.6	34.1	66.9	66.9	52.9	
Actuated g/C Ratio	0.22	0.34	0.67	0.67	0.53	
v/c Ratio	0.82	0.31	0.54	0.48	0.72	
Control Delay	54.8	18.1	16.8	9.3	21.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	54.8	18.1	16.8	9.3	21.4	
LOS	D	B	B	A	C	
Approach Delay	41.7			10.1	21.4	
Approach LOS	D			B	C	
Queue Length 50th (ft)	189	57	28	171	331	
Queue Length 95th (ft)	245	90	52	197	371	
Internal Link Dist (ft)	5611			1019	1944	
Turn Bay Length (ft)	125		95			
Base Capacity (vph)	442	586	259	2366	1843	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.71	0.30	0.51	0.48	0.72	

Intersection Summary

Lanes, Volumes, Timings
3: Lovell Rd & Outlet Dr

Snyder Road Apartments
2024 Existing























Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	186	151	259	1062	1008	317
Future Volume (vph)	186	151	259	1062	1008	317
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Frt		0.850			0.964	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	3539	3412	0
Flt Permitted	0.950		0.123			
Satd. Flow (perm)	1770	1583	229	3539	3412	0
Satd. Flow (RTOR)		113			65	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Shared Lane Traffic (%)						
Lane Group Flow (vph)	194	157	270	1106	1380	0
Turn Type	Perm	pm+ov	pm+pt	NA	NA	
Protected Phases		1	1	6	2	
Permitted Phases	4	4	6			
Detector Phase	4	1	1	6	2	
Switch Phase						
Minimum Initial (s)	8.0	6.0	6.0	20.0	20.0	
Minimum Split (s)	13.0	13.0	13.0	27.0	27.0	
Total Split (s)	22.0	18.0	18.0	98.0	80.0	
Total Split (%)	18.3%	15.0%	15.0%	81.7%	66.7%	
Yellow Time (s)	3.0	4.5	4.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	6.5	6.5	6.5	6.5	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Recall Mode	None	None	None	C-Max	C-Max	
Act Effect Green (s)	16.0	31.8	92.5	92.5	75.2	
Actuated g/C Ratio	0.13	0.26	0.77	0.77	0.63	
v/c Ratio	0.83	0.31	0.86	0.41	0.64	
Control Delay	77.8	12.9	39.5	5.2	15.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	77.8	12.9	39.5	5.2	15.2	
LOS	E	B	D	A	B	
Approach Delay	48.8			11.9	15.2	
Approach LOS	D			B	B	
Queue Length 50th (ft)	147	25	77	132	324	
Queue Length 95th (ft)	#261	80	#120	162	397	
Internal Link Dist (ft)	5611			1019	1944	
Turn Bay Length (ft)	125		95			
Base Capacity (vph)	250	511	324	2728	2162	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.78	0.31	0.83	0.41	0.64	

Intersection Summary

Lanes, Volumes, Timings
1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
2027 Background

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	6	436	1	35	6	271	442	83	574	3
Future Volume (vph)	1	0	6	436	1	35	6	271	442	83	574	3
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.978			0.907			0.999	
Flt Protected	0.950			0.950	0.959		0.950			0.950		
Satd. Flow (prot)	1770	1583	0	1681	1660	0	1770	1690	0	1770	1861	0
Flt Permitted	0.950			0.950	0.959		0.419			0.102		
Satd. Flow (perm)	1770	1583	0	1681	1660	0	780	1690	0	190	1861	0
Satd. Flow (RTOR)		245			10			101				
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Shared Lane Traffic (%)				45%								
Lane Group Flow (vph)	1	7	0	269	261	0	7	801	0	93	648	0
Turn Type	Split	NA		Split	NA		Perm	NA		pm+pt	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2			6		
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		8.0	8.0		12.0	12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0		14.0	14.0		20.0	20.0		13.0	20.0	
Total Split (s)	14.0	14.0		20.0	20.0		30.0	30.0		16.0	46.0	
Total Split (%)	17.5%	17.5%		25.0%	25.0%		37.5%	37.5%		20.0%	57.5%	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0		4.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		8.0	8.0		7.0	8.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	None		None	None		C-Max	C-Max		None	Max	
Act Effect Green (s)	6.0	6.0		14.0	14.0		38.3	38.3		50.6	49.6	
Actuated g/C Ratio	0.08	0.08		0.18	0.18		0.48	0.48		0.63	0.62	
v/c Ratio	0.01	0.02		0.91	0.88		0.02	0.93		0.36	0.56	
Control Delay	34.0	0.2		69.8	61.7		16.5	39.6		10.9	12.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	34.0	0.2		69.8	61.7		16.5	39.6		10.9	12.4	
LOS	C	A		E	E		B	D		B	B	
Approach Delay		4.4			65.8			39.4			12.2	
Approach LOS		A			E			D			B	
Queue Length 50th (ft)	1	0		141	130		2	319		14	152	
Queue Length 95th (ft)	5	0		#282	#266		12	#717		45	352	
Internal Link Dist (ft)		425			2019			960			739	
Turn Bay Length (ft)	75			160			60			115		
Base Capacity (vph)	177	378		294	298		373	860		299	1153	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.01	0.02		0.91	0.88		0.02	0.93		0.31	0.56	

Intersection Summary

Lanes, Volumes, Timings
 1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
 2027 Background





















Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 24 (30%), Referenced to phase 2:NBTL, Start of Yellow
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.93
 Intersection Signal Delay: 36.3 Intersection LOS: D
 Intersection Capacity Utilization 83.7% ICU Level of Service E
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Campbell Station Rd & Snyder Rd

↙ Ø1 16 s	↖ Ø2 (R) 30 s	↘ Ø3 20 s	↗ Ø4 14 s
↓ Ø5 46 s			

Lanes, Volumes, Timings
1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
2027 Background


												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1	6	611	0	130	7	493	390	48	415	1
Future Volume (vph)	0	1	6	611	0	130	7	493	390	48	415	1
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.871			0.946			0.934				
Flt Protected				0.950	0.969		0.950			0.950		
Satd. Flow (prot)	1863	1622	0	1681	1622	0	1770	1740	0	1770	1863	0
Flt Permitted				0.950	0.969		0.515			0.088		
Satd. Flow (perm)	1863	1622	0	1681	1622	0	959	1740	0	164	1863	0
Satd. Flow (RTOR)		6			218			45				
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Shared Lane Traffic (%)				38%								
Lane Group Flow (vph)	0	7	0	386	370	0	7	901	0	49	424	0
Turn Type	Split	NA		Split	NA		Perm	NA		pm+pt	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2			6		
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		8.0	8.0		12.0	12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0		14.0	14.0		20.0	20.0		13.0	20.0	
Total Split (s)	14.0	14.0		25.0	25.0		35.0	35.0		16.0	51.0	
Total Split (%)	15.6%	15.6%		27.8%	27.8%		38.9%	38.9%		17.8%	56.7%	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0		4.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		8.0	8.0		7.0	8.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	None		None	None		C-Max	C-Max		None	Max	
Act Effect Green (s)		6.1		19.0	19.0		46.3	46.3		55.5	54.5	
Actuated g/C Ratio		0.07		0.21	0.21		0.51	0.51		0.62	0.61	
v/c Ratio		0.06		1.09	0.72		0.01	0.98		0.23	0.38	
Control Delay		26.4		110.1	22.4		16.9	50.7		10.8	11.2	
Queue Delay		0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		26.4		110.1	22.4		16.9	50.7		10.8	11.2	
LOS		C		F	C		B	D		B	B	
Approach Delay		26.4			67.1			50.5			11.2	
Approach LOS		C			E			D			B	
Queue Length 50th (ft)		1		~262	81		2	~541		9	103	
Queue Length 95th (ft)		14		#445	191		13	#940		31	228	
Internal Link Dist (ft)		425			2019			960			739	
Turn Bay Length (ft)				160			60			115		
Base Capacity (vph)		149		354	514		492	916		261	1127	
Starvation Cap Reductn		0		0	0		0	0		0	0	
Spillback Cap Reductn		0		0	0		0	0		0	0	
Storage Cap Reductn		0		0	0		0	0		0	0	
Reduced v/c Ratio		0.05		1.09	0.72		0.01	0.98		0.19	0.38	

Intersection Summary

Lanes, Volumes, Timings
 1: Campbell Station Rd & Snyder Rd

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 29 (32%), Referenced to phase 2:NBTL, Start of Yellow
 Natural Cycle: 140
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.09
 Intersection Signal Delay: 47.6 Intersection LOS: D
 Intersection Capacity Utilization 89.0% ICU Level of Service E
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Campbell Station Rd & Snyder Rd

 Ø1	 Ø2 (R)	 Ø3	 Ø4
16 s	35 s	25 s	14 s
 Ø5			
51 s			

Intersection						
Int Delay, s/veh	6.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↙	↑	↗		↙	↗
Traffic Vol, veh/h	209	296	232	30	52	237
Future Vol, veh/h	209	296	232	30	52	237
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Yield
Storage Length	200	-	-	-	0	110
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	74	74	74	74	74	74
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	282	400	314	41	70	320

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	314	0	-	0	1299 335
Stage 1	-	-	-	-	335 -
Stage 2	-	-	-	-	964 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1246	-	-	-	178 707
Stage 1	-	-	-	-	725 -
Stage 2	-	-	-	-	370 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1246	-	-	-	138 707
Mov Cap-2 Maneuver	-	-	-	-	263 -
Stage 1	-	-	-	-	561 -
Stage 2	-	-	-	-	370 -

Approach	EB	WB	SB
HCM Control Delay, s	3.6	0	15.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1246	-	-	-	263	707
HCM Lane V/C Ratio	0.227	-	-	-	0.267	0.453
HCM Control Delay (s)	8.7	-	-	-	23.6	14.2
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.9	-	-	-	1	2.4

Intersection						
Int Delay, s/veh	4.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	191	264	541	38	26	179
Future Vol, veh/h	191	264	541	38	26	179
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Yield
Storage Length	200	-	-	-	0	110
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	195	269	552	39	27	183

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	552	0	-	0	1231
Stage 1	-	-	-	-	572
Stage 2	-	-	-	-	659
Critical Hdwy	4.12	-	-	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	2.218	-	-	-	3.518
Pot Cap-1 Maneuver	1018	-	-	-	196
Stage 1	-	-	-	-	565
Stage 2	-	-	-	-	515
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1018	-	-	-	158
Mov Cap-2 Maneuver	-	-	-	-	293
Stage 1	-	-	-	-	457
Stage 2	-	-	-	-	515

Approach	EB	WB	SB
HCM Control Delay, s	3.9	0	16
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1018	-	-	-	293	520
HCM Lane V/C Ratio	0.191	-	-	-	0.091	0.351
HCM Control Delay (s)	9.4	-	-	-	18.5	15.6
HCM Lane LOS	A	-	-	-	C	C
HCM 95th %tile Q(veh)	0.7	-	-	-	0.3	1.6

Lanes, Volumes, Timings
3: Lovell Rd & Outlet Dr



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	286	160	119	1028	1039	178
Future Volume (vph)	286	160	119	1028	1039	178
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Fr't		0.850			0.978	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	3539	3461	0
Flt Permitted	0.950		0.069			
Satd. Flow (perm)	1770	1583	129	3539	3461	0
Satd. Flow (RTOR)		30			27	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Shared Lane Traffic (%)						
Lane Group Flow (vph)	353	198	147	1269	1503	0
Turn Type	Perm	pm+ov	pm+pt	NA	NA	
Protected Phases		1	1	6	2	
Permitted Phases	4	4	6			
Detector Phase	4	1	1	6	2	
Switch Phase						
Minimum Initial (s)	8.0	6.0	6.0	20.0	20.0	
Minimum Split (s)	13.0	13.0	13.0	27.0	27.0	
Total Split (s)	30.0	15.0	15.0	70.0	55.0	
Total Split (%)	30.0%	15.0%	15.0%	70.0%	55.0%	
Yellow Time (s)	3.0	4.5	4.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	6.5	6.5	6.5	6.5	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Recall Mode	None	None	None	C-Max	C-Max	
Act Effct Green (s)	23.1	35.9	65.4	65.4	51.1	
Actuated g/C Ratio	0.23	0.36	0.65	0.65	0.51	
v/c Ratio	0.87	0.34	0.69	0.55	0.84	
Control Delay	58.4	20.7	34.2	10.8	27.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	58.4	20.7	34.2	10.8	27.0	
LOS	E	C	C	B	C	
Approach Delay	44.9			13.2	27.0	
Approach LOS	D			B	C	
Queue Length 50th (ft)	211	73	42	221	433	
Queue Length 95th (ft)	278	112	90	233	445	
Internal Link Dist (ft)	5611			1019	1944	
Turn Bay Length (ft)	125		95			
Base Capacity (vph)	442	597	223	2316	1783	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.80	0.33	0.66	0.55	0.84	

Intersection Summary

Lanes, Volumes, Timings
 3: Lovell Rd & Outlet Dr

Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 7 (7%), Referenced to phase 2:SBT and 6:NBTL, Start of Yellow	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.87	
Intersection Signal Delay: 24.2	Intersection LOS: C
Intersection Capacity Utilization 71.8%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 3: Lovell Rd & Outlet Dr



Lanes, Volumes, Timings
3: Lovell Rd & Outlet Dr























Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	209	170	291	1195	1134	357
Future Volume (vph)	209	170	291	1195	1134	357
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Fr't		0.850			0.964	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	3539	3412	0
Flt Permitted	0.950		0.085			
Satd. Flow (perm)	1770	1583	158	3539	3412	0
Satd. Flow (RTOR)		84			65	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Shared Lane Traffic (%)						
Lane Group Flow (vph)	218	177	303	1245	1553	0
Turn Type	Perm	pm+ov	pm+pt	NA	NA	
Protected Phases		1	1	6	2	
Permitted Phases	4	4	6			
Detector Phase	4	1	1	6	2	
Switch Phase						
Minimum Initial (s)	8.0	6.0	6.0	20.0	20.0	
Minimum Split (s)	13.0	13.0	13.0	27.0	27.0	
Total Split (s)	22.0	18.0	18.0	98.0	80.0	
Total Split (%)	18.3%	15.0%	15.0%	81.7%	66.7%	
Yellow Time (s)	3.0	4.5	4.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	6.5	6.5	6.5	6.5	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Recall Mode	None	None	None	C-Max	C-Max	
Act Effct Green (s)	16.6	33.5	91.9	91.9	73.5	
Actuated g/C Ratio	0.14	0.28	0.77	0.77	0.61	
v/c Ratio	0.89	0.35	1.08	0.46	0.73	
Control Delay	86.9	20.0	104.1	5.8	18.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	86.9	20.0	104.1	5.8	18.2	
LOS	F	B	F	A	B	
Approach Delay	56.9			25.0	18.2	
Approach LOS	E			C	B	
Queue Length 50th (ft)	168	55	~180	157	402	
Queue Length 95th (ft)	#307	119	#362	192	490	
Internal Link Dist (ft)	5611			1019	1944	
Turn Bay Length (ft)	125		95			
Base Capacity (vph)	250	502	280	2710	2115	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.87	0.35	1.08	0.46	0.73	

Intersection Summary

Lanes, Volumes, Timings
1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
2027 Combined

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	6	493	1	43	6	271	458	85	574	3
Future Volume (vph)	1	0	6	493	1	43	6	271	458	85	574	3
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.976			0.906			0.999	
Flt Protected	0.950			0.950	0.960		0.950			0.950		
Satd. Flow (prot)	1770	1583	0	1681	1658	0	1770	1688	0	1770	1861	0
Flt Permitted	0.950			0.950	0.960		0.419			0.103		
Satd. Flow (perm)	1770	1583	0	1681	1658	0	780	1688	0	192	1861	0
Satd. Flow (RTOR)		245			10			105				
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Shared Lane Traffic (%)				45%								
Lane Group Flow (vph)	1	7	0	305	298	0	7	819	0	96	648	0
Turn Type	Split	NA		Split	NA		Perm	NA		pm+pt	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2			6		
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		8.0	8.0		12.0	12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0		14.0	14.0		20.0	20.0		13.0	20.0	
Total Split (s)	14.0	14.0		20.0	20.0		30.0	30.0		16.0	46.0	
Total Split (%)	17.5%	17.5%		25.0%	25.0%		37.5%	37.5%		20.0%	57.5%	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0		4.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		8.0	8.0		7.0	8.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	None		None	None		C-Max	C-Max		None	Max	
Act Effect Green (s)	6.0	6.0		14.0	14.0		38.2	38.2		50.6	49.6	
Actuated g/C Ratio	0.08	0.08		0.18	0.18		0.48	0.48		0.63	0.62	
v/c Ratio	0.01	0.02		1.04	1.00		0.02	0.95		0.37	0.56	
Control Delay	34.0	0.2		98.0	87.3		16.7	43.1		11.0	12.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	34.0	0.2		98.0	87.3		16.7	43.1		11.0	12.4	
LOS	C	A		F	F		B	D		B	B	
Approach Delay		4.4			92.7			42.9			12.2	
Approach LOS		A			F			D			B	
Queue Length 50th (ft)	1	0		~175	153		2	334		15	152	
Queue Length 95th (ft)	5	0		#329	#315		12	#736		46	352	
Internal Link Dist (ft)		425			2019			960			739	
Turn Bay Length (ft)	75			160			60			115		
Base Capacity (vph)	177	378		294	298		372	860		300	1153	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.01	0.02		1.04	1.00		0.02	0.95		0.32	0.56	

Intersection Summary

Lanes, Volumes, Timings
 1: Campbell Station Rd & Snyder Rd





















Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 24 (30%), Referenced to phase 2:NBTL, Start of Yellow
 Natural Cycle: 100
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.04
 Intersection Signal Delay: 46.1 Intersection LOS: D
 Intersection Capacity Utilization 86.5% ICU Level of Service E
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Campbell Station Rd & Snyder Rd

Ø1	Ø2 (R)	Ø3	Ø4
16 s	30 s	20 s	14 s
Ø5			
46 s			

Lanes, Volumes, Timings
1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
2027 Combined

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1	6	658	0	137	7	493	449	56	415	1
Future Volume (vph)	0	1	6	658	0	137	7	493	449	56	415	1
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.871			0.947			0.929				
Flt Protected				0.950	0.969		0.950			0.950		
Satd. Flow (prot)	1863	1622	0	1681	1624	0	1770	1730	0	1770	1863	0
Flt Permitted				0.950	0.969		0.515			0.090		
Satd. Flow (perm)	1863	1622	0	1681	1624	0	959	1730	0	168	1863	0
Satd. Flow (RTOR)		6			218			52				
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Shared Lane Traffic (%)				38%								
Lane Group Flow (vph)	0	7	0	416	395	0	7	961	0	57	424	0
Turn Type	Split	NA		Split	NA		Perm	NA		pm+pt	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2			6		
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		8.0	8.0		12.0	12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0		14.0	14.0		20.0	20.0		13.0	20.0	
Total Split (s)	14.0	14.0		25.0	25.0		35.0	35.0		16.0	51.0	
Total Split (%)	15.6%	15.6%		27.8%	27.8%		38.9%	38.9%		17.8%	56.7%	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0		4.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		8.0	8.0		7.0	8.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	None		None	None		C-Max	C-Max		None	Max	
Act Effect Green (s)		6.1		19.0	19.0		43.6	43.6		55.5	54.5	
Actuated g/C Ratio		0.07		0.21	0.21		0.48	0.48		0.62	0.61	
v/c Ratio		0.06		1.18	0.77		0.02	1.11		0.26	0.38	
Control Delay		26.4		138.6	26.1		17.1	91.3		11.2	11.2	
Queue Delay		0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		26.4		138.6	26.1		17.1	91.3		11.2	11.2	
LOS		C		F	C		B	F		B	B	
Approach Delay		26.4			83.8			90.7			11.2	
Approach LOS		C			F			F			B	
Queue Length 50th (ft)		1		~300	98		2	~613		11	103	
Queue Length 95th (ft)		14		#487	#245		13	#1017		35	228	
Internal Link Dist (ft)		425			2019			960			739	
Turn Bay Length (ft)				160			60			115		
Base Capacity (vph)		149		354	514		464	864		263	1127	
Starvation Cap Reductn		0		0	0		0	0		0	0	
Spillback Cap Reductn		0		0	0		0	0		0	0	
Storage Cap Reductn		0		0	0		0	0		0	0	
Reduced v/c Ratio		0.05		1.18	0.77		0.02	1.11		0.22	0.38	

Intersection Summary

Lanes, Volumes, Timings
 1: Campbell Station Rd & Snyder Rd





















Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 29 (32%), Referenced to phase 2:NBTL, Start of Yellow
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.18
 Intersection Signal Delay: 71.2 Intersection LOS: E
 Intersection Capacity Utilization 94.1% ICU Level of Service F
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Campbell Station Rd & Snyder Rd

↙ Ø1	↖ Ø2 (R)	↘ Ø3	↗ Ø4
16 s	35 s	25 s	14 s
↓ Ø5			
51 s			

Lanes, Volumes, Timings
1: Campbell Station Rd & Snyder Rd





















Snyder Road Apartments
2027 Combined - Optimized

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	6	493	1	43	6	271	458	85	574	3
Future Volume (vph)	1	0	6	493	1	43	6	271	458	85	574	3
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.976			0.906			0.999	
Flt Protected	0.950			0.950	0.960		0.950			0.950		
Satd. Flow (prot)	1770	1583	0	1681	1658	0	1770	1688	0	1770	1861	0
Flt Permitted	0.950			0.950	0.960		0.419			0.096		
Satd. Flow (perm)	1770	1583	0	1681	1658	0	780	1688	0	179	1861	0
Satd. Flow (RTOR)		245			10			120				
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Shared Lane Traffic (%)				45%								
Lane Group Flow (vph)	1	7	0	305	298	0	7	819	0	96	648	0
Turn Type	Split	NA		Split	NA		Perm	NA		pm+pt	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2			6		
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		8.0	8.0		12.0	12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0		14.0	14.0		20.0	20.0		13.0	20.0	
Total Split (s)	12.0	12.0		18.0	18.0		37.0	37.0		13.0	50.0	
Total Split (%)	15.0%	15.0%		22.5%	22.5%		46.3%	46.3%		16.3%	62.5%	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0		4.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		8.0	8.0		7.0	8.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	None		None	None		C-Max	C-Max		None	Max	
Act Effect Green (s)	6.0	6.0		12.0	12.0		40.9	40.9		52.6	51.6	
Actuated g/C Ratio	0.08	0.08		0.15	0.15		0.51	0.51		0.66	0.64	
v/c Ratio	0.01	0.02		1.21	1.16		0.02	0.89		0.40	0.54	
Control Delay	34.0	0.2		158.7	139.3		14.0	31.4		11.0	10.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	34.0	0.2		158.7	139.3		14.0	31.4		11.0	10.9	
LOS	C	A		F	F		B	C		B	B	
Approach Delay		4.4			149.1			31.3			10.9	
Approach LOS		A			F			C			B	
Queue Length 50th (ft)	1	0		~198	~184		2	305		14	138	
Queue Length 95th (ft)	5	0		#352	#340		10	#670		45	331	
Internal Link Dist (ft)		425			2019			960			739	
Turn Bay Length (ft)	75			160			60			115		
Base Capacity (vph)	132	345		252	257		398	922		242	1200	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.01	0.02		1.21	1.16		0.02	0.89		0.40	0.54	

Intersection Summary

Lanes, Volumes, Timings
1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
2027 Combined - Optimized

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1	6	658	0	137	7	493	449	56	415	1
Future Volume (vph)	0	1	6	658	0	137	7	493	449	56	415	1
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.871			0.947			0.929				
Flt Protected				0.950	0.969		0.950			0.950		
Satd. Flow (prot)	1863	1622	0	1681	1624	0	1770	1730	0	1770	1863	0
Flt Permitted				0.950	0.969		0.515			0.085		
Satd. Flow (perm)	1863	1622	0	1681	1624	0	959	1730	0	158	1863	0
Satd. Flow (RTOR)		6			218			59				
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Shared Lane Traffic (%)				38%								
Lane Group Flow (vph)	0	7	0	416	395	0	7	961	0	57	424	0
Turn Type	Split	NA		Split	NA		Perm	NA		pm+pt	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2			6		
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		8.0	8.0		12.0	12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0		14.0	14.0		20.0	20.0		13.0	20.0	
Total Split (s)	12.0	12.0		23.0	23.0		42.0	42.0		13.0	55.0	
Total Split (%)	13.3%	13.3%		25.6%	25.6%		46.7%	46.7%		14.4%	61.1%	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0		4.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		8.0	8.0		7.0	8.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	None		None	None		C-Max	C-Max		None	Max	
Act Effect Green (s)		6.0		17.0	17.0		46.1	46.1		57.6	56.6	
Actuated g/C Ratio		0.07		0.19	0.19		0.51	0.51		0.64	0.63	
v/c Ratio		0.06		1.31	0.82		0.01	1.05		0.27	0.36	
Control Delay		26.7		193.8	30.8		14.9	67.8		10.5	10.0	
Queue Delay		0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		26.7		193.8	30.8		14.9	67.8		10.5	10.0	
LOS		C		F	C		B	E		B	A	
Approach Delay		26.7			114.4			67.4			10.0	
Approach LOS		C			F			E			B	
Queue Length 50th (ft)		1		~323	102		2	~586		10	96	
Queue Length 95th (ft)		14		#511	#263		12	#959		33	213	
Internal Link Dist (ft)		425			2019			960			739	
Turn Bay Length (ft)				160			60			115		
Base Capacity (vph)		113		317	483		491	915		209	1171	
Starvation Cap Reductn		0		0	0		0	0		0	0	
Spillback Cap Reductn		0		0	0		0	0		0	0	
Storage Cap Reductn		0		0	0		0	0		0	0	
Reduced v/c Ratio		0.06		1.31	0.82		0.01	1.05		0.27	0.36	

Intersection Summary























Cycle Length: 90
Actuated Cycle Length: 90
Offset: 29 (32%), Referenced to phase 2:NBTL, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.31
Intersection Signal Delay: 71.9 Intersection LOS: E
Intersection Capacity Utilization 94.1% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Campbell Station Rd & Snyder Rd



Lanes, Volumes, Timings
1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
2027 Combined W/ NB Right Non-Channelized

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	6	493	1	43	6	271	458	85	574	3
Future Volume (vph)	1	0	6	493	1	43	6	271	458	85	574	3
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.976				0.850		0.999	
Flt Protected	0.950			0.950	0.960		0.950			0.950		
Satd. Flow (prot)	1770	1583	0	1681	1658	0	1770	1863	1583	1770	1861	0
Flt Permitted	0.950			0.950	0.960		0.393			0.422		
Satd. Flow (perm)	1770	1583	0	1681	1658	0	732	1863	1583	786	1861	0
Satd. Flow (RTOR)		245			11				515			
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Shared Lane Traffic (%)				45%								
Lane Group Flow (vph)	1	7	0	305	298	0	7	304	515	96	648	0
Turn Type	Split	NA		Split	NA		Perm	NA	pm+ov	pm+pt	NA	
Protected Phases	4	4		3	3			2	3	1	6	
Permitted Phases							2		2	6		
Detector Phase	4	4		3	3		2	2	3	1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		8.0	8.0		12.0	12.0	8.0	6.0	12.0	
Minimum Split (s)	12.0	12.0		14.0	14.0		20.0	20.0	14.0	13.0	20.0	
Total Split (s)	12.0	12.0		25.0	25.0		30.0	30.0	25.0	13.0	43.0	
Total Split (%)	15.0%	15.0%		31.3%	31.3%		37.5%	37.5%	31.3%	16.3%	53.8%	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0	4.0	4.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0	2.0	3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		8.0	8.0	6.0	7.0	8.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag	Lead	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes		
Recall Mode	None	None		None	None		C-Max	C-Max	None	None	Max	
Act Effect Green (s)	6.0	6.0		18.0	18.0		34.7	34.7	61.9	46.6	45.6	
Actuated g/C Ratio	0.08	0.08		0.22	0.22		0.43	0.43	0.77	0.58	0.57	
v/c Ratio	0.01	0.02		0.80	0.78		0.02	0.38	0.38	0.18	0.61	
Control Delay	34.0	0.2		46.9	43.4		18.7	20.1	1.5	10.0	16.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	34.0	0.2		46.9	43.4		18.7	20.1	1.5	10.0	16.4	
LOS	C	A		D	D		B	C	A	A	B	
Approach Delay		4.4			45.2			8.5			15.6	
Approach LOS		A			D			A			B	
Queue Length 50th (ft)	1	0		149	140		2	103	0	18	187	
Queue Length 95th (ft)	5	0		#270	#254		12	209	32	54	#415	
Internal Link Dist (ft)		425			2019			960			739	
Turn Bay Length (ft)	75			160			60		125	115		
Base Capacity (vph)	132	345		399	402		317	807	1338	537	1059	
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	
Reduced v/c Ratio	0.01	0.02		0.76	0.74		0.02	0.38	0.38	0.18	0.61	






Intersection Summary

Lanes, Volumes, Timings
 1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
 2027 Combined W/ NB Right Non-Channelized

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 24 (30%), Referenced to phase 2:NBTL, Start of Yellow
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.80
 Intersection Signal Delay: 21.0 Intersection LOS: C
 Intersection Capacity Utilization 80.4% ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Campbell Station Rd & Snyder Rd

 Ø1	 Ø2 (R)	 Ø3	 Ø4
13 s	30 s	25 s	12 s
 Ø5			
43 s			

Lanes, Volumes, Timings
1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
2027 Combined W/ NB Right Non-Channelized

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1	6	658	0	137	7	493	449	56	415	1
Future Volume (vph)	0	1	6	658	0	137	7	493	449	56	415	1
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.871			0.947				0.850			
Flt Protected				0.950	0.969		0.950			0.950		
Satd. Flow (prot)	1863	1622	0	1681	1624	0	1770	1863	1583	1770	1863	0
Flt Permitted				0.950	0.969		0.515			0.224		
Satd. Flow (perm)	1863	1622	0	1681	1624	0	959	1863	1583	417	1863	0
Satd. Flow (RTOR)		6			218				458			
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Shared Lane Traffic (%)				38%								
Lane Group Flow (vph)	0	7	0	416	395	0	7	503	458	57	424	0
Turn Type	Split	NA		Split	NA		Perm	NA	pm+ov	pm+pt	NA	
Protected Phases	4	4		3	3			2	3	1	6	
Permitted Phases							2		2	6		
Detector Phase	4	4		3	3		2	2	3	1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		8.0	8.0		12.0	12.0	8.0	6.0	12.0	
Minimum Split (s)	12.0	12.0		14.0	14.0		20.0	20.0	14.0	13.0	20.0	
Total Split (s)	12.0	12.0		30.0	30.0		35.0	35.0	30.0	13.0	48.0	
Total Split (%)	13.3%	13.3%		33.3%	33.3%		38.9%	38.9%	33.3%	14.4%	53.3%	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0	4.0	4.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0	2.0	3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		8.0	8.0	6.0	7.0	8.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag	Lead	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes		
Recall Mode	None	None		None	None		C-Max	C-Max	None	None	Max	
Act Effect Green (s)		6.0		24.0	24.0		39.1	39.1	72.2	50.6	49.6	
Actuated g/C Ratio		0.07		0.27	0.27		0.43	0.43	0.80	0.56	0.55	
v/c Ratio		0.06		0.93	0.67		0.02	0.62	0.34	0.17	0.41	
Control Delay		26.7		62.3	19.1		19.3	26.9	1.2	11.7	14.3	
Queue Delay		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay		26.7		62.3	19.1		19.3	26.9	1.2	11.7	14.3	
LOS		C		E	B		B	C	A	B	B	
Approach Delay		26.7			41.3			14.7			14.0	
Approach LOS		C			D			B			B	
Queue Length 50th (ft)		1		242	90		2	216	0	13	122	
Queue Length 95th (ft)		14		#428	198		13	#457	30	39	253	
Internal Link Dist (ft)		425			2019			960			739	
Turn Bay Length (ft)				160			60		125	115		
Base Capacity (vph)		113		448	592		416	808	1346	327	1027	
Starvation Cap Reductn		0		0	0		0	0	0	0	0	
Spillback Cap Reductn		0		0	0		0	0	0	0	0	
Storage Cap Reductn		0		0	0		0	0	0	0	0	
Reduced v/c Ratio		0.06		0.93	0.67		0.02	0.62	0.34	0.17	0.41	

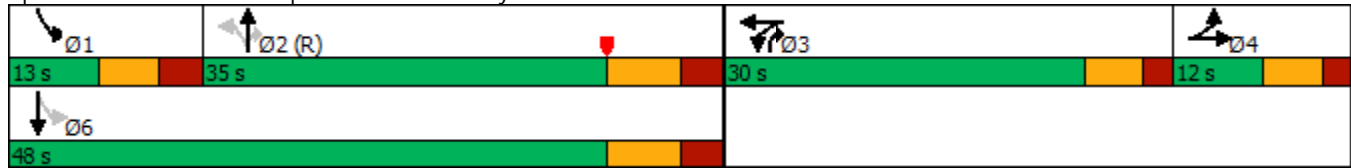
Intersection Summary

Lanes, Volumes, Timings
 1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
 2027 Combined W/ NB Right Non-Channelized





















Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 29 (32%), Referenced to phase 2:NBTL, Start of Yellow
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.93
 Intersection Signal Delay: 24.1 Intersection LOS: C
 Intersection Capacity Utilization 79.3% ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Campbell Station Rd & Snyder Rd



Lanes, Volumes, Timings
1: Campbell Station Rd & Snyder Rd





















Snyder Road Apartments
2027 Combined W/ WB dual left

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	6	493	1	43	6	271	458	85	574	3
Future Volume (vph)	1	0	6	493	1	43	6	271	458	85	574	3
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.853			0.906			0.999	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1583	0	3433	1589	0	1770	1688	0	1770	1861	0
Flt Permitted	0.950			0.950			0.419			0.091		
Satd. Flow (perm)	1770	1583	0	3433	1589	0	780	1688	0	170	1861	0
Satd. Flow (RTOR)		245			48			124				
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1	7	0	554	49	0	7	819	0	96	648	0
Turn Type	Split	NA		Split	NA		Perm	NA		pm+pt	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2			6		
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		8.0	8.0		12.0	12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0		14.0	14.0		20.0	20.0		13.0	20.0	
Total Split (s)	12.0	12.0		16.0	16.0		39.0	39.0		13.0	52.0	
Total Split (%)	15.0%	15.0%		20.0%	20.0%		48.8%	48.8%		16.3%	65.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0		4.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		8.0	8.0		7.0	8.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	None		None	None		C-Max	C-Max		None	Max	
Act Effect Green (s)	6.0	6.0		10.0	10.0		43.0	43.0		54.6	53.6	
Actuated g/C Ratio	0.08	0.08		0.12	0.12		0.54	0.54		0.68	0.67	
v/c Ratio	0.01	0.02		1.29	0.20		0.02	0.85		0.40	0.52	
Control Delay	34.0	0.2		179.5	12.8		12.8	26.6		10.9	9.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	34.0	0.2		179.5	12.8		12.8	26.6		10.9	9.6	
LOS	C	A		F	B		B	C		B	A	
Approach Delay		4.4			166.0			26.4			9.7	
Approach LOS		A			F			C			A	
Queue Length 50th (ft)	1	0		~185	0		2	284		12	124	
Queue Length 95th (ft)	5	0		#277	30		10	#647		45	310	
Internal Link Dist (ft)		425			2019			960			739	
Turn Bay Length (ft)	75			160			60			115		
Base Capacity (vph)	132	345		429	240		419	964		240	1246	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.01	0.02		1.29	0.20		0.02	0.85		0.40	0.52	

Intersection Summary

Lanes, Volumes, Timings
1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
2027 Combined W/ WB dual left

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1	6	658	0	137	7	493	449	56	415	1
Future Volume (vph)	0	1	6	658	0	137	7	493	449	56	415	1
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr't		0.871			0.850			0.929				
Flt Protected				0.950			0.950			0.950		
Satd. Flow (prot)	1863	1622	0	3433	1583	0	1770	1730	0	1770	1863	0
Flt Permitted				0.950			0.515			0.080		
Satd. Flow (perm)	1863	1622	0	3433	1583	0	959	1730	0	149	1863	0
Satd. Flow (RTOR)		6			434			62				
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	7	0	671	140	0	7	961	0	57	424	0
Turn Type	Split	NA		Split	NA		Perm	NA		pm+pt	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2			6		
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		8.0	8.0		12.0	12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0		14.0	14.0		20.0	20.0		13.0	20.0	
Total Split (s)	12.0	12.0		20.0	20.0		45.0	45.0		13.0	58.0	
Total Split (%)	13.3%	13.3%		22.2%	22.2%		50.0%	50.0%		14.4%	64.4%	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0		4.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		8.0	8.0		7.0	8.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	None		None	None		C-Max	C-Max		None	Max	
Act Effect Green (s)		6.0		14.0	14.0		49.1	49.1		60.6	59.6	
Actuated g/C Ratio		0.07		0.16	0.16		0.55	0.55		0.67	0.66	
v/c Ratio		0.06		1.26	0.23		0.01	0.99		0.27	0.34	
Control Delay		26.7		164.2	0.9		13.1	48.6		9.4	8.4	
Queue Delay		0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		26.7		164.2	0.9		13.1	48.6		9.4	8.4	
LOS		C		F	A		B	D		A	A	
Approach Delay		26.7			136.0			48.3			8.5	
Approach LOS		C			F			D			A	
Queue Length 50th (ft)		1		~248	0		2	487		9	84	
Queue Length 95th (ft)		14		#356	0		11	#923		30	196	
Internal Link Dist (ft)		425			2019			960			739	
Turn Bay Length (ft)				160			60			115		
Base Capacity (vph)		113		534	612		523	972		209	1233	
Starvation Cap Reductn		0		0	0		0	0		0	0	
Spillback Cap Reductn		0		0	0		0	0		0	0	
Storage Cap Reductn		0		0	0		0	0		0	0	
Reduced v/c Ratio		0.06		1.26	0.23		0.01	0.99		0.27	0.34	

Intersection Summary

Lanes, Volumes, Timings
1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
2027 Combined W/ WB dual left protected

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	6	493	1	43	6	271	458	85	574	3
Future Volume (vph)	1	0	6	493	1	43	6	271	458	85	574	3
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.853			0.906			0.999	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1583	0	3433	1589	0	1770	1688	0	1770	1861	0
Flt Permitted				0.950			0.419			0.091		
Satd. Flow (perm)	1863	1583	0	3433	1589	0	780	1688	0	170	1861	0
Satd. Flow (RTOR)		245			48			124				
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1	7	0	554	49	0	7	819	0	96	648	0
Turn Type	Perm	NA		Prot	NA		Perm	NA		pm+pt	NA	
Protected Phases		4		3	8			2		1	6	
Permitted Phases	4						2			6		
Detector Phase	4	4		3	8		2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	8.0		12.0	12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0		14.0	14.0		20.0	20.0		13.0	20.0	
Total Split (s)	12.0	12.0		16.0	28.0		39.0	39.0		13.0	52.0	
Total Split (%)	15.0%	15.0%		20.0%	35.0%		48.8%	48.8%		16.3%	65.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0		4.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		8.0	8.0		7.0	8.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes			Yes	Yes		Yes		
Recall Mode	None	None		None	None		C-Max	C-Max		None	Max	
Act Effect Green (s)	6.0	6.0		10.0	12.4		43.0	43.0		54.6	53.6	
Actuated g/C Ratio	0.08	0.08		0.12	0.16		0.54	0.54		0.68	0.67	
v/c Ratio	0.01	0.02		1.29	0.17		0.02	0.85		0.40	0.52	
Control Delay	34.0	0.2		179.5	9.8		12.8	26.6		10.9	9.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	34.0	0.2		179.5	9.8		12.8	26.6		10.9	9.6	
LOS	C	A		F	A		B	C		B	A	
Approach Delay		4.4			165.7			26.4			9.7	
Approach LOS		A			F			C			A	
Queue Length 50th (ft)	1	0		~185	0		2	284		12	124	
Queue Length 95th (ft)	5	0		#277	24		10	#647		45	310	
Internal Link Dist (ft)		425			2019			960			739	
Turn Bay Length (ft)	75			160			60			115		
Base Capacity (vph)	139	345		429	471		419	964		240	1246	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.01	0.02		1.29	0.10		0.02	0.85		0.40	0.52	

Intersection Summary

Lanes, Volumes, Timings
1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
2027 Combined W/ WB dual left protected

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1	6	658	0	137	7	493	449	56	415	1
Future Volume (vph)	0	1	6	658	0	137	7	493	449	56	415	1
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.871			0.850			0.929				
Flt Protected				0.950			0.950			0.950		
Satd. Flow (prot)	1863	1622	0	3433	1583	0	1770	1730	0	1770	1863	0
Flt Permitted				0.950			0.515			0.080		
Satd. Flow (perm)	1863	1622	0	3433	1583	0	959	1730	0	149	1863	0
Satd. Flow (RTOR)		6			342			62				
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	7	0	671	140	0	7	961	0	57	424	0
Turn Type	Perm	NA		Prot	NA		Perm	NA		pm+pt	NA	
Protected Phases		4		3	8			2		1	6	
Permitted Phases	4						2			6		
Detector Phase	4	4		3	8		2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	8.0		12.0	12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0		14.0	14.0		20.0	20.0		13.0	20.0	
Total Split (s)	12.0	12.0		20.0	32.0		45.0	45.0		13.0	58.0	
Total Split (%)	13.3%	13.3%		22.2%	35.6%		50.0%	50.0%		14.4%	64.4%	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0		4.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		8.0	8.0		7.0	8.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes			Yes	Yes		Yes		
Recall Mode	None	None		None	None		C-Max	C-Max		None	Max	
Act Effect Green (s)		6.0		14.0	16.4		49.1	49.1		60.6	59.6	
Actuated g/C Ratio		0.07		0.16	0.18		0.55	0.55		0.67	0.66	
v/c Ratio		0.06		1.26	0.25		0.01	0.99		0.27	0.34	
Control Delay		26.7		164.2	1.0		13.1	48.6		9.4	8.4	
Queue Delay		0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		26.7		164.2	1.0		13.1	48.6		9.4	8.4	
LOS		C		F	A		B	D		A	A	
Approach Delay		26.7			136.0			48.3			8.5	
Approach LOS		C			F			D			A	
Queue Length 50th (ft)		1		~248	0		2	487		9	84	
Queue Length 95th (ft)		14		#356	0		11	#923		30	196	
Internal Link Dist (ft)		425			2019			960			739	
Turn Bay Length (ft)				160			60			115		
Base Capacity (vph)		113		534	700		523	972		209	1233	
Starvation Cap Reductn		0		0	0		0	0		0	0	
Spillback Cap Reductn		0		0	0		0	0		0	0	
Storage Cap Reductn		0		0	0		0	0		0	0	
Reduced v/c Ratio		0.06		1.26	0.20		0.01	0.99		0.27	0.34	

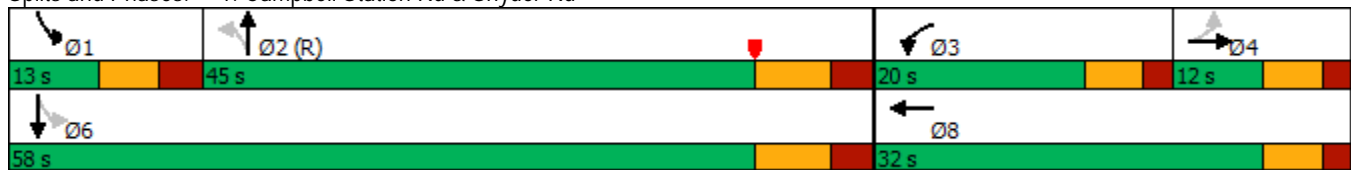
Intersection Summary

Lanes, Volumes, Timings
 1: Campbell Station Rd & Snyder Rd

Snyder Road Apartments
 2027 Combined W/ WB dual left protected

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 29 (32%), Referenced to phase 2:NBTL, Start of Yellow
 Natural Cycle: 140
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.26
 Intersection Signal Delay: 71.2 Intersection LOS: E
 Intersection Capacity Utilization 90.5% ICU Level of Service E
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Campbell Station Rd & Snyder Rd



Intersection						
Int Delay, s/veh	6.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↶	↷	↶		↶	↷
Traffic Vol, veh/h	209	314	297	30	52	237
Future Vol, veh/h	209	314	297	30	52	237
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Yield
Storage Length	200	-	-	-	0	110
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	74	74	74	74	74	74
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	282	424	401	41	70	320

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	401	0	-	0	1410 422
Stage 1	-	-	-	-	422 -
Stage 2	-	-	-	-	988 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1158	-	-	-	153 632
Stage 1	-	-	-	-	662 -
Stage 2	-	-	-	-	361 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1158	-	-	-	116 632
Mov Cap-2 Maneuver	-	-	-	-	242 -
Stage 1	-	-	-	-	500 -
Stage 2	-	-	-	-	361 -

Approach	EB	WB	SB
HCM Control Delay, s	3.6	0	18.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1158	-	-	-	242	632
HCM Lane V/C Ratio	0.244	-	-	-	0.29	0.507
HCM Control Delay (s)	9.1	-	-	-	25.9	16.4
HCM Lane LOS	A	-	-	-	D	C
HCM 95th %tile Q(veh)	1	-	-	-	1.2	2.9

Intersection						
Int Delay, s/veh	4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↑	↗		↖	↗
Traffic Vol, veh/h	191	331	595	38	26	179
Future Vol, veh/h	191	331	595	38	26	179
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Yield
Storage Length	200	-	-	-	0	110
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	195	338	607	39	27	183

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	607	0	-	0	1355 627
Stage 1	-	-	-	-	627 -
Stage 2	-	-	-	-	728 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	971	-	-	-	165 484
Stage 1	-	-	-	-	532 -
Stage 2	-	-	-	-	478 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	971	-	-	-	132 484
Mov Cap-2 Maneuver	-	-	-	-	265 -
Stage 1	-	-	-	-	425 -
Stage 2	-	-	-	-	478 -

Approach	EB	WB	SB
HCM Control Delay, s	3.5	0	17.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	971	-	-	-	265	484
HCM Lane V/C Ratio	0.201	-	-	-	0.1	0.377
HCM Control Delay (s)	9.6	-	-	-	20.1	16.9
HCM Lane LOS	A	-	-	-	C	C
HCM 95th %tile Q(veh)	0.7	-	-	-	0.3	1.7

Lanes, Volumes, Timings
3: Lovell Rd & Outlet Dr

Snyder Road Apartments
2027 Combined



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	319	225	142	1028	1039	183
Future Volume (vph)	319	225	142	1028	1039	183
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Fr't		0.850			0.978	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	3539	3461	0
Flt Permitted	0.950		0.071			
Satd. Flow (perm)	1770	1583	132	3539	3461	0
Satd. Flow (RTOR)		30			28	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Shared Lane Traffic (%)						
Lane Group Flow (vph)	394	278	175	1269	1509	0
Turn Type	Perm	pm+ov	pm+pt	NA	NA	
Protected Phases		1	1	6	2	
Permitted Phases	4	4	6			
Detector Phase	4	1	1	6	2	
Switch Phase						
Minimum Initial (s)	8.0	6.0	6.0	20.0	20.0	
Minimum Split (s)	13.0	13.0	13.0	27.0	27.0	
Total Split (s)	30.0	15.0	15.0	70.0	55.0	
Total Split (%)	30.0%	15.0%	15.0%	70.0%	55.0%	
Yellow Time (s)	3.0	4.5	4.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	6.5	6.5	6.5	6.5	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Recall Mode	None	None	None	C-Max	C-Max	
Act Effct Green (s)	24.2	37.4	64.3	64.3	49.6	
Actuated g/C Ratio	0.24	0.37	0.64	0.64	0.50	
v/c Ratio	0.92	0.45	0.80	0.56	0.87	
Control Delay	65.5	23.4	45.4	11.3	29.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	65.5	23.4	45.4	11.3	29.4	
LOS	E	C	D	B	C	
Approach Delay	48.1			15.4	29.4	
Approach LOS	D			B	C	
Queue Length 50th (ft)	243	114	59	221	435	
Queue Length 95th (ft)	#343	163	#132	233	448	
Internal Link Dist (ft)	5611			1019	1944	
Turn Bay Length (ft)	125		95			
Base Capacity (vph)	442	615	224	2275	1729	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.89	0.45	0.78	0.56	0.87	

Intersection Summary

Lanes, Volumes, Timings
3: Lovell Rd & Outlet Dr















Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	223	238	358	1195	1134	390
Future Volume (vph)	223	238	358	1195	1134	390
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Fr't		0.850			0.962	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	3539	3405	0
Flt Permitted	0.950		0.079			
Satd. Flow (perm)	1770	1583	147	3539	3405	0
Satd. Flow (RTOR)		84			73	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Shared Lane Traffic (%)						
Lane Group Flow (vph)	232	248	373	1245	1587	0
Turn Type	Perm	pm+ov	pm+pt	NA	NA	
Protected Phases		1	1	6	2	
Permitted Phases	4	4	6			
Detector Phase	4	1	1	6	2	
Switch Phase						
Minimum Initial (s)	8.0	6.0	6.0	20.0	20.0	
Minimum Split (s)	13.0	13.0	13.0	27.0	27.0	
Total Split (s)	22.0	18.0	18.0	98.0	80.0	
Total Split (%)	18.3%	15.0%	15.0%	81.7%	66.7%	
Yellow Time (s)	3.0	4.5	4.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	6.5	6.5	6.5	6.5	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Recall Mode	None	None	None	C-Max	C-Max	
Act Effect Green (s)	17.0	33.5	91.5	91.5	73.5	
Actuated g/C Ratio	0.14	0.28	0.76	0.76	0.61	
v/c Ratio	0.93	0.49	1.40	0.46	0.75	
Control Delay	92.4	27.3	225.9	5.9	18.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	92.4	27.3	225.9	5.9	18.7	
LOS	F	C	F	A	B	
Approach Delay	58.8			56.6	18.7	
Approach LOS	E			E	B	
Queue Length 50th (ft)	180	105	~307	157	417	
Queue Length 95th (ft)	#333	187	#502	192	508	
Internal Link Dist (ft)	5611			1019	1944	
Turn Bay Length (ft)	125		95			
Base Capacity (vph)	250	502	267	2698	2113	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.93	0.49	1.40	0.46	0.75	













Intersection Summary

Lanes, Volumes, Timings
3: Lovell Rd & Outlet Dr

Snyder Road Apartments
2027 Combined - Optimized

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	319	225	142	1028	1039	183
Future Volume (vph)	319	225	142	1028	1039	183
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Frt		0.850			0.978	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	3539	3461	0
Flt Permitted	0.950		0.072			
Satd. Flow (perm)	1770	1583	134	3539	3461	0
Satd. Flow (RTOR)		28			27	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Shared Lane Traffic (%)						
Lane Group Flow (vph)	394	278	175	1269	1509	0
Turn Type	Perm	pm+ov	pm+pt	NA	NA	
Protected Phases		1	1	6	2	
Permitted Phases	4	4	6			
Detector Phase	4	1	1	6	2	
Switch Phase						
Minimum Initial (s)	8.0	6.0	6.0	20.0	20.0	
Minimum Split (s)	13.0	13.0	13.0	27.0	27.0	
Total Split (s)	31.0	15.0	15.0	69.0	54.0	
Total Split (%)	31.0%	15.0%	15.0%	69.0%	54.0%	
Yellow Time (s)	3.0	4.5	4.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	6.5	6.5	6.5	6.5	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Recall Mode	None	None	None	C-Max	C-Max	
Act Effect Green (s)	24.7	38.0	63.8	63.8	49.0	
Actuated g/C Ratio	0.25	0.38	0.64	0.64	0.49	
v/c Ratio	0.90	0.45	0.79	0.56	0.88	
Control Delay	61.4	23.0	44.7	11.7	30.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	61.4	23.0	44.7	11.7	30.7	
LOS	E	C	D	B	C	
Approach Delay	45.5			15.7	30.7	
Approach LOS	D			B	C	
Queue Length 50th (ft)	239	113	60	227	445	
Queue Length 95th (ft)	#331	161	#133	240	458	
Internal Link Dist (ft)	5611			1019	1944	
Turn Bay Length (ft)	125		95			
Base Capacity (vph)	460	623	225	2257	1708	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.86	0.45	0.78	0.56	0.88	
Intersection Summary						

Lanes, Volumes, Timings
3: Lovell Rd & Outlet Dr

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	223	238	358	1195	1134	390
Future Volume (vph)	223	238	358	1195	1134	390
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Frt		0.850			0.962	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	3539	3405	0
Flt Permitted	0.950		0.059			
Satd. Flow (perm)	1770	1583	110	3539	3405	0
Satd. Flow (RTOR)		44			56	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Shared Lane Traffic (%)						
Lane Group Flow (vph)	232	248	373	1245	1587	0
Turn Type	Perm	pm+ov	pm+pt	NA	NA	
Protected Phases		1	1	6	2	
Permitted Phases	4	4	6			
Detector Phase	4	1	1	6	2	
Switch Phase						
Minimum Initial (s)	8.0	6.0	6.0	20.0	20.0	
Minimum Split (s)	13.0	13.0	13.0	27.0	27.0	
Total Split (s)	23.0	31.0	31.0	97.0	66.0	
Total Split (%)	19.2%	25.8%	25.8%	80.8%	55.0%	
Yellow Time (s)	3.0	4.5	4.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	6.5	6.5	6.5	6.5	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Recall Mode	None	None	None	C-Max	C-Max	
Act Effect Green (s)	17.5	45.5	91.0	91.0	61.5	
Actuated g/C Ratio	0.15	0.38	0.76	0.76	0.51	
v/c Ratio	0.90	0.40	0.93	0.46	0.90	
Control Delay	85.9	23.7	66.1	6.1	34.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	85.9	23.7	66.1	6.1	34.0	
LOS	F	C	E	A	C	
Approach Delay	53.7			19.9	34.0	
Approach LOS	D			B	C	
Queue Length 50th (ft)	178	110	230	165	568	
Queue Length 95th (ft)	#321	180	#405	201	#745	
Internal Link Dist (ft)	5611			1019	1944	
Turn Bay Length (ft)	125		95			
Base Capacity (vph)	265	647	422	2682	1772	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.88	0.38	0.88	0.46	0.90	
Intersection Summary						

Intersection						
Int Delay, s/veh	2.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑	↑	↑	↘	↘
Traffic Vol, veh/h	18	348	262	28	98	65
Future Vol, veh/h	18	348	262	28	98	65
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	0	0	-
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	20	378	285	30	107	71

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	315	0	-	0	703 285
Stage 1	-	-	-	-	285 -
Stage 2	-	-	-	-	418 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1245	-	-	-	404 754
Stage 1	-	-	-	-	763 -
Stage 2	-	-	-	-	664 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1245	-	-	-	398 754
Mov Cap-2 Maneuver	-	-	-	-	502 -
Stage 1	-	-	-	-	751 -
Stage 2	-	-	-	-	664 -

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	13.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1245	-	-	-	579
HCM Lane V/C Ratio	0.016	-	-	-	0.306
HCM Control Delay (s)	7.9	-	-	-	13.9
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	1.3

Intersection						
Int Delay, s/veh	2.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	67	290	579	100	82	54
Future Vol, veh/h	67	290	579	100	82	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	0	0	-
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	73	315	629	109	89	59

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	738	0	-	0	1090 629
Stage 1	-	-	-	-	629 -
Stage 2	-	-	-	-	461 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	868	-	-	-	238 482
Stage 1	-	-	-	-	531 -
Stage 2	-	-	-	-	635 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	868	-	-	-	218 482
Mov Cap-2 Maneuver	-	-	-	-	348 -
Stage 1	-	-	-	-	486 -
Stage 2	-	-	-	-	635 -

Approach	EB	WB	SB
HCM Control Delay, s	1.8	0	19.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	868	-	-	-	391
HCM Lane V/C Ratio	0.084	-	-	-	0.378
HCM Control Delay (s)	9.5	-	-	-	19.7
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.3	-	-	-	1.7

APPENDIX D – TURN LANE WARRANT EVALUATIONS

TABLE 4B KNOX COUNTY RIGHT-TURN LANE VOLUME THRESHOLDS FOR 2-LANE ROADWAYS WITH A PREVAILING SPEED OF 0 TO 35 MPH	Project No: 01781-0000 Project Name: Venture at Laster Farms Notes: 2027 Combined
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RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	< 100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25						
25 - 49						
50 - 99						
100 - 149						
150 - 199						
200 - 249						
250 - 299						Yes
300 - 349					Yes	Yes
350 - 399				Yes	Yes	Yes
400 - 449			Yes	Yes	Yes	Yes
450 - 499			Yes	Yes	Yes	Yes
500 - 549		Yes	Yes	Yes	Yes	Yes
550 - 599		Yes	Yes	Yes	Yes	Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
Fewer Than 25						
25 - 49						Yes
50 - 99					Yes	Yes
100 - 149				Yes	Yes	Yes
150 - 199			Yes	Yes	Yes	Yes
200 - 249		Yes	Yes	Yes	Yes	Yes
250 - 299	Yes	Yes	Yes	Yes	Yes	Yes
300 - 349	Yes	Yes	Yes	Yes	Yes	Yes
350 - 399	Yes	Yes	Yes	Yes	Yes	Yes
400 - 449	Yes	Yes	Yes	Yes	Yes	Yes
450 - 499	Yes	Yes	Yes	Yes	Yes	Yes
500 - 549	Yes	Yes	Yes	Yes	Yes	Yes
550 - 599	Yes	Yes	Yes	Yes	Yes	Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

* Or through volume only if a left-turn lane exists

Intersection	Time Period	Through Volume	Right-Turn Volume	Right-Turn Lane Warranted (Yes / No)
Outlet Drive at Site Access	AM Peak	262	28	No
Outlet Drive at Site Access	PM Peak	579	100	Yes

Source: Knox County Department of Engineering and Public Works "Access Control and Driveway Design Policy"