

PROJECT MALIBU

TRAFFIC IMPACT STUDY

KNOXVILLE CENTER DRIVE
KNOXVILLE, TN

CCI PROJECT NO. 01514-0002

REV I



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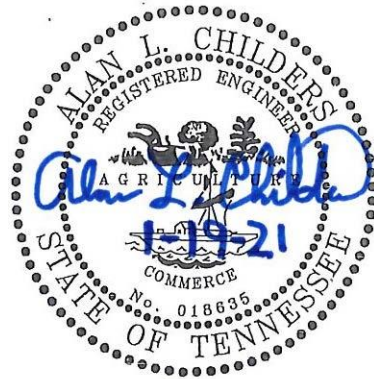
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REVISED
JANUARY 19
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REVISION I (01/19/21)

This report replaces the previous version of the traffic impact study dated 12/15/2020 prepared for this project in its entirety. The associated changes are related to comments received from the City of Knoxville and Knoxville/Knox County Planning, which are located in Appendix H.

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EXECUTIVE SUMMARY

This report provides a summary of a traffic impact study that was performed for the proposed Project Malibu development to be located on the former Knoxville Center Mall site in Knoxville, Tennessee. The project site is the existing mall and property, which is located just to the northeast of Interstate 640 and a short distance inside the northeast city limits. The conceptual development plan for this project proposes a 219,000 square-foot warehouse located on approximately 78 acres. The existing mall building will be removed and the site will be completely redeveloped. The existing Knoxville Center Drive loop road will be retained and the project will utilize the existing access points of Kinzel Way, Humphrey Road, and East Towne Road to access the site. The proposed Project Malibu development is anticipated to be completed in 2022.

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 site. Appropriate intersection evaluations were conducted at 19 study intersections for existing and future conditions, both with and without traffic volumes generated from the proposed development, in order to determine the anticipated impacts and to establish recommended measures to mitigate these impacts. These evaluations consisted primarily of intersection capacity analyses utilizing the methods of the Highway Capacity Manual (HCM2010).

The primary conclusion of this study is that the traffic generated from the proposed Project Malibu development will have very minor impacts on study area traffic conditions. This is true during the traditional AM and PM peak traffic hours, as well as the peak hours of the generator. This conclusion was assisted by the fact that the project's operation and hourly traffic distribution will be structured to minimize newly generated trips during the peak hours of adjacent street traffic.

The Tennessee Department of Transportation (TDOT) is proposing an I-640 ramp improvement project that will affect four of the study intersections. It is concluded that the improvements proposed for this project will be especially important to future operational conditions for the intersection of Washington Pike / North Mall Road / I-640 Westbound On-Ramp. While not as immediately important for the other three affected study intersections, it is concluded that these improvements are desirable and will improve intersection operations and safety.

The City of Knoxville is proposing a major improvement and widening project on Washington Pike in the study area and further to the east. It is concluded that the most affected study intersection will be the intersection of Washington Pike and Mill Road. Although just outside the study area limits, we also conclude from field observations that the section of Washington Pike from Mill Road to Murphy Road is especially in need of this improvement. This includes the intersection of Washington Pike and Murphy Road, where substantial peak period delays and queues were observed.

The following recommendations resulted from this study of current and future operational conditions for the proposed Project Malibu development:

1. The proposed TDOT I-640 ramp improvement project should be completed prior to the completion and opening of the Project Malibu development, anticipated for 2022.

2. The proposed City of Knoxville Washington Pike improvement project should be completed prior to 2027.
3. In order to provide interim congestion relief until the Washington Pike improvement project is completed, a limited scale intersection improvement project should be considered. This project would provide a northbound Mill Road free-flow right-turn lane turning into an eastbound Washington Pike acceleration lane, constructed primarily where a paved shoulder currently exists. Completion of this project by 2022 would be helpful to intersection operations, but is justified almost entirely by non-Malibu site traffic. Therefore, the City of Knoxville should determine the necessity and timing of this possible interim project.
4. A new roadway improvement project should be developed and constructed on Millertown Pike, between the north termination point of the TDOT I-640 ramp improvement project and the railroad bridge just south of Mill Road. This project would add a second northbound through traffic lane that would terminate as a dropped left-turn lane at Mill Road.
5. Care should be taken during the project site development and construction process to ensure that intersection sight distance and other important lines of sight are not restricted by new site landscaping or signage.
6. In coordination with the City of Knoxville and TDOT, site related way-finding or other directional signage changes for the area should be reviewed to ensure signage related to the former mall site is removed and any necessary signage related to the proposed site is added.
7. Upon completion and opening of the proposed Project Malibu development to full operation, new turning movement traffic counts should be obtained for the study signalized intersections and new optimized traffic signal timing developed and implemented.

INTRODUCTION & PURPOSE OF STUDY

This report provides a summary of a traffic impact study that was performed for the proposed Project Malibu development to be located on the former Knoxville Center Mall site in Knoxville, Tennessee. The project site is the existing mall and property, which is located just to the northeast of Interstate 640 and a short distance inside the northeast city limits. FIGURE 1 is a location map identifying the major roadways in the project vicinity.

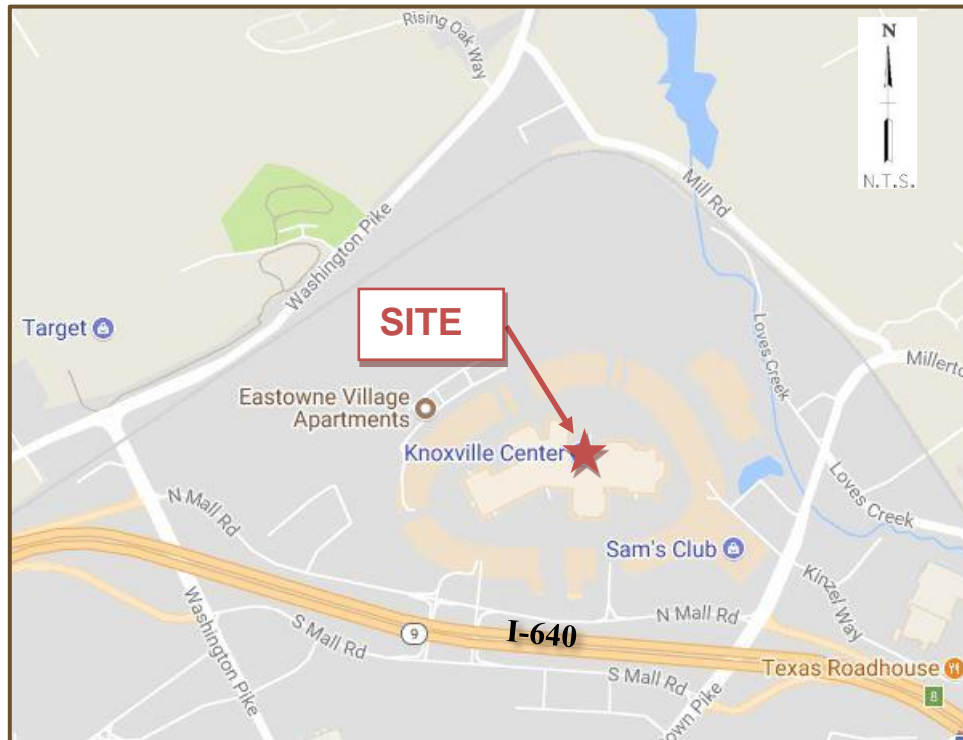


FIGURE 1
LOCATION MAP

PROJECT DESCRIPTION

The conceptual development plan for this project proposes a 219,000 square-foot warehouse located on approximately 78 acres. The existing mall building will be removed and the site will be completely redeveloped. The existing Knoxville Center Drive loop road will be retained and the project will utilize the existing access points of Kinzel Way, Humphrey Road, and East Towne Road to access the site. The proposed Project Malibu development is anticipated to be completed in 2022. FIGURE 2 is a Conceptual Site Plan which illustrates the proposed site configuration and adjacent roadways. FIGURE 2A provides a closer look at the project site and site traffic circulation.

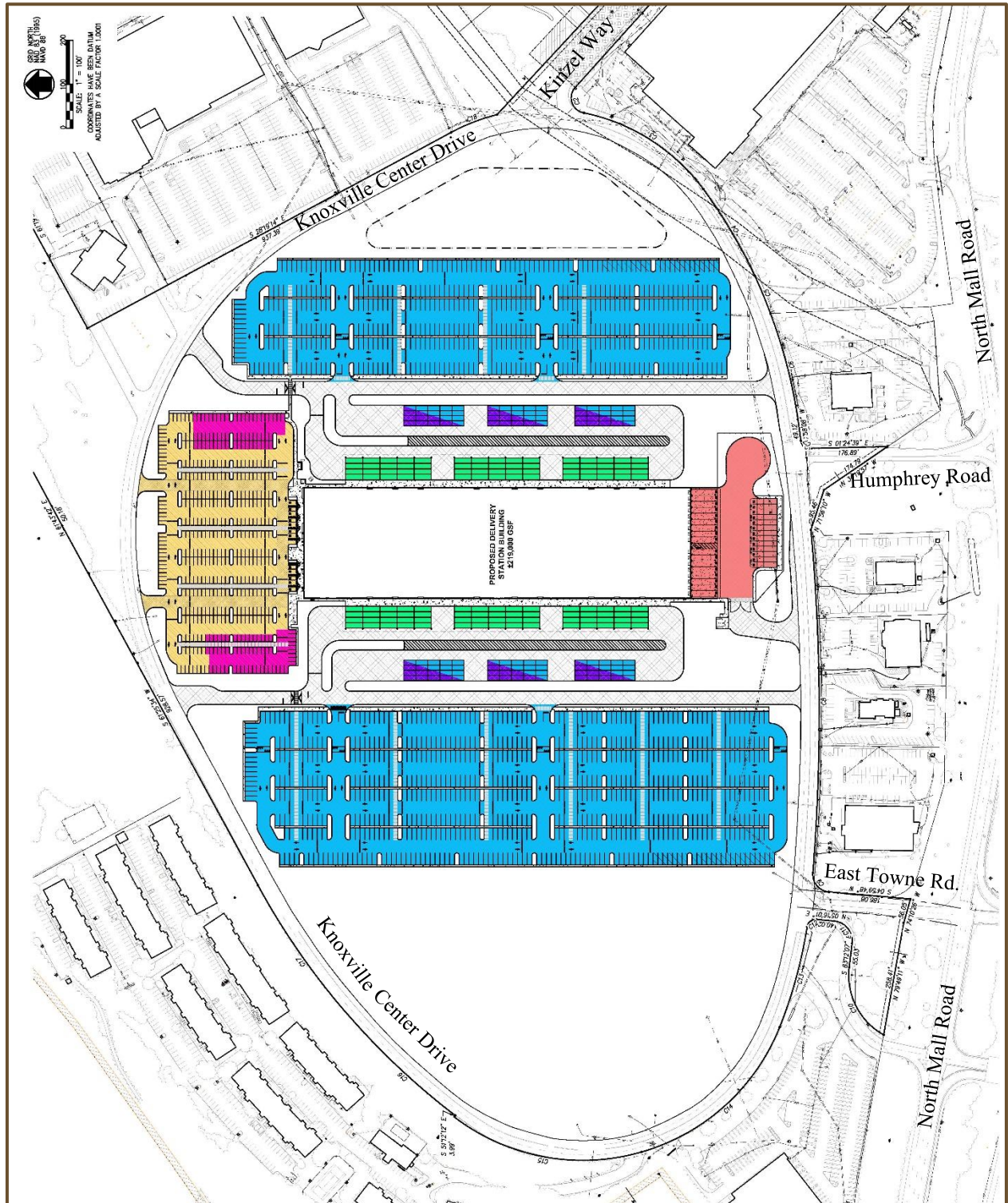


FIGURE 2
CONCEPTUAL SITE PLAN

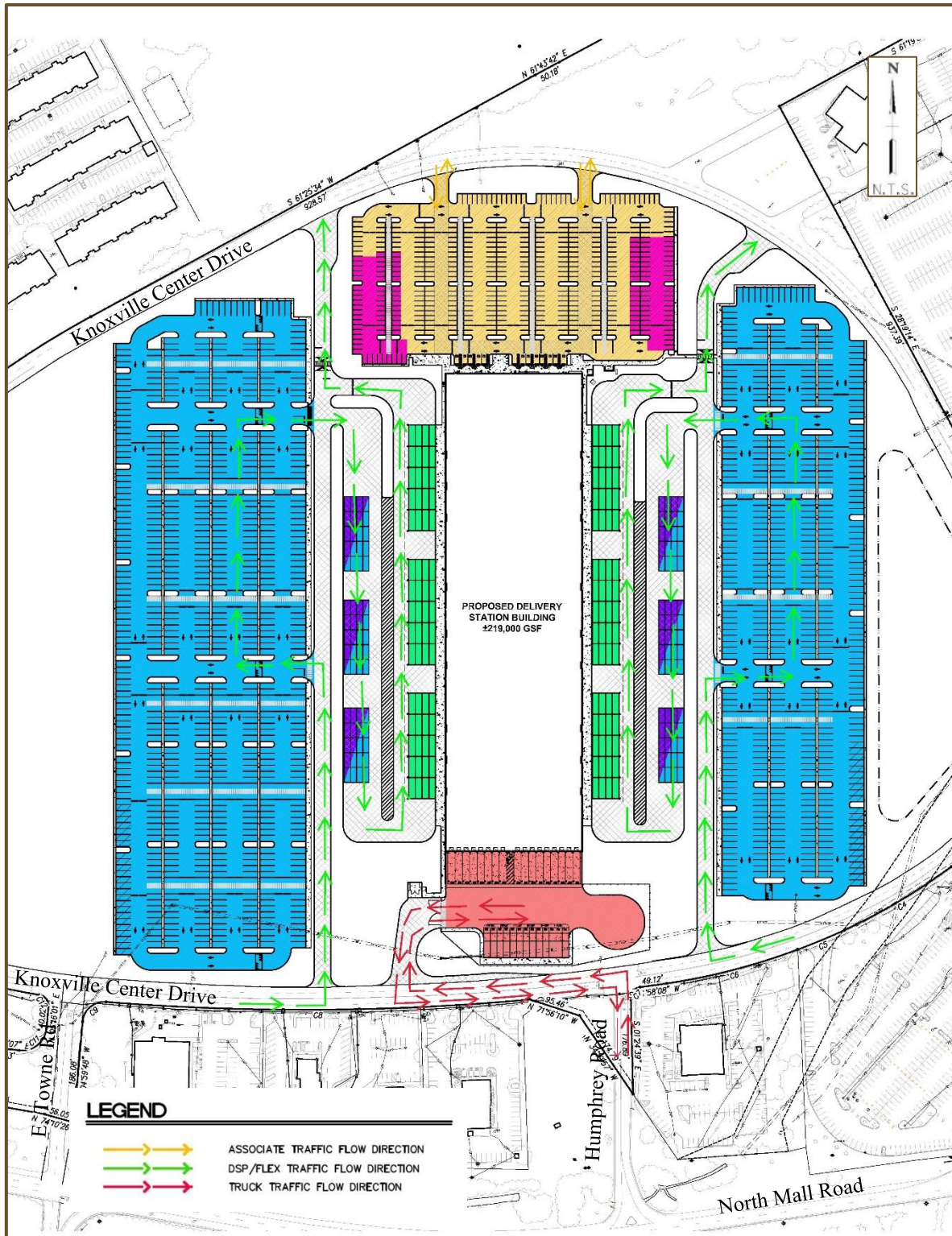


FIGURE 2A
SITE CIRCULATION

STUDY AREA

The project study area consists of 19 key intersections, which are located both on the immediate site property and on the adjacent roadways surrounding the site, with a few being located some distance from the site. All of these were selected in consultation with representatives of the City of Knoxville, the Knoxville-Knox County Metropolitan Planning Commission, and the Tennessee Department of Transportation (TDOT) and were identified as intersections that have potential to be significantly impacted by traffic generated by the proposed redevelopment. The nineteen study intersections include the following locations:

1. Washington Pike at Mill Road
2. Washington Pike at Washington Pike / Greenway Drive
3. Washington Pike at I-640 WB On-Ramp / North Mall Road
4. Washington Pike at I-640 EB Off-Ramp / South Mall Road
5. South Mall Road at East Towne Road (W)
6. South Mall Road at East Towne Road (E)
7. Millertown Pike at I-640 EB On-Ramp / South Mall Road
8. Millertown Pike at I-640 WB Off-Ramp / North Mall Road
9. Millertown Pike at Kinzel Way
10. Millertown Pike at Miller Place Way
11. Millertown Pike at Loves Creek Road
12. Millertown Pike at Mill Road
13. North Mall Road at East Towne Road (W)
14. North Mall Road at East Towne Road (E)
15. N. Mall Road at Humphrey Road
16. Knoxville Center Drive at East Towne Road
17. Knoxville Center Drive at Humphrey Road
18. Knoxville Center Drive at Kinzel Way
19. Knoxville Center Drive at Village Crest Way

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 site. Appropriate intersection evaluations were conducted at the study intersections for existing and future conditions, both with and without traffic volumes generated from the proposed development, in order to determine the anticipated impacts and to establish recommended measures to mitigate these impacts. These evaluations consisted primarily of intersection capacity analyses utilizing the methods of the Highway Capacity Manual (HCM2010).

EXISTING CONDITIONS

EXISTING ROADWAY CONDITIONS

Interstate 640 is located to the immediate south of the project site. It possesses six basic traffic lanes, three in each direction, and as with all interstate highways the facility is fully access controlled. Access from I-640 to the other area roadways is provided by two diamond type interchanges. One of these is located on the east side of the site at Millertown Pike and the other on the west side of the site at Washington Pike. The speed limit on I-640 in the study area is posted as 65 mph. The 2019 ADT on I-640 was 79,741 to the west of the site and 74,397 to the east of the site.

The two I-640 interchanges are connected by frontage roads that parallel the interstate, North Mall Road on the north side of the interstate and South Mall Road on the south side. Each of these one-way roadways possesses two traffic lanes with turn lanes at select intersections, and they are each one-way in the same direction as the adjacent interstate lanes. They also have speed limits posted as 40 mph. Two bridges span the interstate about one-half way between the two interchanges, and they connect the two frontage roads and then continue on into the former mall property to the north. Five study intersections are located on the two Mall Road frontage roads, between Millertown Pike and Washington Pike, all of which possess some form of stop sign traffic control.

Millertown Pike is located on the east side of the site, running perpendicular to the interstate and the two Mall Roads. It varies in width in the study area, being four-lane median divided with various turn lanes to the south, in the area crossing the interstate and immediately adjacent to the site. It narrows to two and three lanes on to the north, as the roadway departs the immediate site vicinity. The posted speed limit on Millertown Pike in the study area is 35 mph. Five traffic signals are located on Millertown Pike in the study area; at South Mall Road/I-640, North Mall Road/I-640, Kinzel Way, Loves Creek Road and Mill Road. All five of these intersections are study intersections for this project. The 2019 ADT on Millertown Pike just north of the project site was 18,428.

Washington Pike is located to the west and north of the site, and is broken into two distinct sections. The first section runs generally perpendicular to the interstate and the two Mall Roads. It is a four lane roadway with a center median and turn lanes at select locations. The second section of Washington Pike begins at its intersection with Greenway Drive, where the roadway turns 90 degrees and extends to the northeast, departing the site area. This section is mostly two lanes in width, with turn lanes at the Greenway Drive intersection, the Mill Road intersection, and two other intermediate locations. The first (four-lane) section possesses four signalized intersections, three of which are study intersections for this project; South Mall Road/I-640, North Mall Road/I-640, and Greenway Drive. The second section of Washington Pike, the one running northeast beyond Greenway Drive, possesses only one study intersection, which is the signalized intersection with Mill Road. The posted speed limit on both study sections of Washington Pike is 40 mph. The 2019 ADT on Washington Pike was 20,856 north of I-640 and 10,214 south of I-640.

Knoxville Center Drive is an internal perimeter ring road that completely encircles the project site, as well as a number of existing land uses located on the outside of the ring road. The southern two quadrants of this roadway possess four traffic lanes, two in each direction, separated by a double yellow centerline. The northern two quadrants are three lanes wide, two of which go in the counterclockwise direction and one in the clockwise direction. These lanes are also separated by a

double yellow centerline between the lanes in opposite directions. Four study intersections are located along the perimeter ring road, three of which possess all-way stop traffic control. These include East Town Road, Humphrey Road and Kinzel Way. The fourth intersection, Village Crest Way, is stop controlled on the side street.

EXISTING SITE CONDITIONS

The existing project site consists of approximately 78 acres and was previously developed into a major regional shopping mall, originally known as East Town Mall. The gross leasable area of the existing buildings is slightly over 961,000 square feet. Like many similar malls in the United States, Knoxville Center Mall suffered in recent years and ultimately closed in January 2020. In addition to the former mall building adjacent properties lying beyond this ring road consist primarily of other shopping and restaurant facilities, and the Village Crest apartments. Loves Creek lies to the east and north of the site, and steep-hilly terrain is located to the immediate north. FIGURE 3 provides an aerial photograph of the existing site conditions.



FIGURE 3
EXISTING SITE CONDITIONS

EXISTING TRAFFIC DATA

The Tennessee Department of Transportation (TDOT), the City of Knoxville, and the Knoxville/Knox County Metropolitan Planning Commission (MPC) collect annual average daily traffic (AADT) data on roadways in the study area. Thirteen count stations were identified on study roadways in the vicinity of the project site which are likely to have particular relevance for this study. The most recent year estimated AADT data from these stations are contained in Table 1.

TABLE 1: ANNUAL AVERAGE DAILY TRAFFIC COUNT SUMMARY

STATION ID NUMBER	COUNT STATION LOCATION	2019 ESTIMATED AADT
093T331	I-640, East of Broadway	79,741
093T332	I-640, South of Buffat Mill Road Overpass	74,397
093T576	North Mall Road, West of Millertown Pike	6,890
093T577	South Mall Road, West of Millertown Pike	6,523
093T265	Millertown Pike, East of Spring Hill Road	7,032
093T384	Millertown Pike, South of Loves Creek Road	18,428
093T261	Millertown Pike, West of Mary Emily Lane	8,541
093T388	Loves Creek Road, South of Old Millertown Pike	5,023
093T308	Washington Pike, South of Valley View Drive	10,113
093T383	Washington Pike, North of I-640	20,856
093T508	Greenway Drive, East of Beverly Road	6,492
093M035	Washington Pike, 200' West of Mill Road	14,150
093T041	Mill Road, South of Washington Pike	12,215

In addition to the available AADT data, intersection turning movement traffic counts were conducted at the existing study intersections to determine the current peak hour operating volumes. The traffic counts were conducted during September 2020. During this time, regional traffic volumes and patterns were recovering from COVID-19 pandemic restrictions including, business and school closures and widespread telecommuting or working from home practices. Due to concerns related to the validity of the intersection turning movement traffic counts, prior turning movement counts conducted at the study intersections in 2017 were reviewed in order to assist in validating the results of the intersection turning movement counts conducted in September 2020. The 2017 traffic data was forecasted to the year 2020 by applying a 2% annual growth factor.

After comparing the 2020 forecasted volumes from the 2017 counts to the counts conducted in September 2020, the September 2020 volumes were found to be between 15% and 40% lower than the 2020 forecasted volumes in some movements. In consultation with the City and TDOT, the September 2020 count data was increased by 20% to address reductions in typical travel volumes due to the ongoing pandemic. The adjusted 2020 base traffic data is summarized on FIGURES 4A and 4B and the raw data traffic count summary sheets are contained in APPENDIX A.

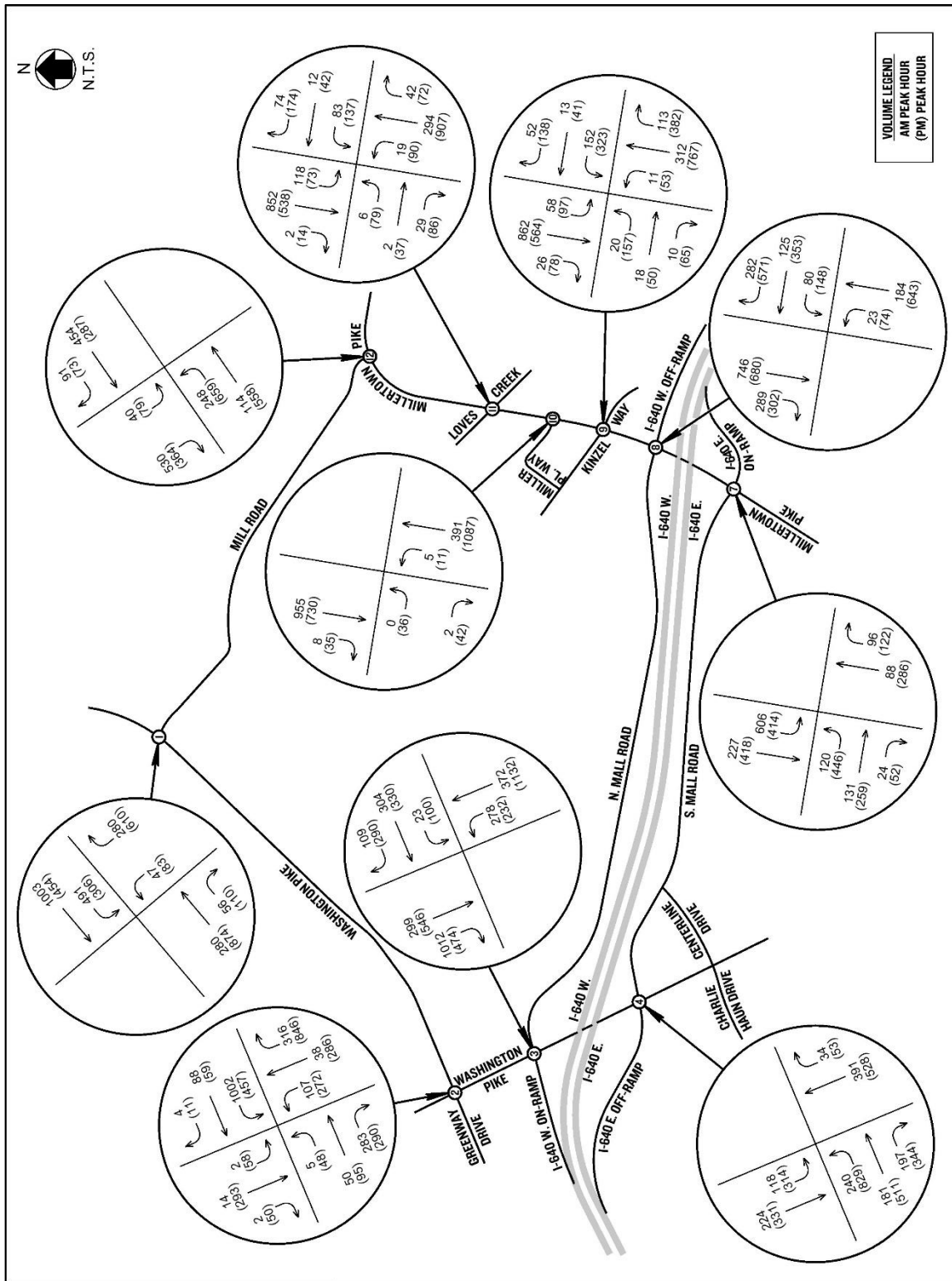


FIGURE 4A
 2020 EXISTING TRAFFIC DATA (STUDY AREA)

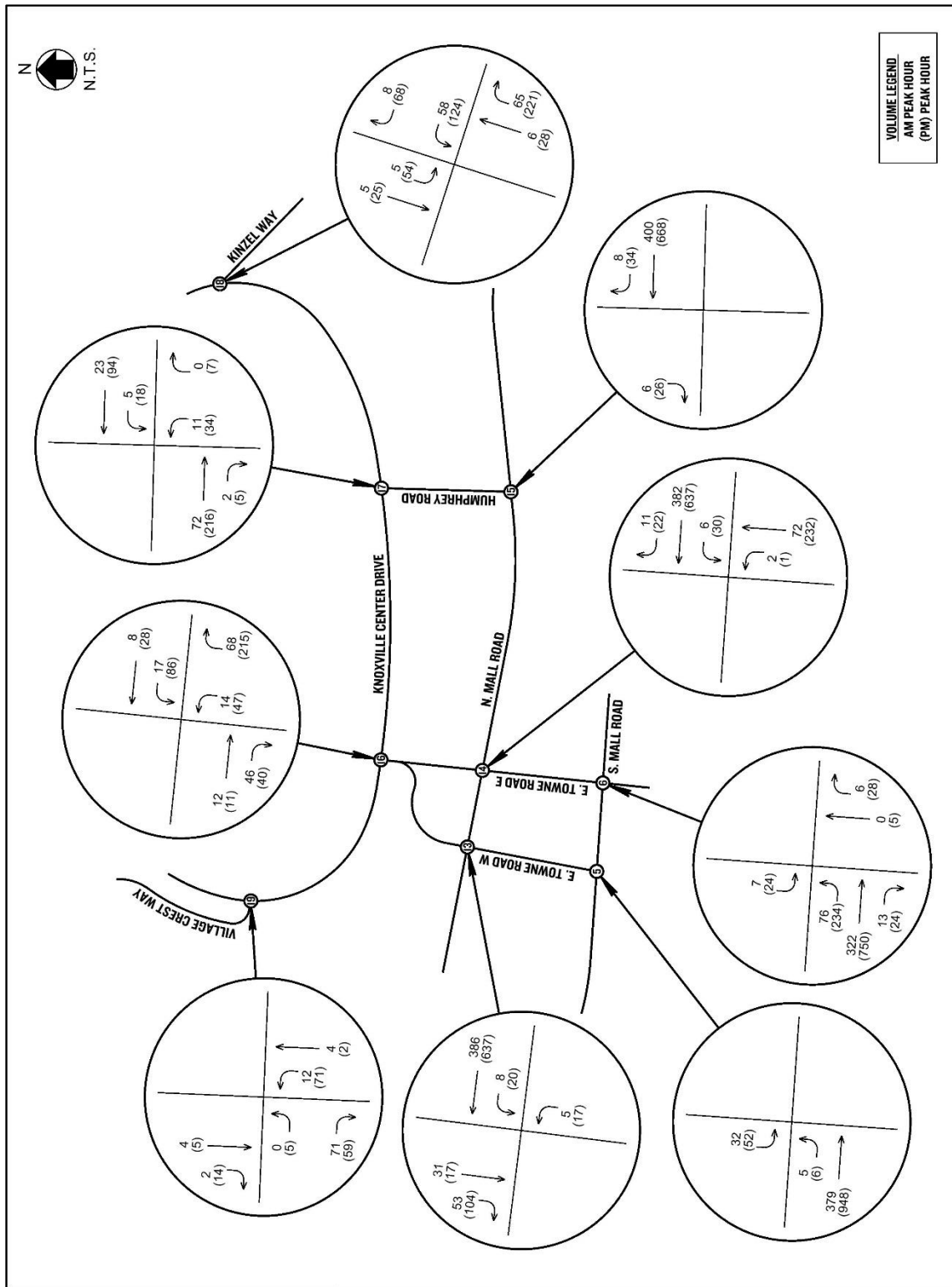


FIGURE 4B
 2020 EXISTING TRAFFIC DATA (SITE VICINITY)

EXISTING CAPACITY ANALYSES / LEVELS-OF-SERVICE

Capacity analyses for this project were conducted for the study intersections utilizing the methods of the Highway Capacity Manual (HCM2010). The results of these analyses for the existing traffic conditions are presented and discussed in the EVALUATIONS section of this report. More detailed information is contained on the capacity software print-out summaries contained in APPENDIX B, which also includes information pertaining to capacity and level-of-service concepts.

4.0 BACKGROUND CONDITIONS

BACKGROUND TRAFFIC GROWTH

The proposed development is anticipated to be constructed in one general phase with completion in year 2022. Therefore, year 2022 was established as the first evaluation year for this project. Year 2027 was also established as an evaluation year, as this is five years beyond the anticipated completion of the development and TDOT recommends this type of assessment of future conditions.

Background trips were established for each of the evaluation years in order to account for new traffic growth that will likely occur with or without the proposed project. For future evaluation years 2022 and 2027, this involved growing the existing 2020 traffic by 2.0 percent per year for the appropriate number of years. This value was selected after review of historical AADT growth trends in the area.

FIGURES 5A and 5B contain the background traffic volumes that would result from a 2.0% annual growth rate from year 2020, when the counts were conducted, to the first analysis year of 2022. The background traffic volumes shown on these figures represent year 2022 background traffic conditions, which is without traffic related to the proposed development. FIGURES 5C and 5D contain the background traffic volumes that would result from a 2.0% annual growth rate from year 2020, when the counts were conducted, to the second analysis year of 2027.

BACKGROUND CAPACITY ANALYSES / LEVELS-OF-SERVICE

As mentioned in the EXISTING CONDITIONS section of this report, capacity analyses for this project were conducted for the study intersections utilizing the methods of the Highway Capacity Manual (HCM2010). The results of these analyses for the background traffic conditions are presented and discussed in the EVALUATIONS section of this report. More detailed information is contained on the capacity software print-out summaries contained in APPENDIX B, which also includes information pertaining to capacity and level-of-service concepts.

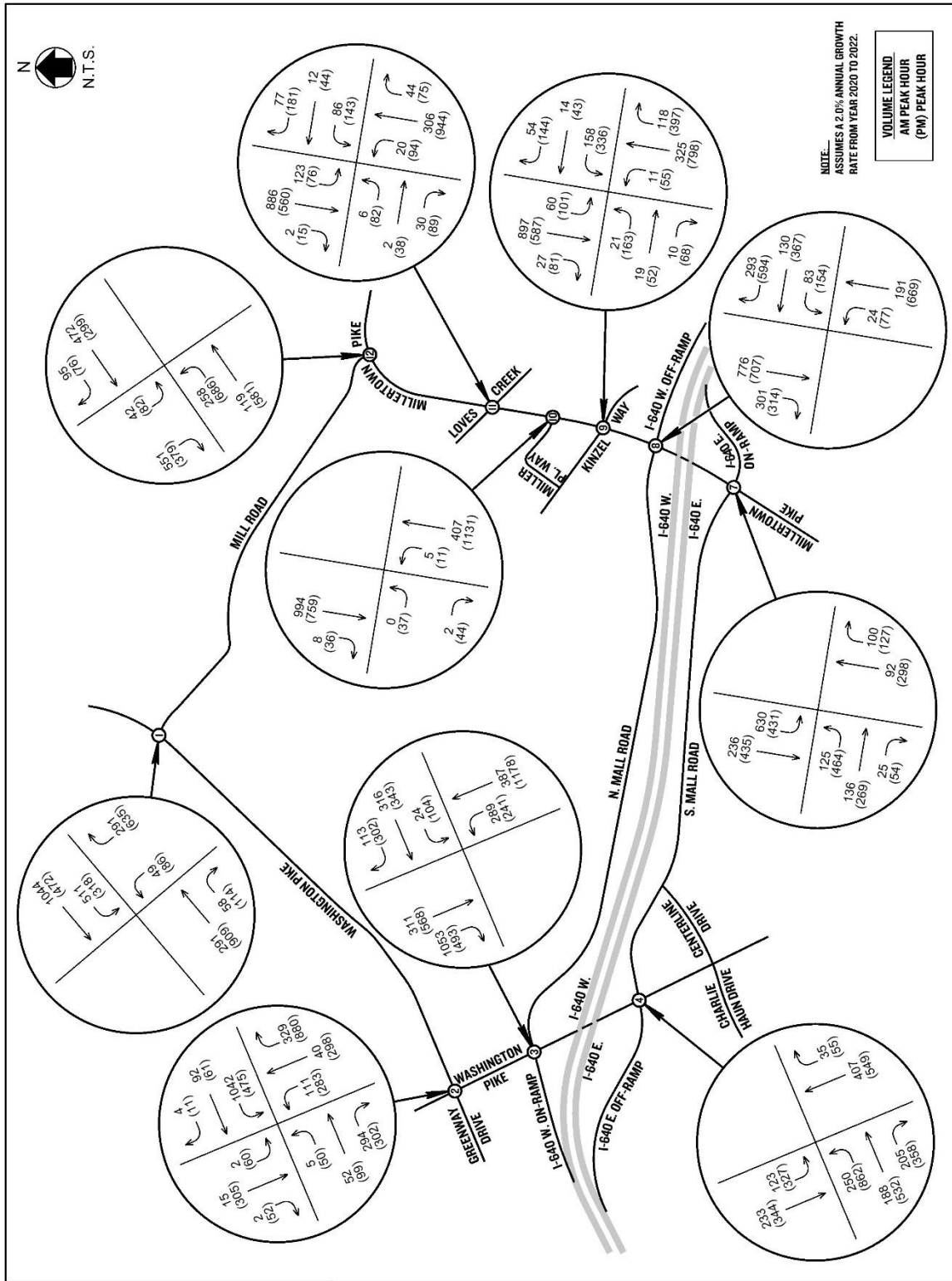


FIGURE 5A
2022 BACKGROUND TRAFFIC VOLUMES (STUDY AREA)

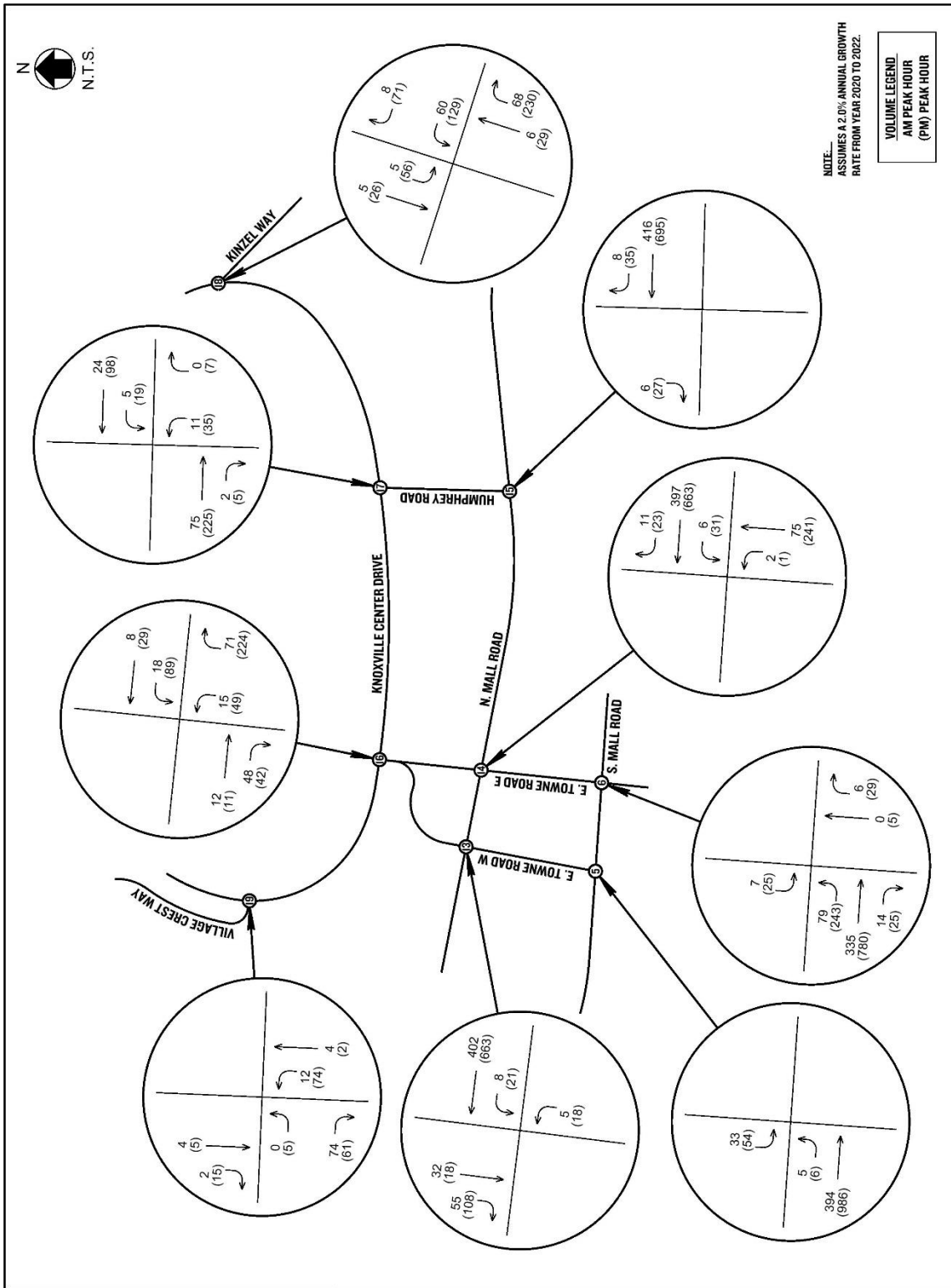


FIGURE 5B
2022 BACKGROUND TRAFFIC VOLUMES (SITE VICINITY)

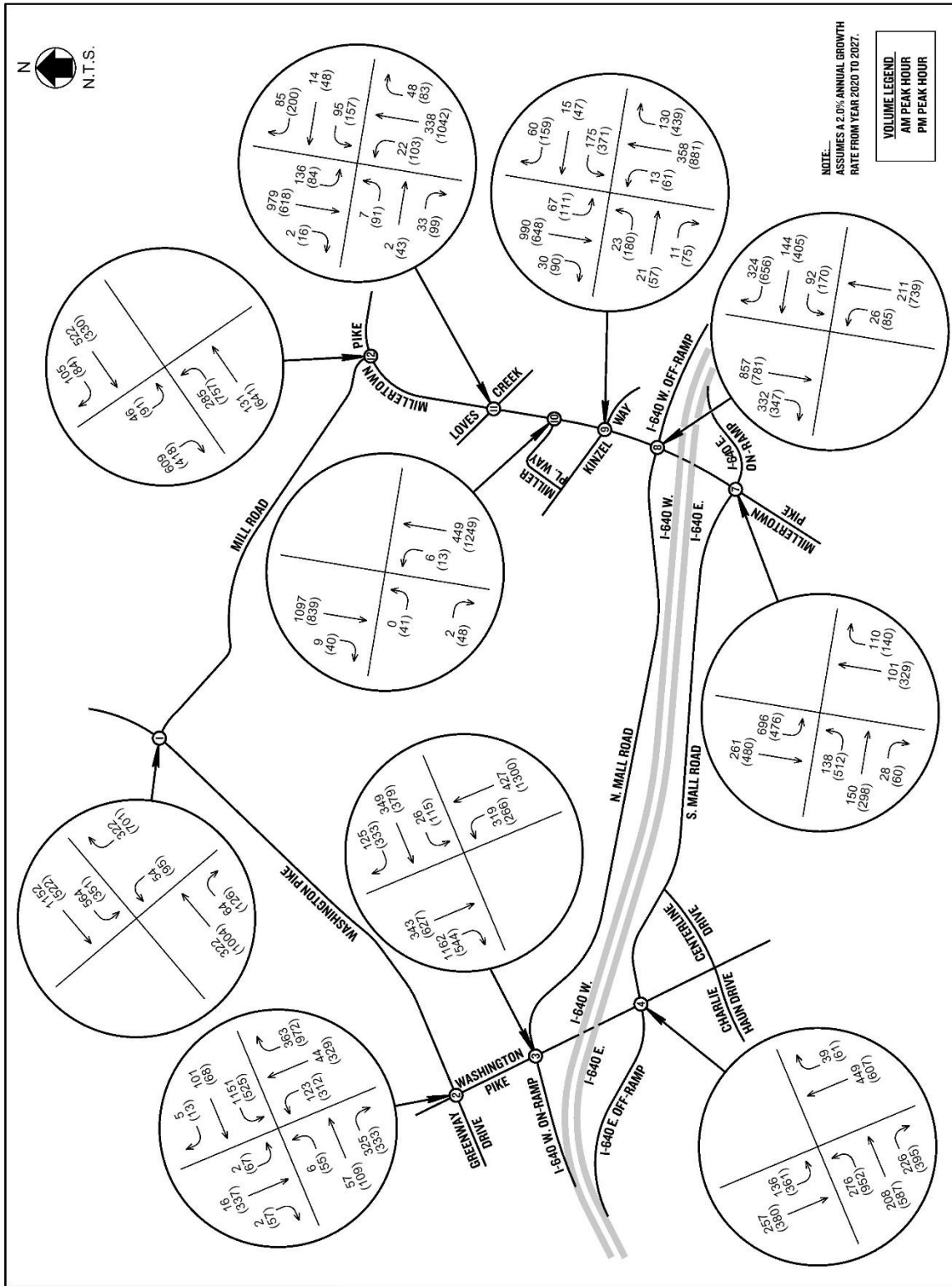


FIGURE 5C
2027 BACKGROUND TRAFFIC VOLUMES (STUDY AREA)

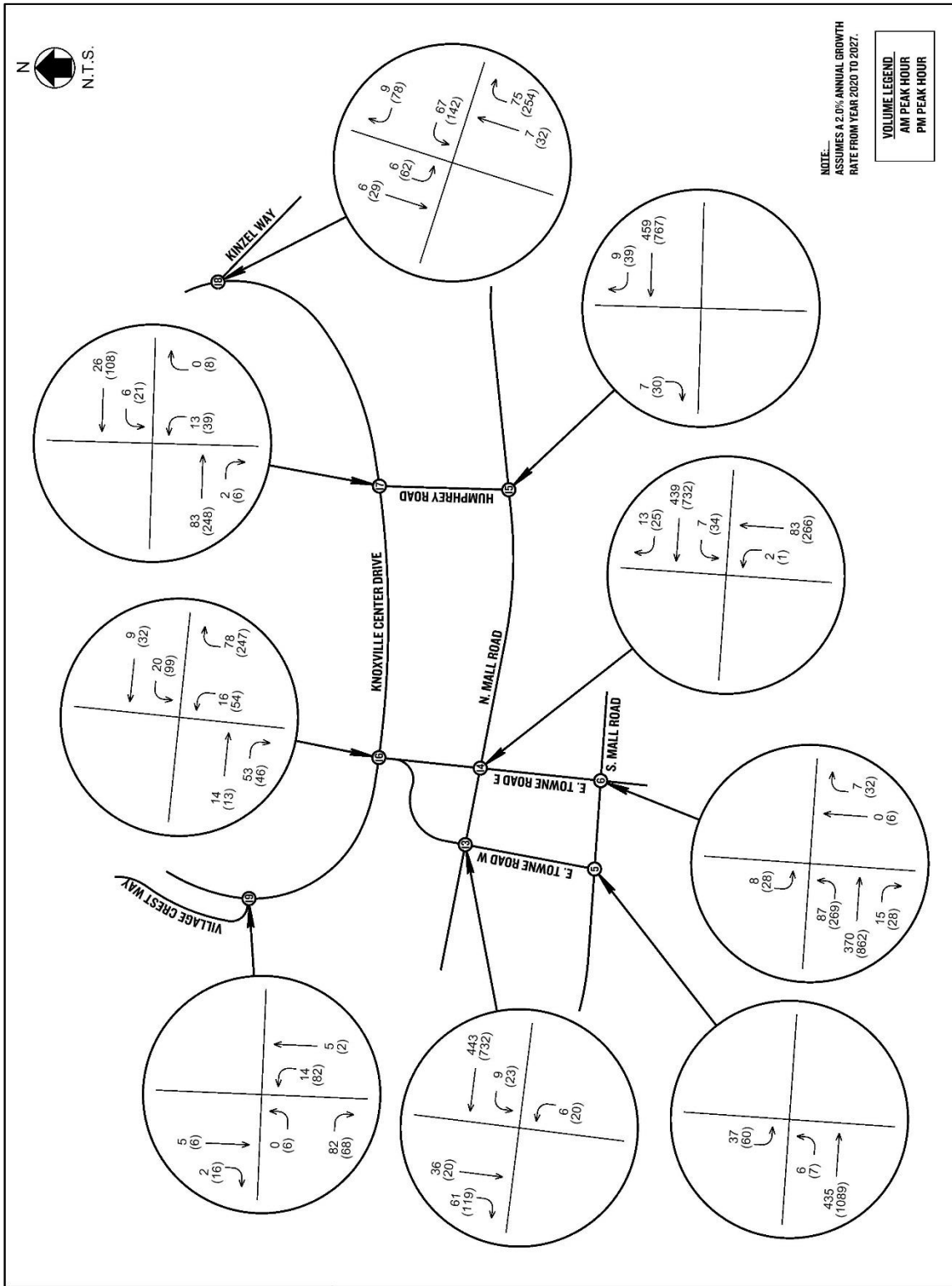


FIGURE 5D
2027 BACKGROUND TRAFFIC VOLUMES (SITE VICINITY)

5.0 FUTURE CONDITIONS

TRIP GENERATION

The trip generation estimates for the proposed development were calculated based on site specific trip generation information provided by the future tenant. A detailed trip generation table with an hourly breakdown of data is provided in APPENDIX C for typical weekday site traffic. The total vehicle trips anticipated to be generated by the project during the critical AM and PM peak traffic hours are summarized in TABLE 2 for the typical weekday site traffic.

TABLE 2: TRIP GENERATION SUMMARY (PEAK OF ADJACENT STREET)

VEHICLE	DAILY			AM PEAK HOUR (7:15 A.M. – 8:15 A.M.)			PM PEAK HOUR (4:45 P.M. – 5:45 P.M.)		
	ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Employees	633	633	1,326	0	0	0	0	0	0
Service Vehicles									
Trucks	32	32	64	1	2	3	2	1	3
Delivery Vans	461	461	922	0	0	0	0	90	90
TOTAL	1,156	1,156	2,312	1	2	3	2	91	93

The characteristics of the proposed development involves a 24/7 operation to support sortation and delivery of goods. The scheduling of employee shifts and delivery of goods is structured to mitigate traffic impacts during typical peak traffic periods. As shown in TABLE 2, the majority of the service vehicle trips, and essentially all of the employee commuting trips occur outside of the A.M. and P.M. peak traffic periods of the surrounding street network.

As mentioned, the operation of the proposed development involves several shifts spread out over a 24-hour period. The operation begins with the arrival of line haul trucks delivering goods to the facility between the hours of 10:00 P.M. and 8:00 A.M. Sortation employees arrive prior to 2 A.M. to sort and ready the goods for delivery. Sortation employees depart after 12:30 P.M. Delivery employees are anticipated to arrive between 9:00 A.M. to 10:30 A.M. Delivery vehicles begin departing the facility around 10:00 A.M. under a regulated flow until just after 11:00 A.M. Delivery vehicles return to the facility between 7:00 P.M. and 9:00 P.M. Delivery employees depart after returning their delivery vehicle to the facility. A summary of the trip generation estimates for the A.M. and P.M. peak of the generator are shown in TABLE 2A. As shown, the peak periods associated with the proposed facility occur between 10:00 A.M. to 11:00 A.M. and 7:30 P.M. to 8:30 P.M. Both of these periods occur during times of lesser traffic volumes on the study area roadways.

TABLE 2A: TRIP GENERATION SUMMARY (PEAK OF THE GENERATOR)

VEHICLE	AM PEAK HOUR (10:00 A.M. – 11:00 A.M.)			PM PEAK HOUR (7:30 P.M. – 8:30 P.M.)		
	ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Employees	185	0	185	0	233	233
Service Vehicles						
Trucks	0	1	1	2	2	4
Delivery Vans	0	336	336	233	0	233
TOTAL	185	337	522	235	235	470

TRIP DISTRIBUTION AND ASSIGNMENT

The generated trips presented in TABLE 2 were distributed and assigned to the roadway system, including the study intersections. The figures listed below, which are presented in APPENDIX D, summarize the steps taken to develop the site generated trip assignments. FIGURES D-1A through D-1D provide a summary of the entering and exiting trip distribution patterns assumed for this study. These patterns were based on the existing traffic patterns derived from traffic counts conducted at the study intersections and employment data obtained from the U.S. Census Bureau for the study area. FIGURES 6A and 6B provide a summary of the generated trips as assigned to the study intersections.

- FIGURES D-1A / D-1B – Trip Distribution for Employees
- FIGURES D-1C / D-1D – Trip Distribution for Service Vehicles

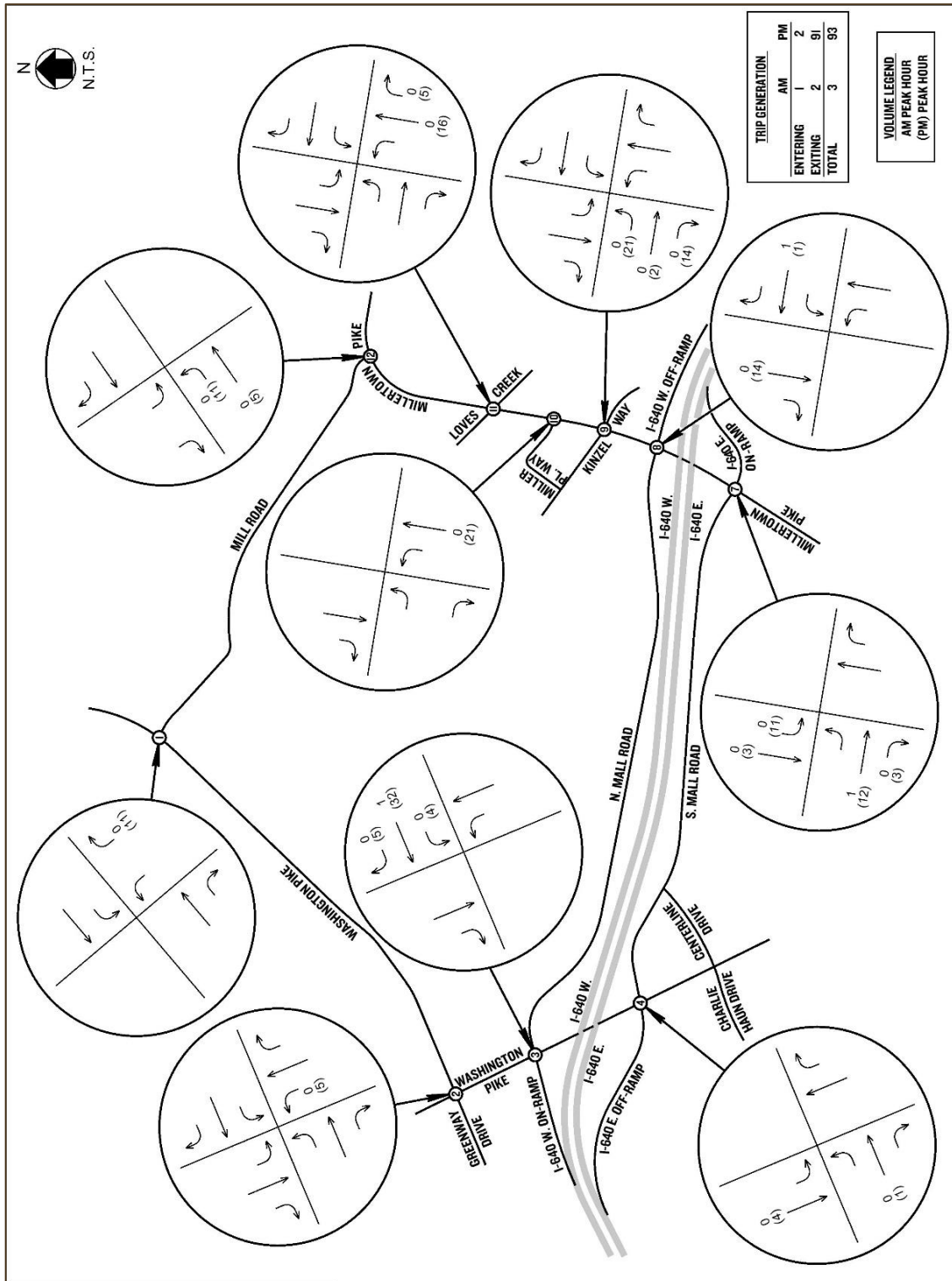


FIGURE 6A
GENERATED TRIPS

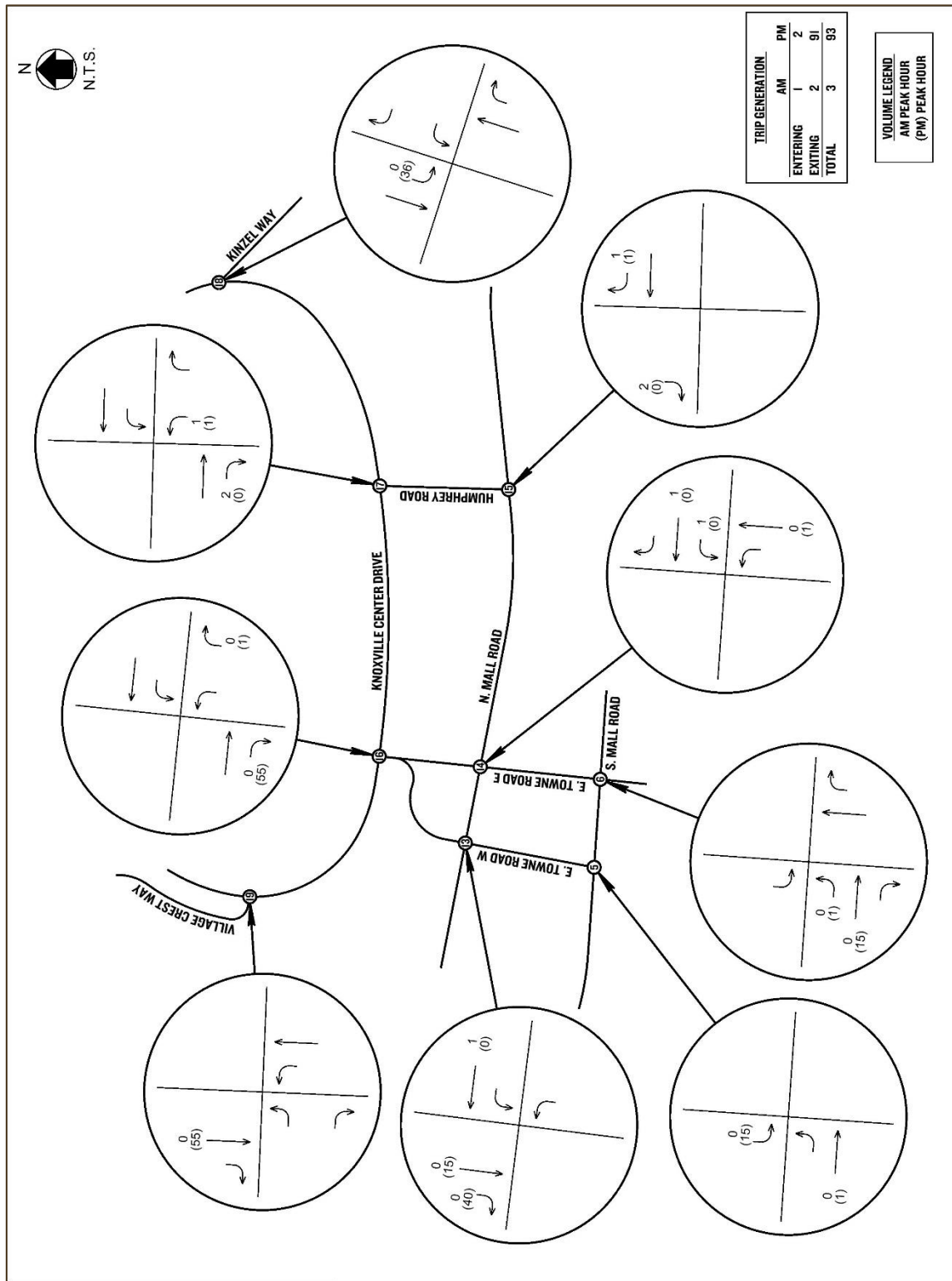


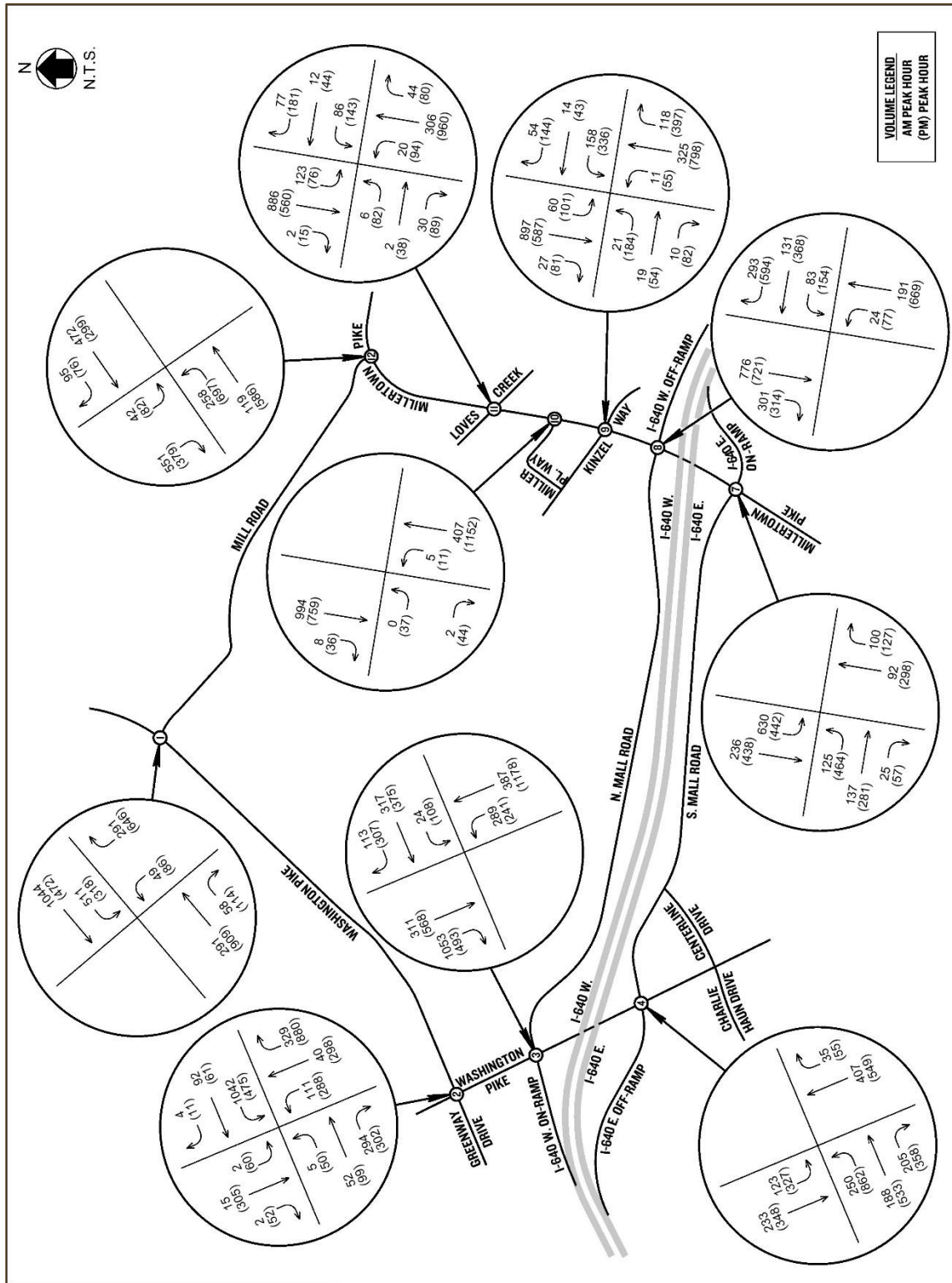
FIGURE 6B
GENERATED TRIPS

FUTURE TRAFFIC VOLUMES

Future projected traffic volumes were developed by adding the generated trips shown in FIGURES 6A and 6B to the 2022 and 2027 background traffic volumes developed in the previous section (FIGURES 5A through 5D). The combined year volumes reflect the existing traffic, the background traffic growth, and the anticipated newly generated traffic from the proposed development. FIGURES 7A and 7B represent the 2022 combined traffic data with trips generated from the proposed development while FIGURES 7C and 7D represent the 2027 combined traffic data with trips generated from the proposed development. The volumes shown on FIGURES 7A through 7D are the combined volumes used in the analysis of the future conditions.

FUTURE CAPACITY ANALYSES / LEVELS-OF-SERVICE

As mentioned in the EXISTING CONDITIONS section of this report, capacity analyses for this project were conducted for the study intersections utilizing the methods of the Highway Capacity Manual (HCM2010). The results of these analyses for the combined future traffic conditions are presented and discussed in the EVALUATIONS section of this report. More detailed information is contained on the capacity software print-out summaries contained in APPENDICES E and F.



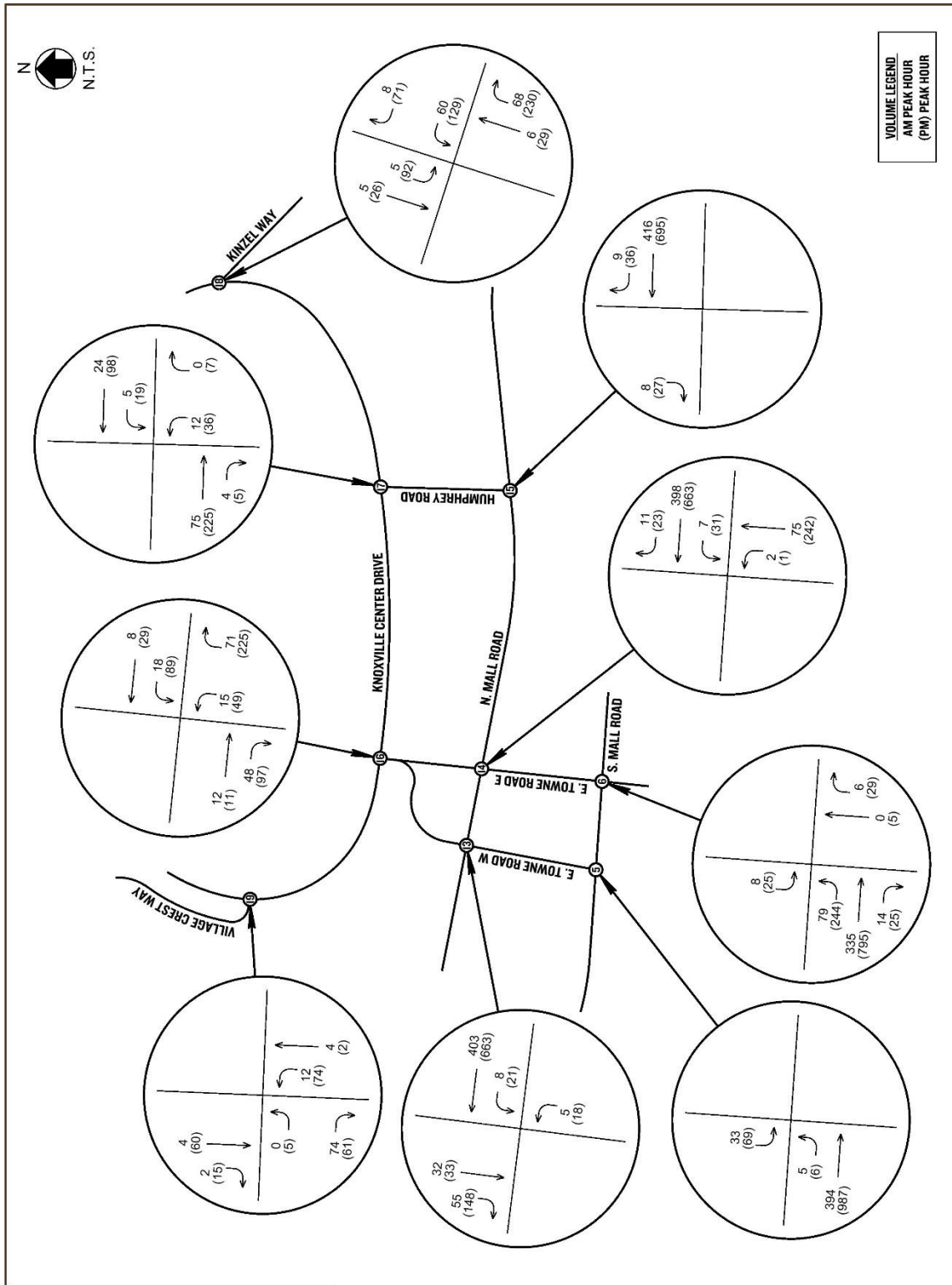


FIGURE 7B
 2022 COMBINED TRAFFIC VOLUMES (SITE VICINITY)

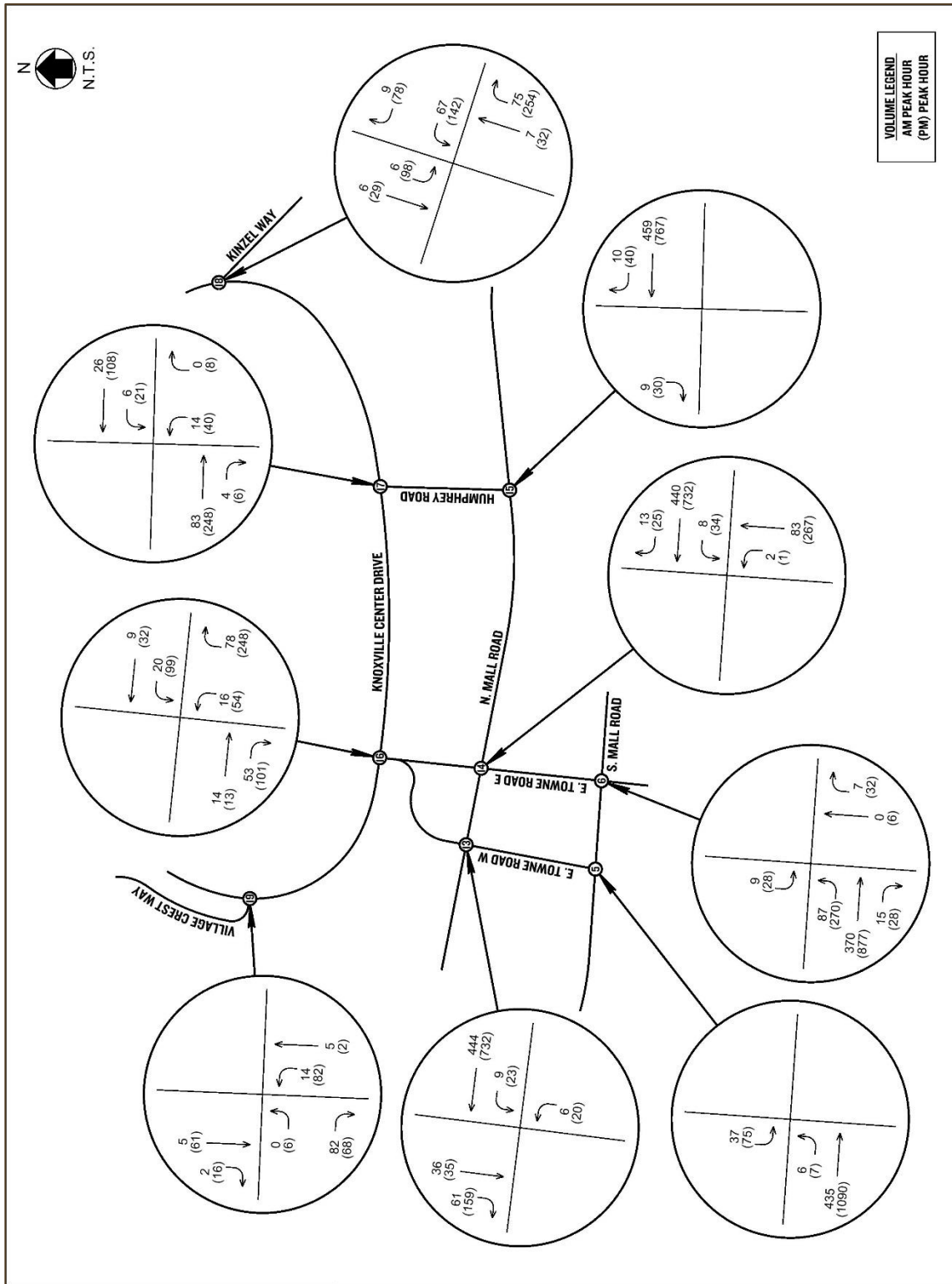


FIGURE 7D
 2027 COMBINED TRAFFIC VOLUMES (SITE VICINITY)

6.0 EVALUATIONS

INTERSECTION CAPACITY ANALYSES AND PROPOSED IMPROVEMENTS

The primary evaluation methodology employed in this study involved capacity analyses of the project study intersections utilizing the methods of the Highway Capacity Manual (HCM2010). The results of these analyses for the existing, background and combined future traffic conditions are presented and discussed in the paragraphs below, including the referenced figures. More detailed information is contained on the capacity software print-out summaries contained in APPENDICES B, E, and F, which also includes information pertaining to capacity and level-of-service concepts.

The intersection capacity analyses conducted for the project study intersections were performed for the following relevant traffic volume, lane geometry, and traffic signal timing conditions (results shown on indicated figures):

1. 2020 EXISTING traffic volumes with existing intersection geometry and optimized traffic signal timing – The conducted traffic counts did require some factoring and volume manipulation due to COVID-19 pandemic related concerns. The methodology employed is discussed in the EXISTING CONDITIONS section of this report. (see FIGURES 8A and 8B)
2. 2022 BACKGROUND traffic volumes with existing intersection geometry, except for those intersections where TDOT I-640 ramp improvements are currently planned to be implemented by that date. Optimized traffic signal timing was also utilized. (see FIGURES 9A and 9B)
3. 2027 BACKGROUND traffic volumes with existing intersection geometry, except for those intersections where TDOT I-640 ramp improvements and City of Knoxville Washington Pike improvements are currently planned to be implemented by that date. Optimized traffic signal timing was also utilized. (see FIGURES 9C and 9D)
4. 2022 COMBINED traffic volumes with existing intersection geometry, except for those intersections where TDOT I-640 ramp improvements are currently planned to be implemented by that date. Optimized traffic signal timing was also utilized. (see FIGURES 10A and 10B)
5. 2022 COMBINED traffic volumes similar to No. 4 above, except proposed improved intersection geometry added for intersections with capacity issues identified by No. 4 analyses. (see FIGURES 10C and 10D)
6. 2027 COMBINED traffic volumes with existing intersection geometry, except for those intersections where TDOT I-640 ramp improvements and City of Knoxville Washington Pike improvements are currently planned to be implemented by that date. Optimized traffic signal timing was also utilized. (see FIGURES 11A and 11B)
7. 2027 COMBINED traffic volumes similar to No. 6 above, except proposed improved intersection geometry added for intersections with capacity issues identified by No. 6 analyses. (see FIGURES 11C and 11D)

As discussed above, capacity analyses were performed to arrive at possible solutions to identified level-of-service (LOS) issues (LOS "E" or "F" conditions on any traffic movement). The improvements resulting from these analyses are discussed below for each intersection where an issue was identified.

1) Washington Pike at Mill Road

This issue involves the northbound and eastbound traffic movements, some of which will experience LOS E/F conditions during the PM peak hour. The Existing and 2022 Background capacity analyses confirm that this issue is independent of the proposed Project Malibu development, whose traffic would only result in a negligible worsening of these conditions. Washington Pike is proposed for a major widening project by the City of Knoxville which will address this situation, with the current schedule anticipating project completion prior to 2027. If an interim measure is deemed desirable to address this issue before completion of the widening project, this study identified the installation of a northbound Mill Road free-flow right-turn lane terminating into an eastbound Washington Pike acceleration lane as the most cost-effective solution.

2) Washington Pike at North Mall Road / I-640 Westbound On-Ramp

The southbound right-turn movement at this intersection possesses an extreme volume during the AM peak hour resulting in poor level-of-service conditions for one or more movements depending on how signal timing is configured. This was confirmed by the Existing capacity analyses. TDOT has a ramp improvement project in the planning stages to address this issue. The proposed solution is to make the southbound right-turn movement a free-flow right-turn onto the I-640 ramp, with an associated adjustment in the westbound lane use on the North Mall Road approach. The anticipated completion date of the TDOT ramp improvement project is 2022.

3) Washington Pike at South Mall Road / I-640 Eastbound Off-Ramp

The existing capacity analyses indicate that this intersection experiences level-of-service issues on the eastbound off-ramp approach during both the AM and PM peak hours. In addition, these issues will most likely worsen without improvement. The TDOT ramp improvement project discussed in No. 2 above is planned to address this issue by adding a traffic lane to this approach.

4) Millertown Pike at South Mall Road / I-640 Eastbound On-Ramp

The existing capacity analyses indicate that this intersection experiences acceptable level-of-service conditions during both the AM and PM peak hours. However, some of the eastbound movements are approaching LOS E, with the expectation that these unacceptable conditions will be reached in the not-to-distant future. The TDOT ramp improvement project discussed above will address these future concerns by modifying the lane use configuration of the eastbound approach traffic lanes.

5) Millertown Pike at North Mall Road / I-640 Westbound Off-Ramp

Similar to item No. 4 above, existing capacity analyses indicate currently acceptable conditions, some of which would be expected to deteriorate to unacceptable conditions in the not-to-distant future. This is especially a concern for the westbound off-ramp right-turn movement, which possesses very heavy PM peak hour volumes. The TDOT ramp improvement project discussed above will address this issue by adding a second right-turn lane on the westbound off-ramp approach.

6) Millertown Pike from Kinzel Way to beyond Loves Creek Road

This section of roadway experiences level-of-service issues, especially during the PM peak hour. This results primarily from high northbound traffic volumes departing the I-640 area. This traffic is currently provided only one northbound through traffic lane, which creates level-of-service issues at both the Kinzel Way and Loves Creek Road signalized intersections. Existing capacity analyses indicate PM peak LOS E for several movements at the Kinzel Way intersection and LOS D at the Loves Creek Road intersection. Both of these intersections possess high volume to capacity ratios, meaning that relatively small increases in traffic in the future will likely result in a rapid deterioration in delay and level-of-service conditions. In fact, the 2027 background capacity analyses indicate LOS E for the northbound traffic movement at Loves Creek Road.

The previously mentioned TDOT ramp improvement project proposes a second northbound traffic lane to be constructed from the I-640 Westbound Off-Ramp to Kinzel Way and a few hundred feet beyond. While this improvement will help the Kinzel Way intersection, it will do nothing for the Loves Creek Road intersection as it will taper back to one northbound lane prior to the intersection. In addition, the associated merging will create operational and safety concerns, especially during high traffic volume periods. If this lane were continued on through the Loves Creek Road intersection, up to Mill Road where it could drop as a left-turn lane, acceptable level-of-service conditions would be anticipated for both of these intersections during both AM and PM peak hours.

SIGHT DISTANCE ASSESSMENT

Intersection sight distance was not assessed in detail since the proposed site access intersections are existing intersections. The “windshield” review that was conducted did not identify any instances where sight distance values appeared deficient. Care should be taken during the site development process to confirm this conclusion and to ensure that new site landscaping and signage does not restrict intersection lines-of-sight.

EVALUATION OF PEAK HOURS OF GENERATOR

In addition to the traditional evaluation of the “peak of adjacent street” traffic conditions, additional evaluation was conducted to ensure that the proposed improved roadway conditions could handle traffic during the “peak of the generator” traffic conditions. FIGURES G-6 and G-9 show the traffic volumes anticipated for these conditions for years 2022 and 2027 respectively, which were developed for the AM (10:00 to 11:00) and PM (7:30 to 8:30) peak of generator time periods in a manner similar to the development of the traditional peak hour volumes. Capacity analyses were conducted for the AM peak of generator conditions for both evaluation years (2022 and 2027), with all proposed roadway improvements in place, with the results shown on FIGURES G-7 and G-10. All intersections are anticipated to operate with LOS C or better overall, and LOS D or better for all individual traffic movements. The PM peak of generator background traffic volumes were significantly lower than those for any other evaluation hour, so no capacity analyses were deemed necessary. The conclusion of this evaluation of the “peak of adjacent street” traffic conditions was therefore that the proposed roadway conditions are more than adequate to serve the anticipated traffic during these time periods. Additional figures containing existing traffic volumes, trip distribution, and site generated trips are located in APPENDIX G.

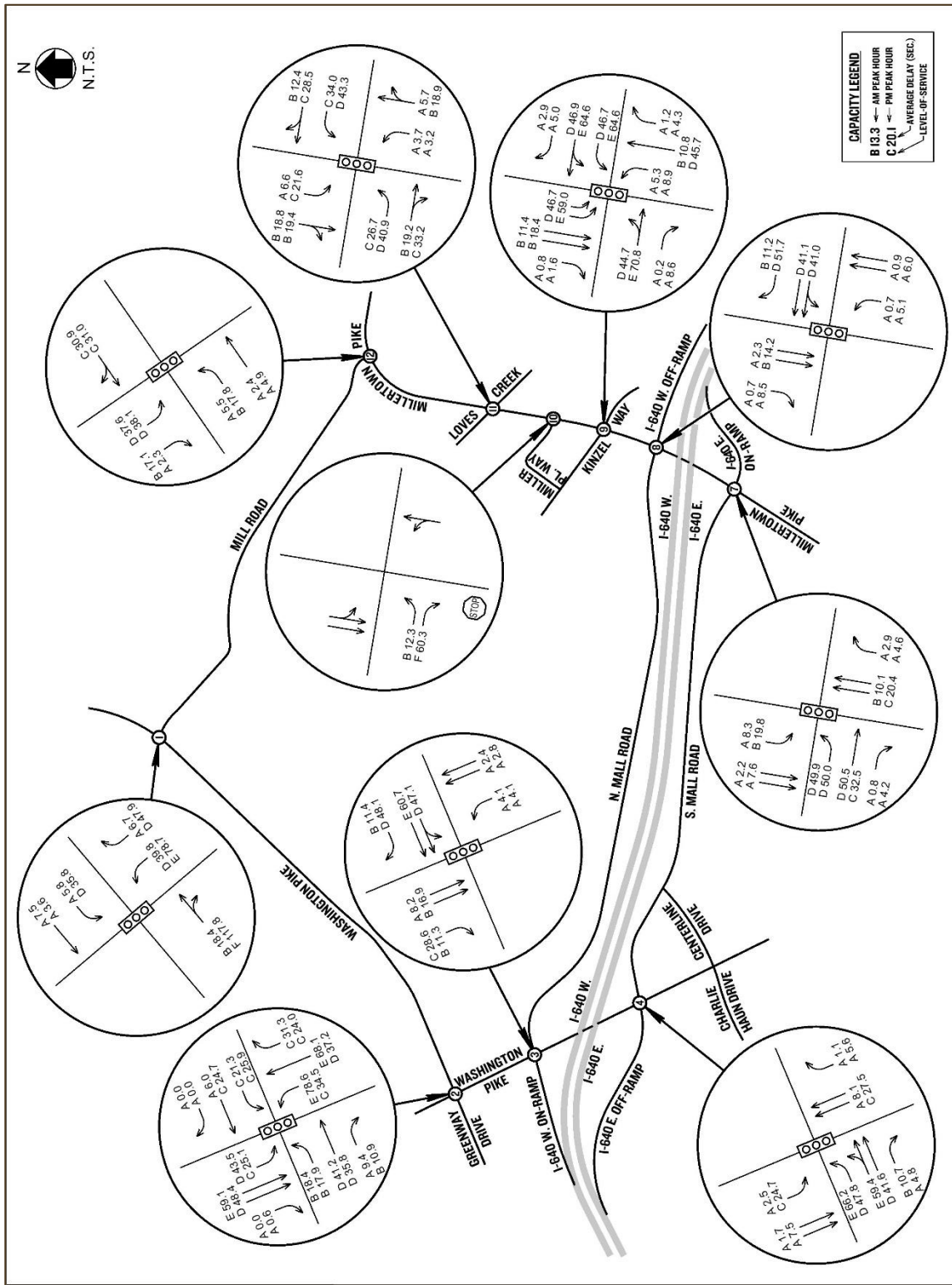


FIGURE 8A
 2020 EXISTING CAPACITY ANALYSIS RESULTS (STUDY AREA)

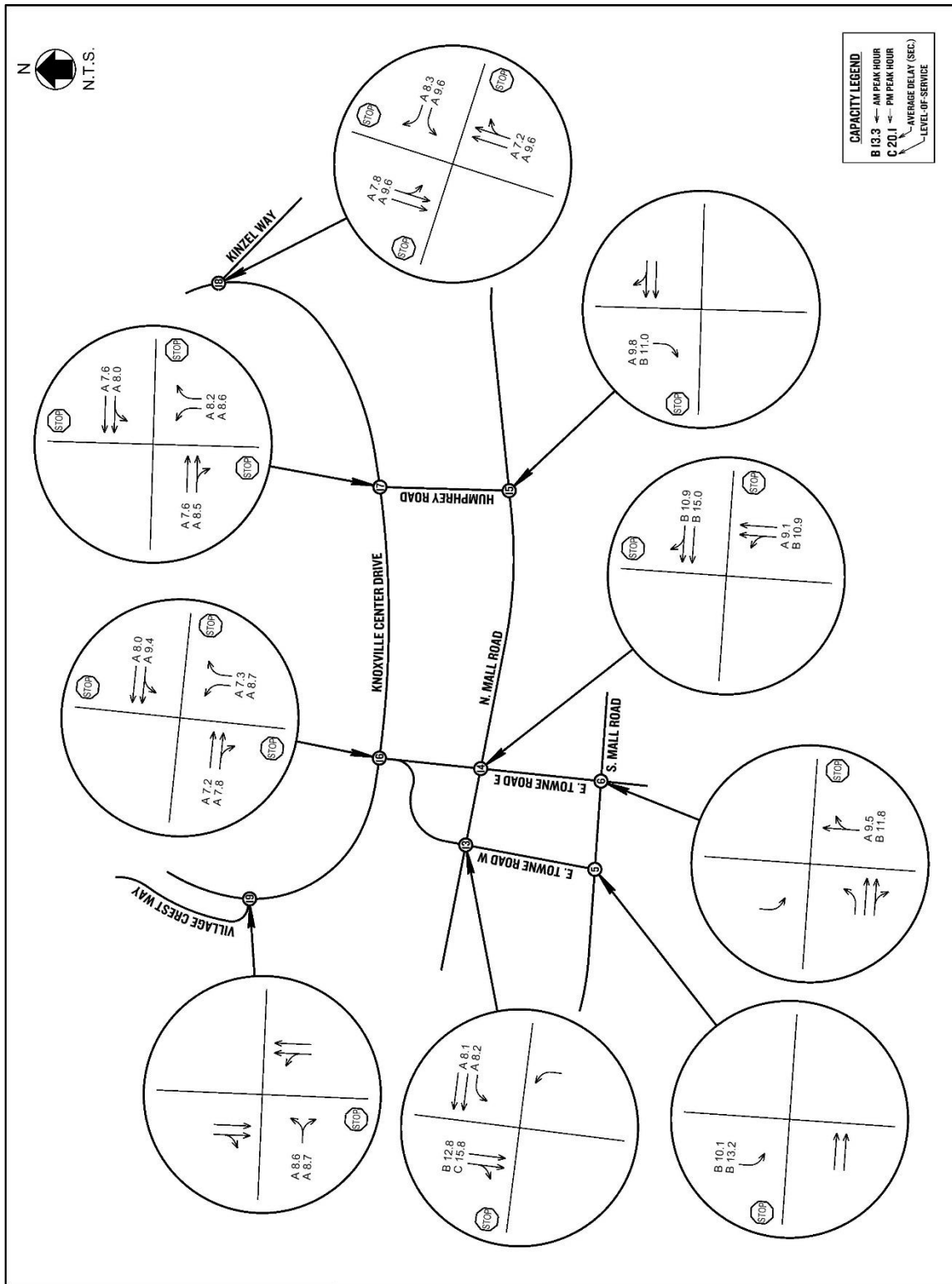


FIGURE 8B
 2020 EXISTING CAPACITY ANALYSIS RESULTS (SITE VICINITY)

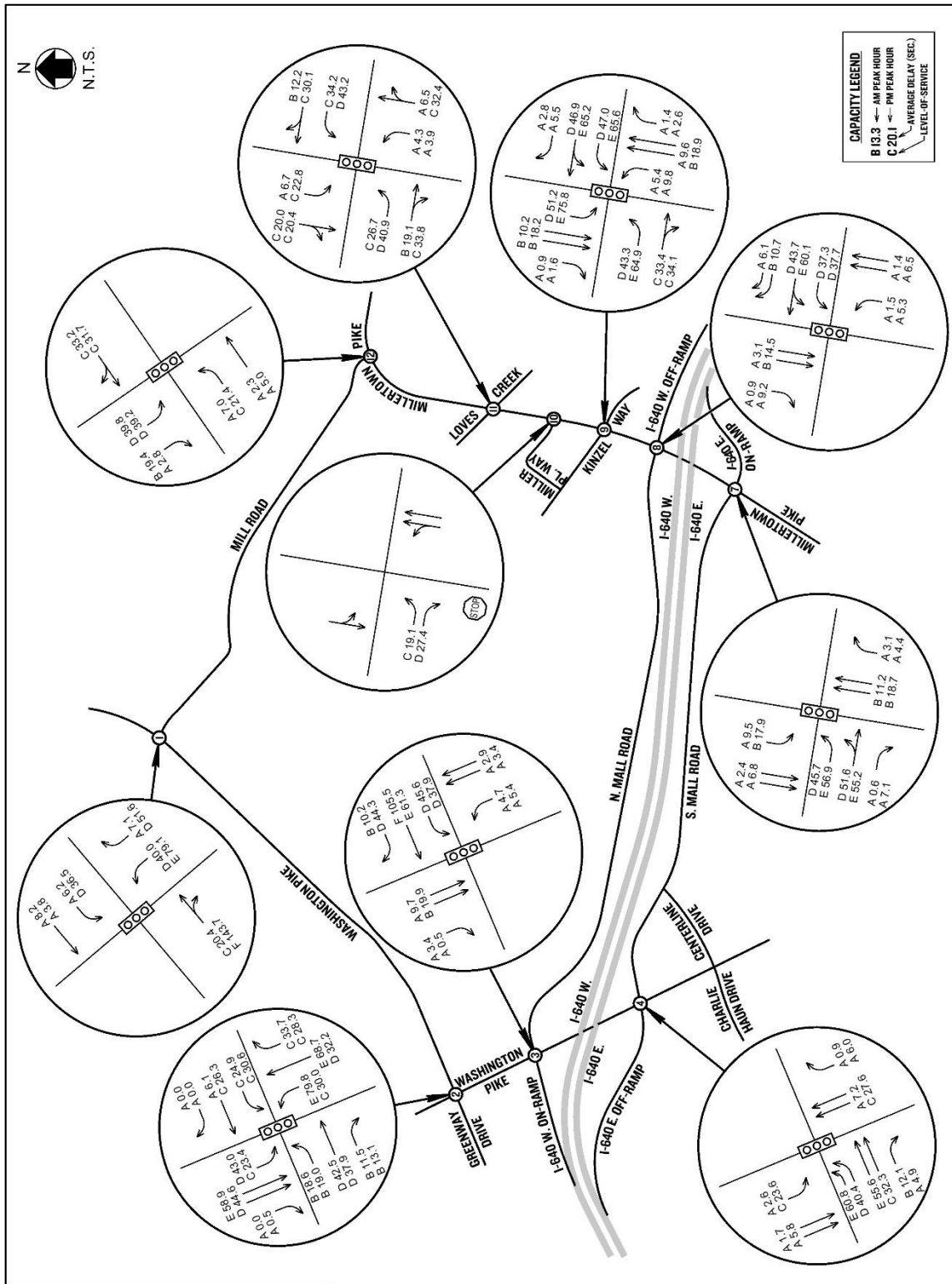


FIGURE 9A
 2022 BACKGROUND CAPACITY ANALYSIS RESULTS (STUDY AREA)

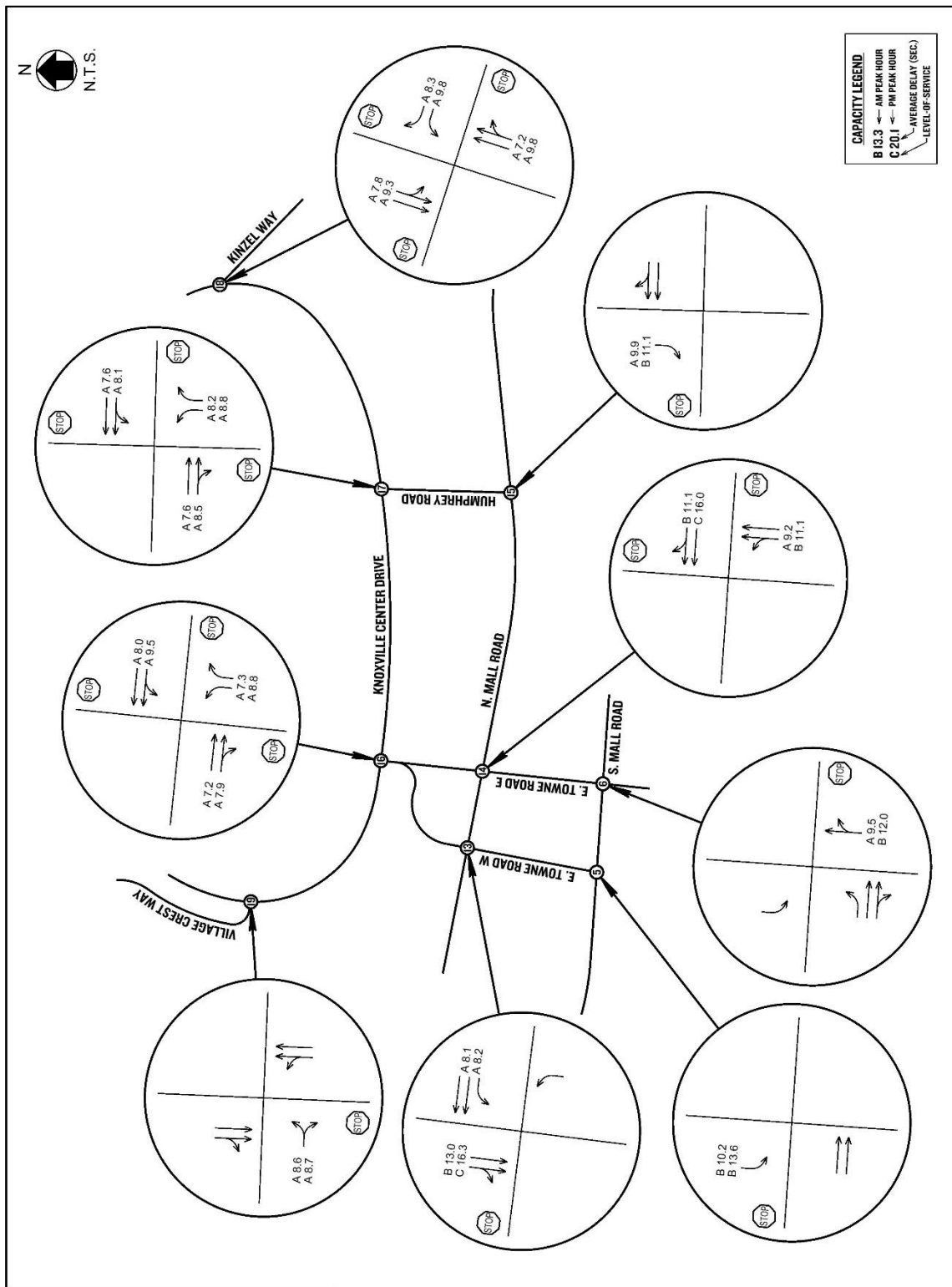


FIGURE 9B
 2022 BACKGROUND CAPACITY ANALYSIS RESULTS (SITE VICINITY)

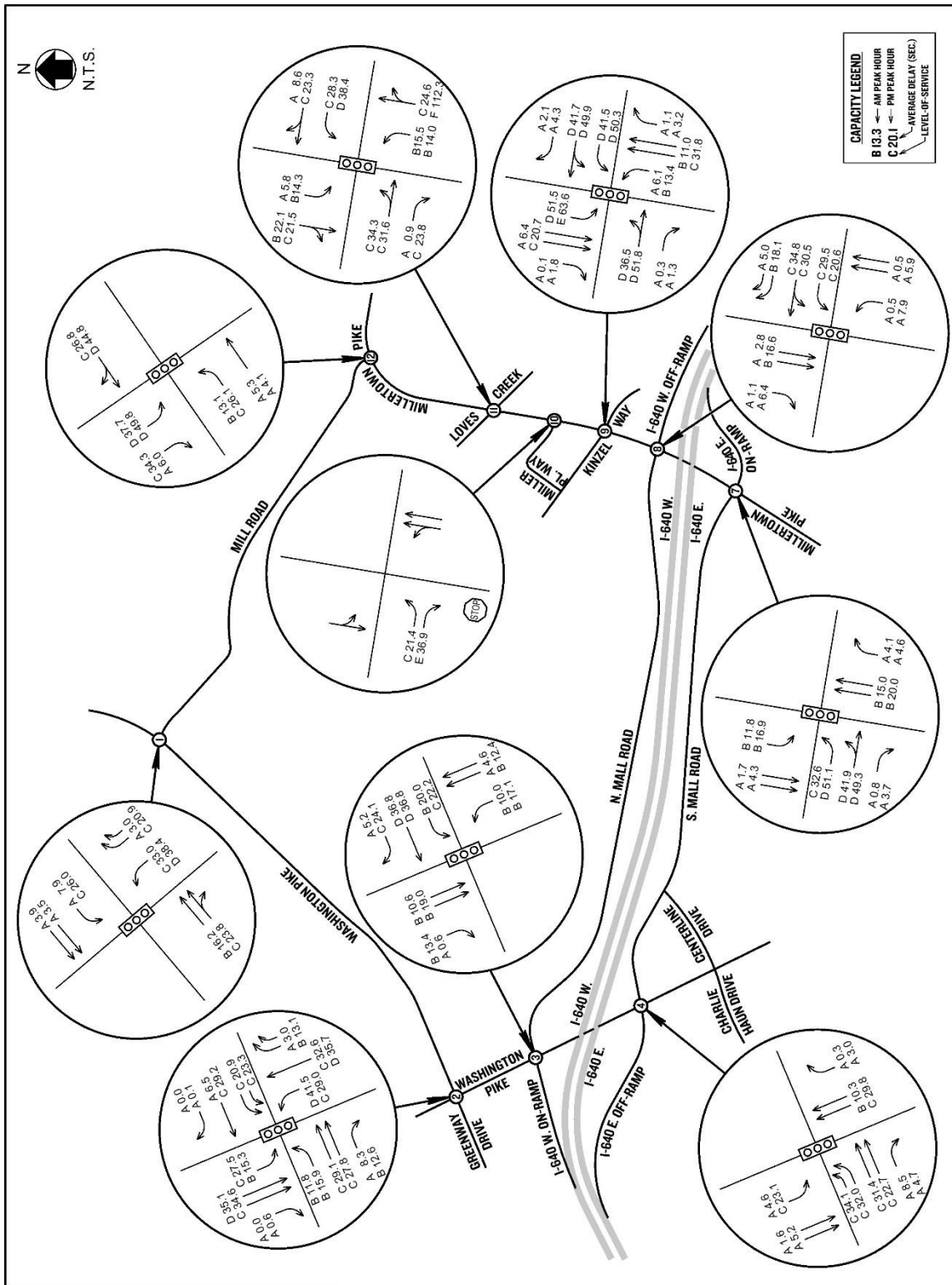


FIGURE 9C
 2027 BACKGROUND CAPACITY ANALYSIS RESULTS (STUDY AREA)

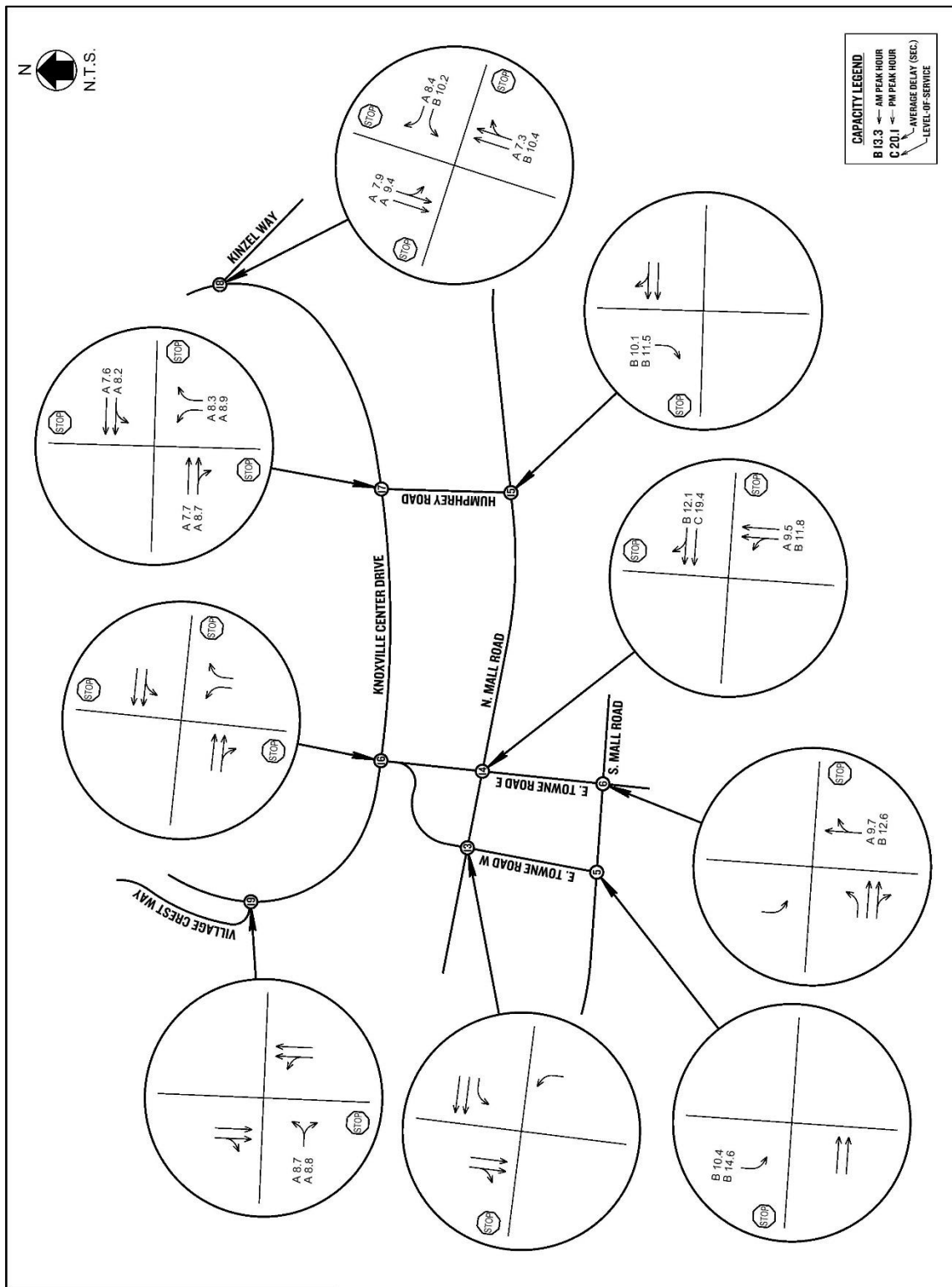


FIGURE 9D
 2027 BACKGROUND CAPACITY ANALYSIS RESULTS (SITE VICINITY)

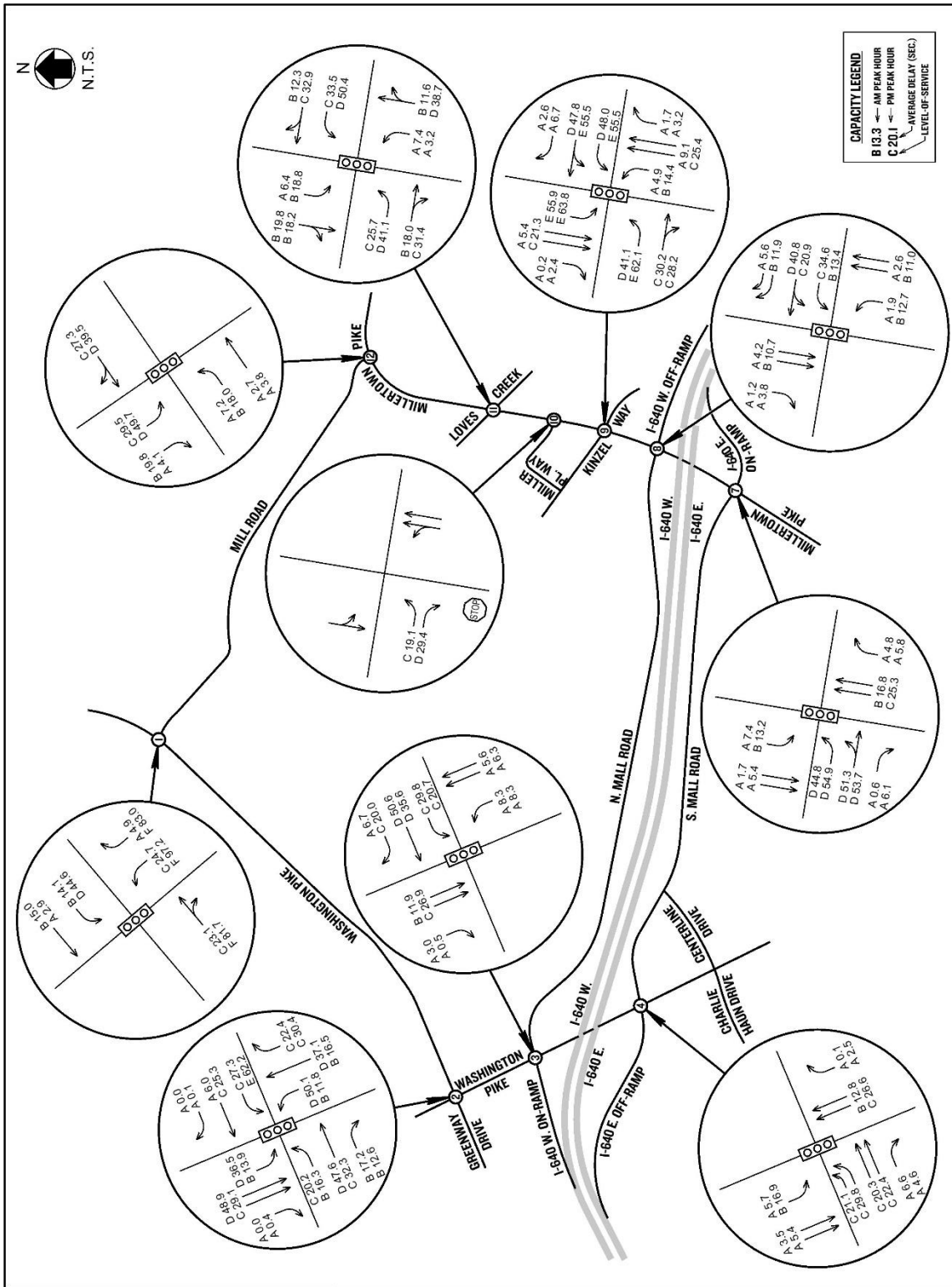


FIGURE 10A
 2022 COMBINED CAPACITY ANALYSIS RESULTS (STUDY AREA)

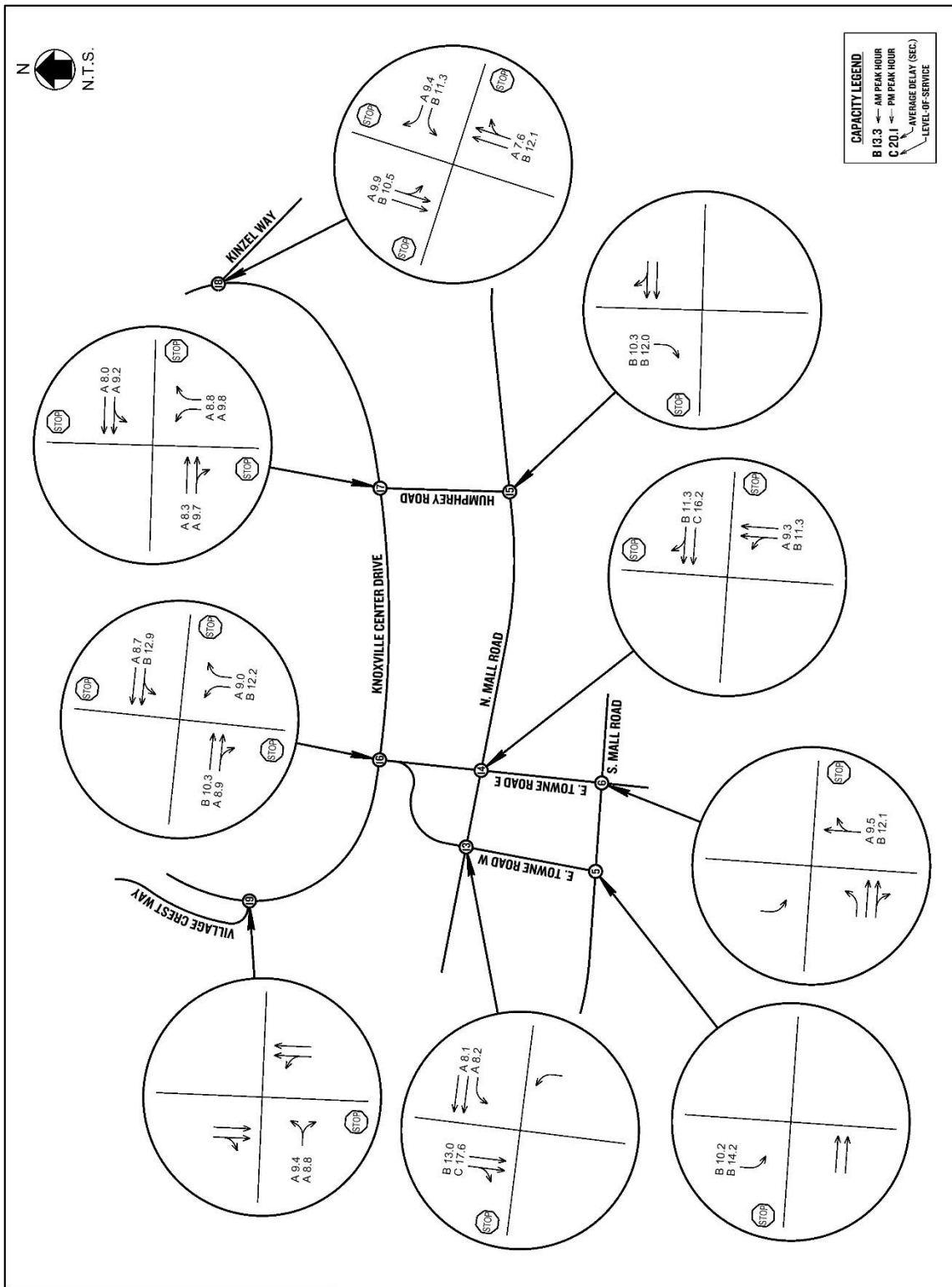


FIGURE 10B
 2022 COMBINED CAPACITY ANALYSIS RESULTS (SITE VICINITY)

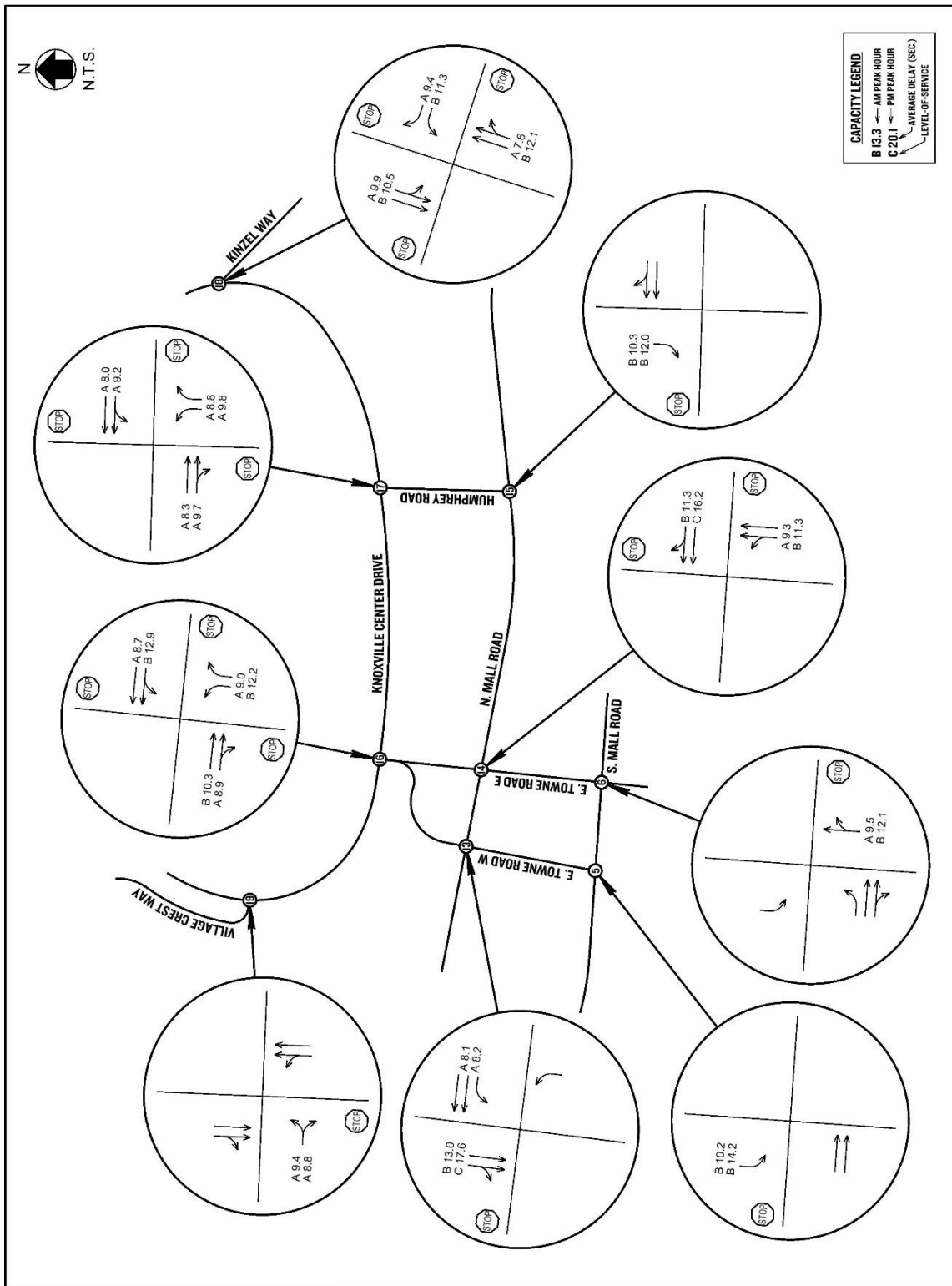


FIGURE 10D
 2022 COMBINED CAPACITY ANALYSIS RESULTS WITH IMPROVEMENTS (SITE VICINITY)

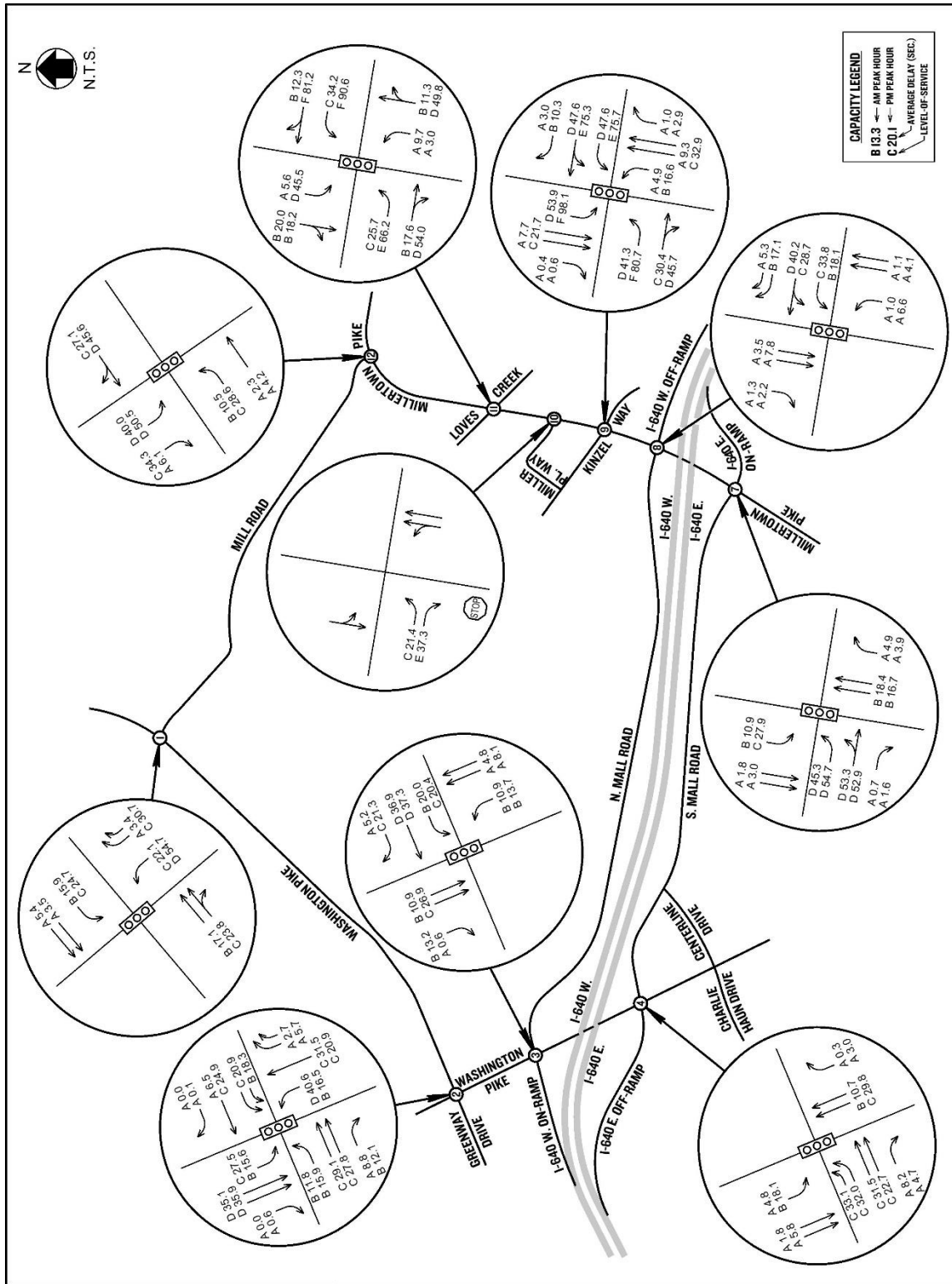


FIGURE 11A
 2027 COMBINED CAPACITY ANALYSIS RESULTS (STUDY AREA)

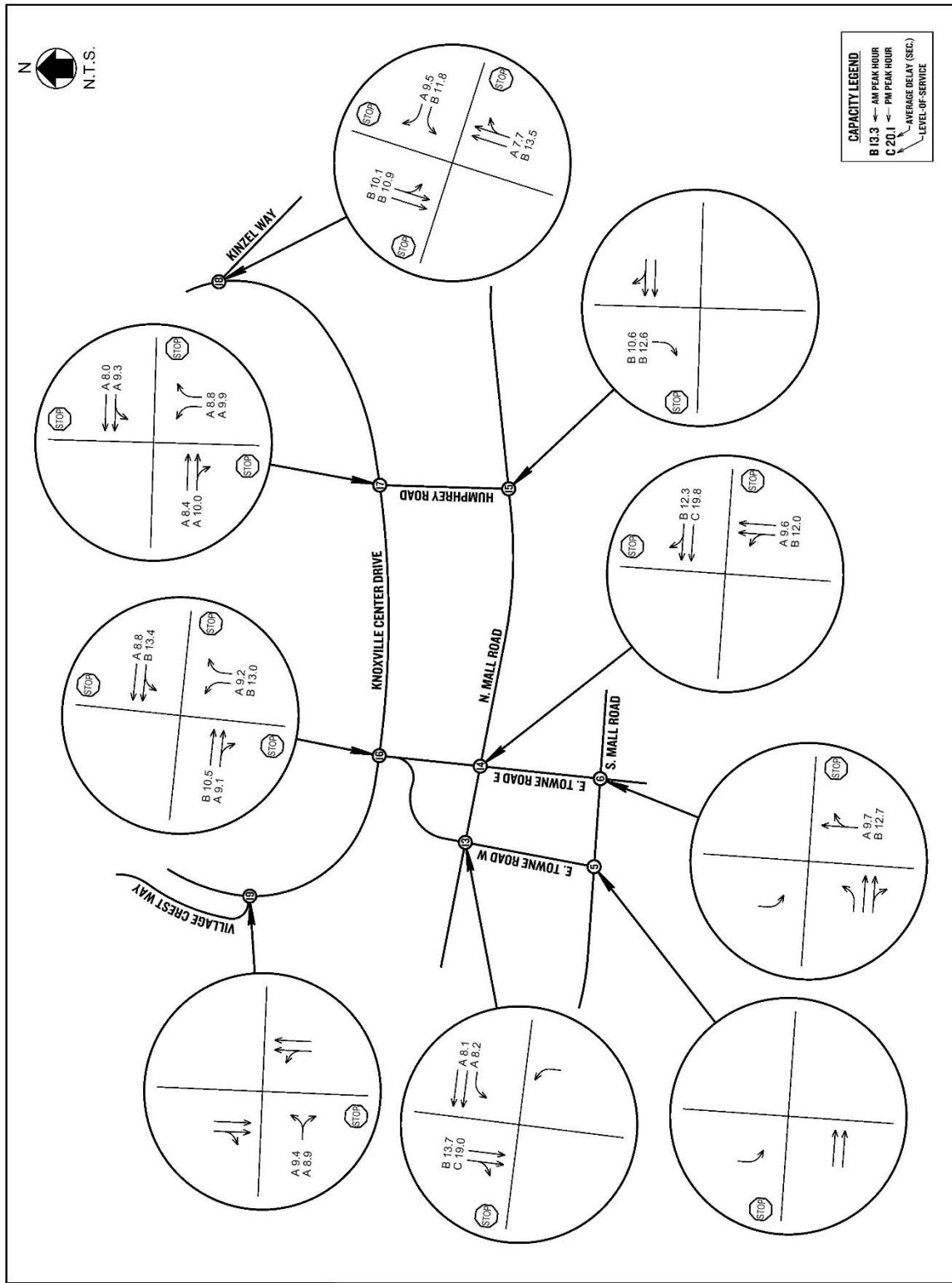


FIGURE 11B
 2027 COMBINED CAPACITY ANALYSIS RESULTS (SITE VICINITY)

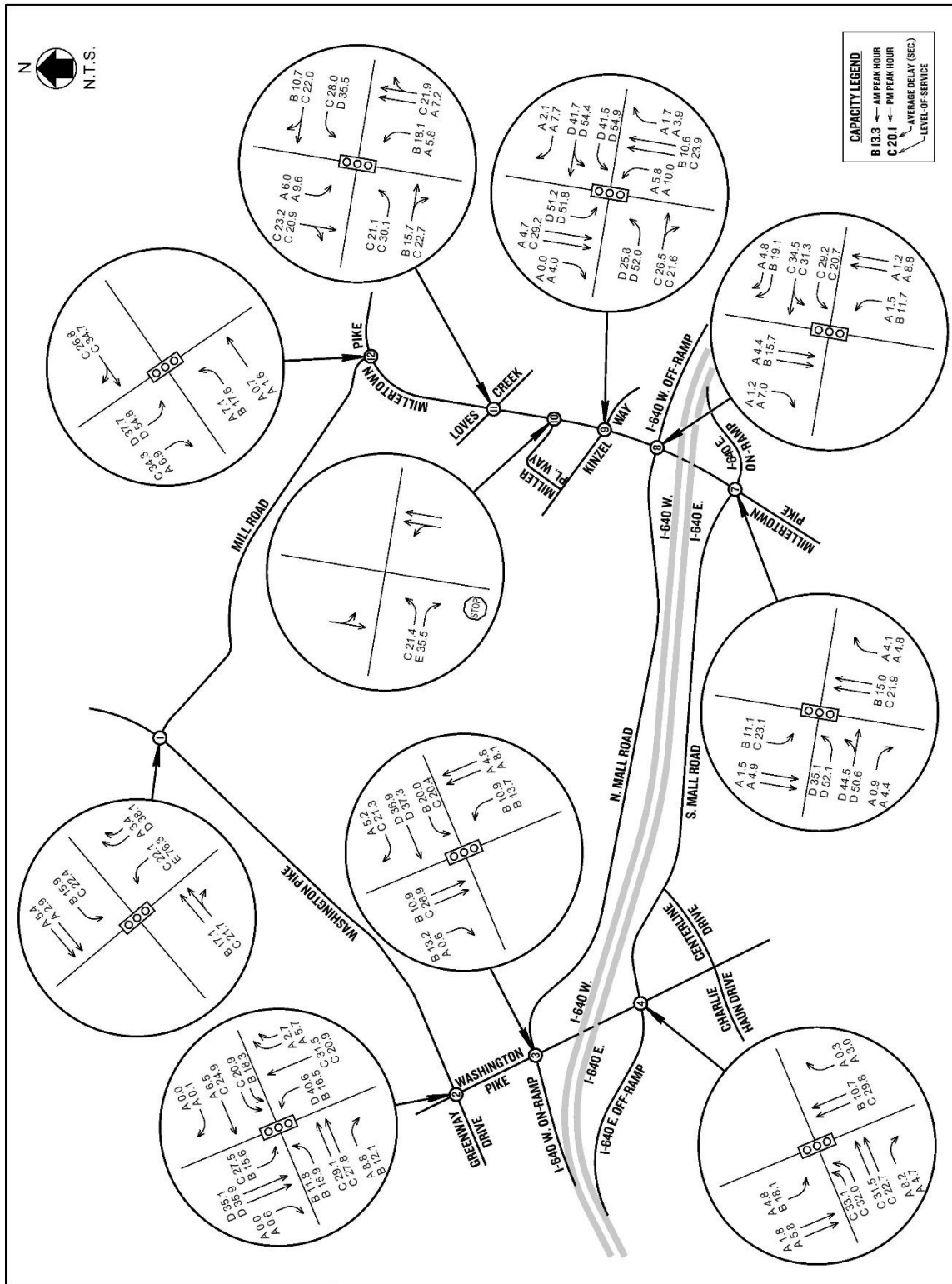


FIGURE 11C
 2027 COMBINED CAPACITY ANALYSIS RESULTS WITH IMPROVEMENTS (STUDY AREA)

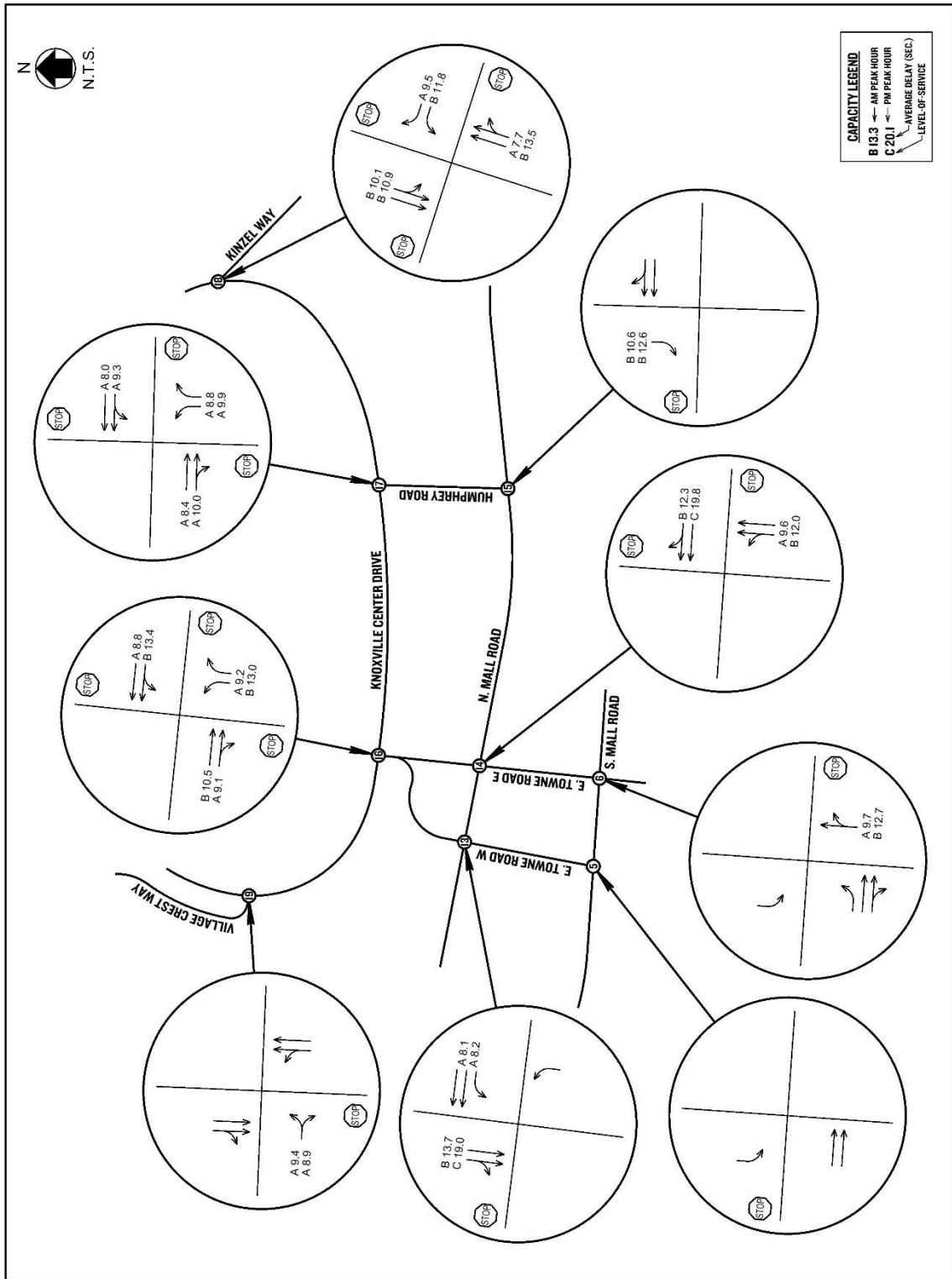


FIGURE 11D
 2027 COMBINED CAPACITY ANALYSIS RESULTS WITH IMPROVEMENTS
 (SITE VICINITY)

7.0 CONCLUSIONS & RECOMMENDATIONS

The primary conclusion of this study is that the traffic generated from the proposed Project Malibu development will have very minor impacts on study area traffic conditions. This is true during the traditional AM and PM peak traffic hours, as well as the peak hours of the generator. This conclusion was assisted by the fact that the project's operation and hourly traffic distribution will be structured to minimize newly generated trips during the peak hours of adjacent street traffic.

The Tennessee Department of Transportation (TDOT) is proposing an I-640 ramp improvement project that will affect four of the study intersections. It is concluded that the improvements proposed for this project will be especially important to future operational conditions for the intersection of Washington Pike / North Mall Road / I-640 Westbound On-Ramp. While not as immediately important for the other three affected study intersections, it is concluded that these improvements are desirable and will improve intersection operations and safety. These improvements are shown in schematic form on FIGURE 12A.

The City of Knoxville is proposing a major improvement and widening project on Washington Pike in the study area and further to the east. It is concluded that the most affected study intersection will be the intersection of Washington Pike and Mill Road. Although just outside the study area limits, we also conclude from field observations that the section of Washington Pike from Mill Road to Murphy Road is especially in need of this improvement. This includes the intersection of Washington Pike and Murphy Road, where substantial peak period delays and queues were observed. This project is indicated and further described on FIGURE 12A.

The following recommendations resulted from this study of current and future operational conditions for the proposed Project Malibu development:

1. The proposed TDOT I-640 ramp improvement project should be completed prior to the completion and opening of the Project Malibu development, anticipated for 2022.
2. The proposed City of Knoxville Washington Pike improvement project should be completed prior to 2027.
3. In order to provide interim congestion relief until the Washington Pike improvement project is completed, a limited scale intersection improvement project should be considered. This project would provide a northbound Mill Road free-flow right-turn lane turning into an eastbound Washington Pike acceleration lane, constructed primarily where a paved shoulder currently exists. Completion of this project by 2022 would be helpful to intersection operations, but is justified almost entirely by non-Malibu site traffic. Therefore, the City of Knoxville should determine the necessity and timing of this possible interim project. The layout of this proposed improvement is shown on FIGURE 12B.
4. A new roadway improvement project should be developed and constructed on Millertown Pike, between the north termination point of the TDOT I-640 ramp improvement project and the railroad bridge just south of Mill Road. This project would add a second northbound through traffic lane that would terminate as a dropped left-turn lane at Mill Road. The layout of this proposed improvement is shown schematically on FIGURE 12B.

CONCLUSIONS & RECOMMENDATIONS | SECTION 7

5. Care should be taken during the project site development and construction process to ensure than intersection sight distance and other important lines of sight are not restricted by new site landscaping or signage.
6. In coordination with the City of Knoxville and TDOT, site related way-finding or other directional signage changes for the area should be reviewed to ensure signage related to the former mall site is removed and any necessary signage related to the proposed site is added.
7. Upon completion and opening of the proposed Project Malibu development to full operation, new turning movement traffic counts should be obtained for the study signalized intersections and new optimized traffic signal timing developed and implemented.

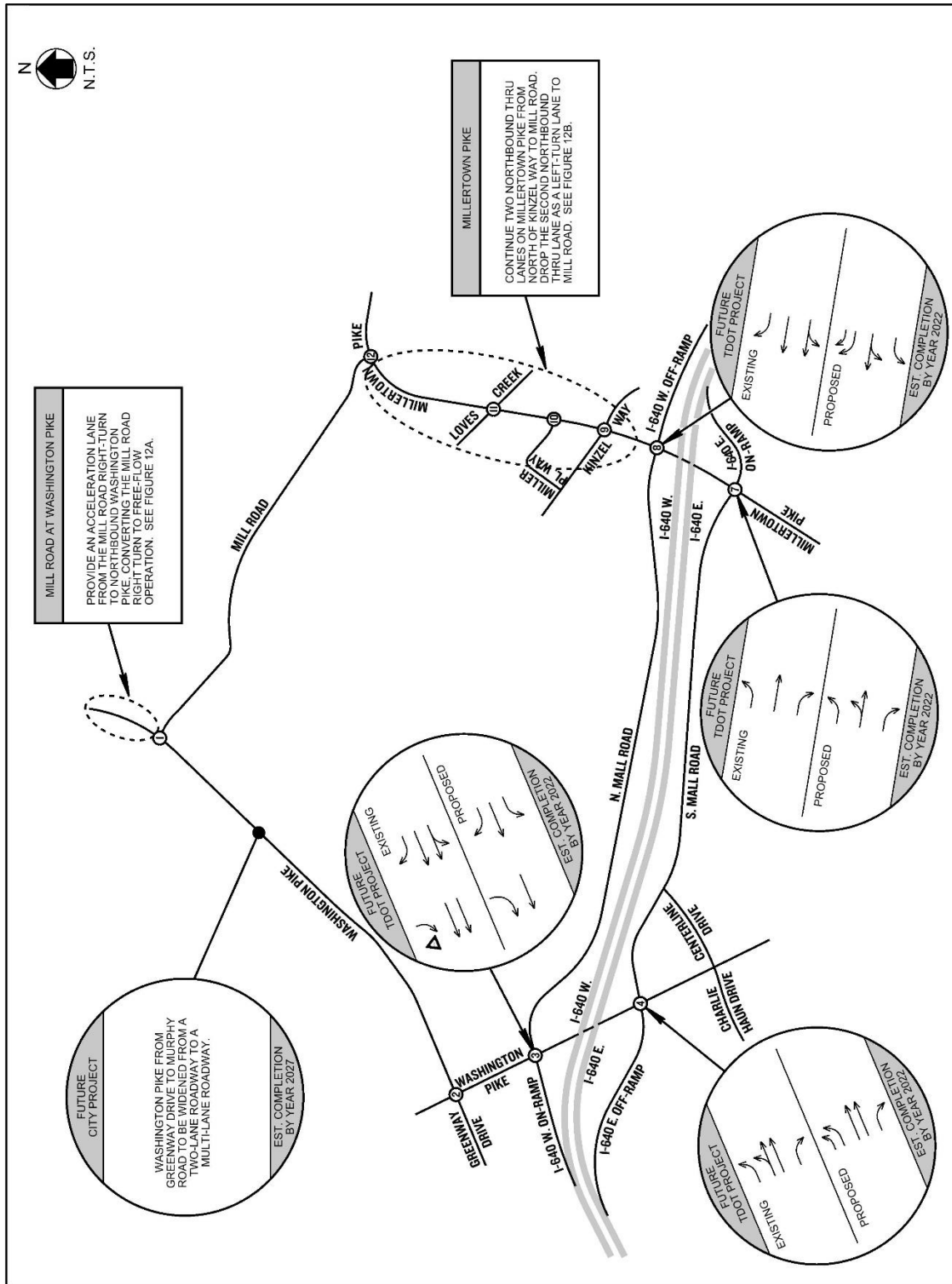


FIGURE 12A
RECOMMENDATIONS

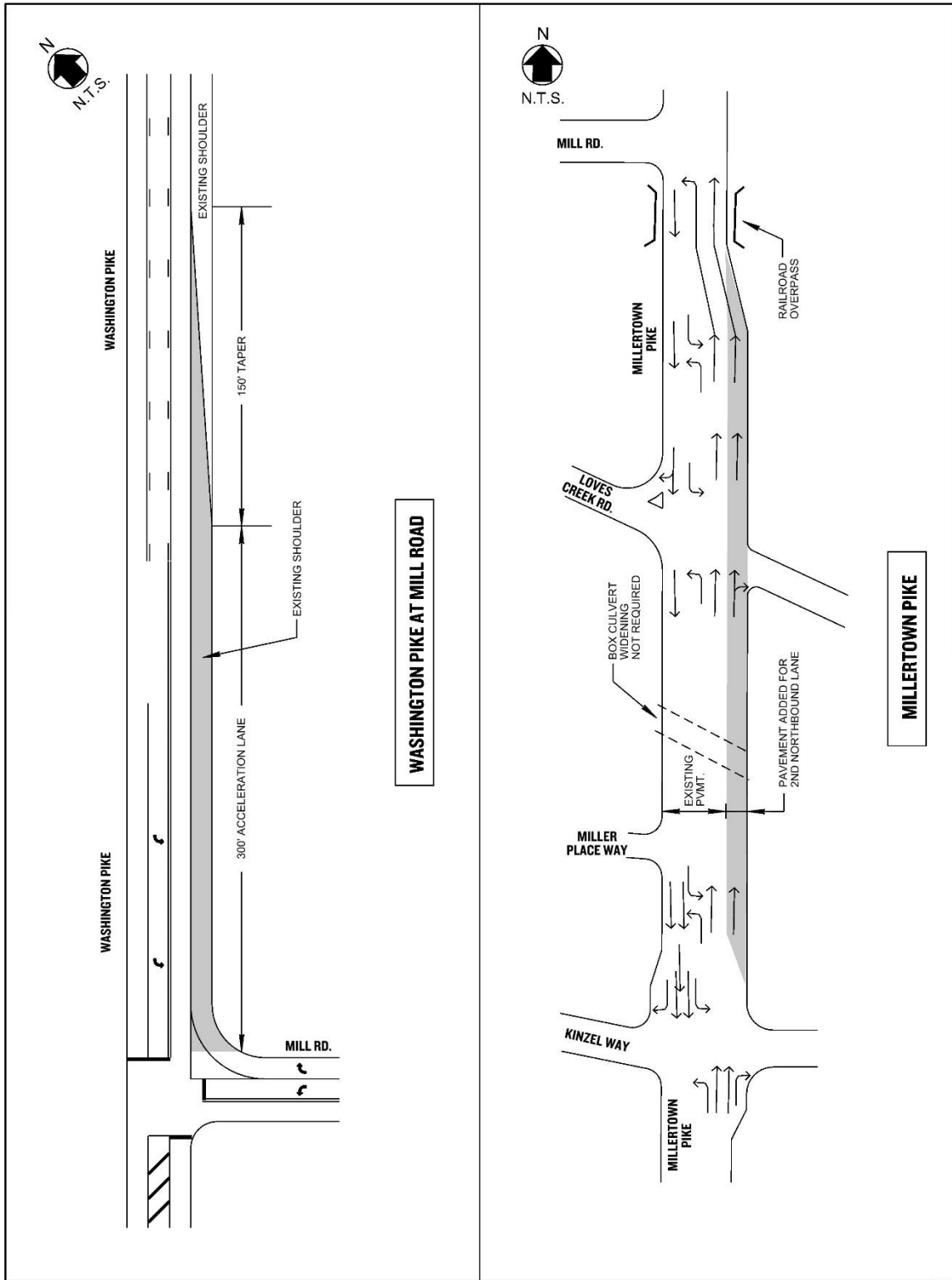


FIGURE 12B
RECOMMENDATIONS

8.0 APPENDICES

APPENDIX A | TRAFFIC DATA

APPENDIX B | ANALYSES FOR EXISTING AND BACKGROUND TRAFFIC

APPENDIX C | TRIP GENERATION & INFORMATION

APPENDIX D | TRIP DISTRIBUTION AND ASSIGNMENT FIGURES

APPENDIX E | ANALYSES FOR COMBINED TRAFFIC

APPENDIX F | ANALYSES FOR COMBINED TRAFFIC WITH IMPROVEMENTS

APPENDIX G | ANALYSES FOR PEAK HOUR OF THE GENERATOR

APPENDIX H | MPC COMMENTS

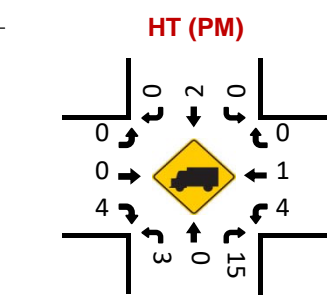
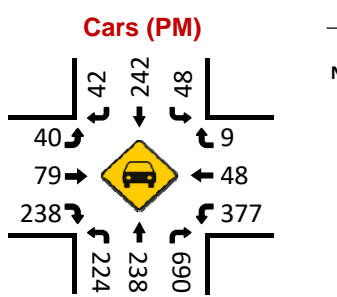
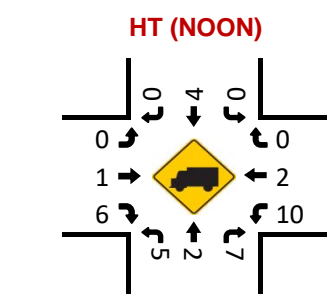
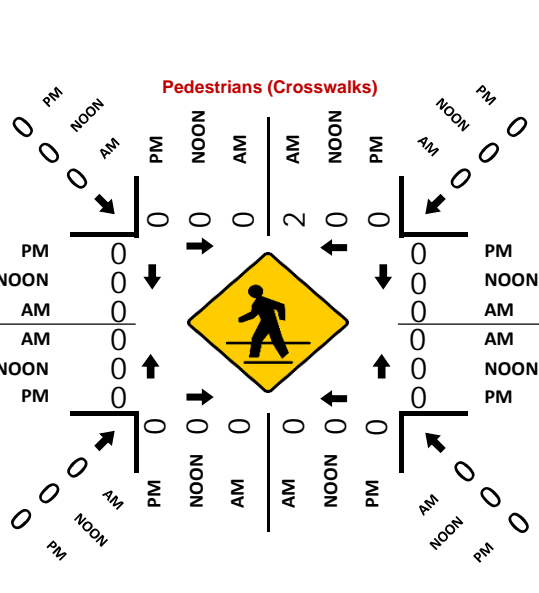
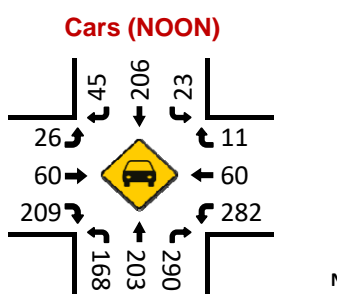
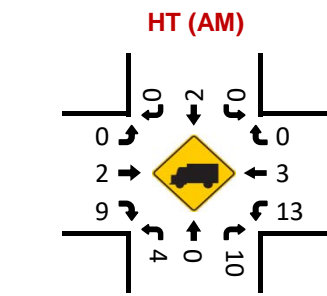
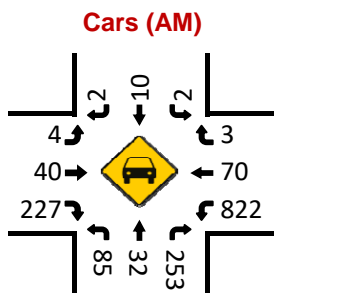
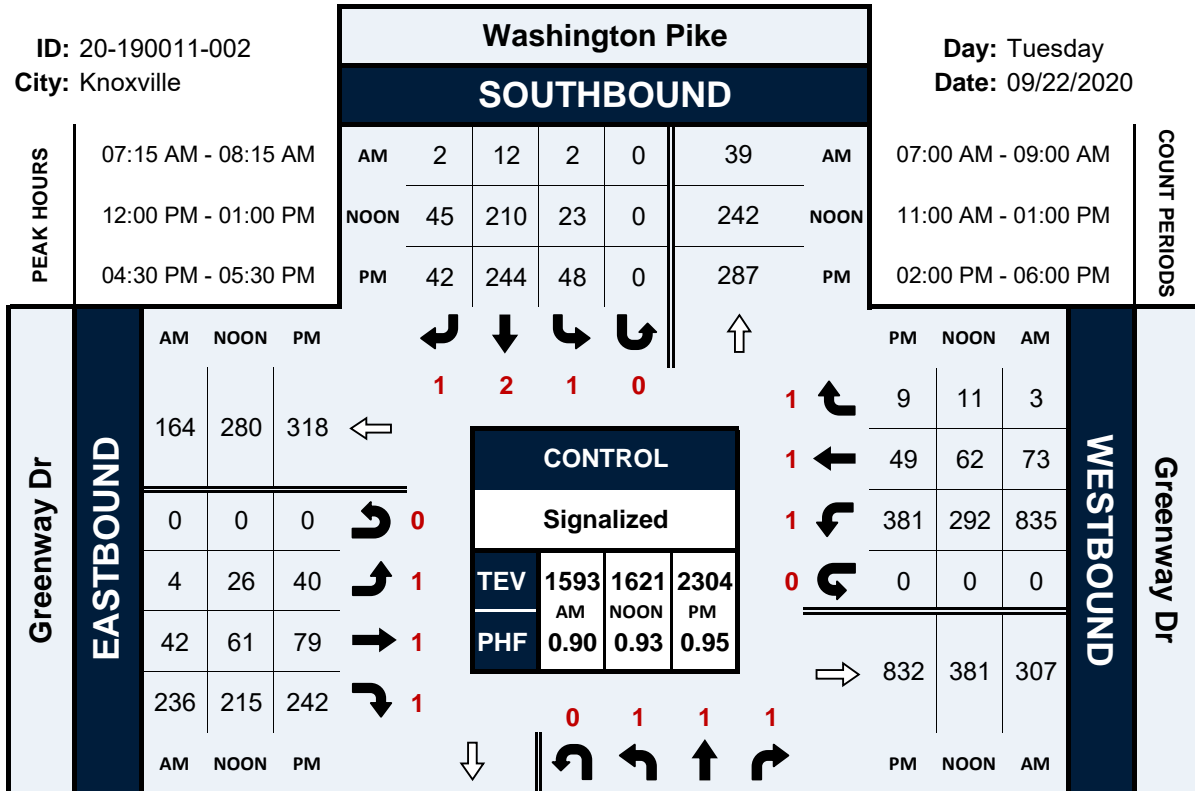
APPENDIX A | TRAFFIC DATA

Washington Pike & Greenway Dr

Peak Hour Turning Movement Count

ID: 20-190011-002
City: Knoxville

Day: Tuesday
Date: 09/22/2020

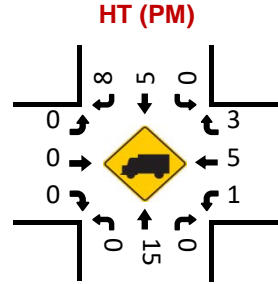
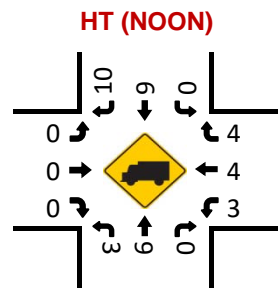
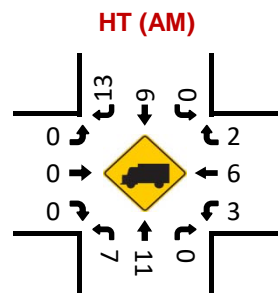
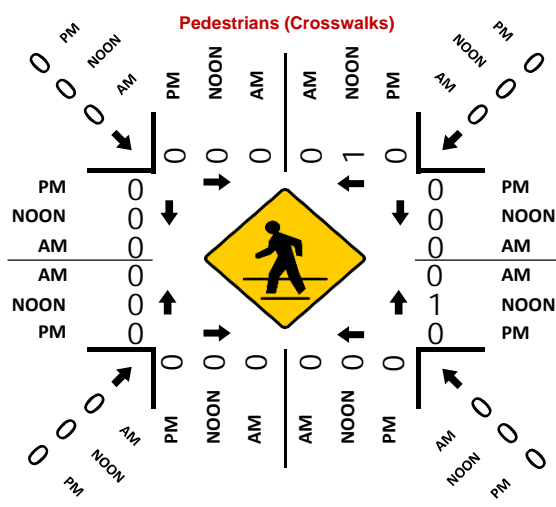
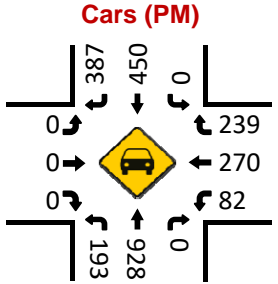
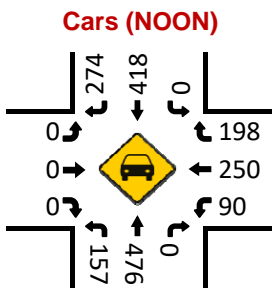
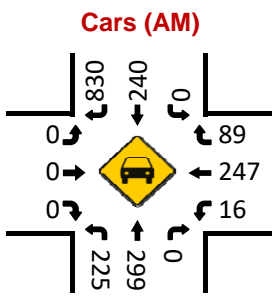
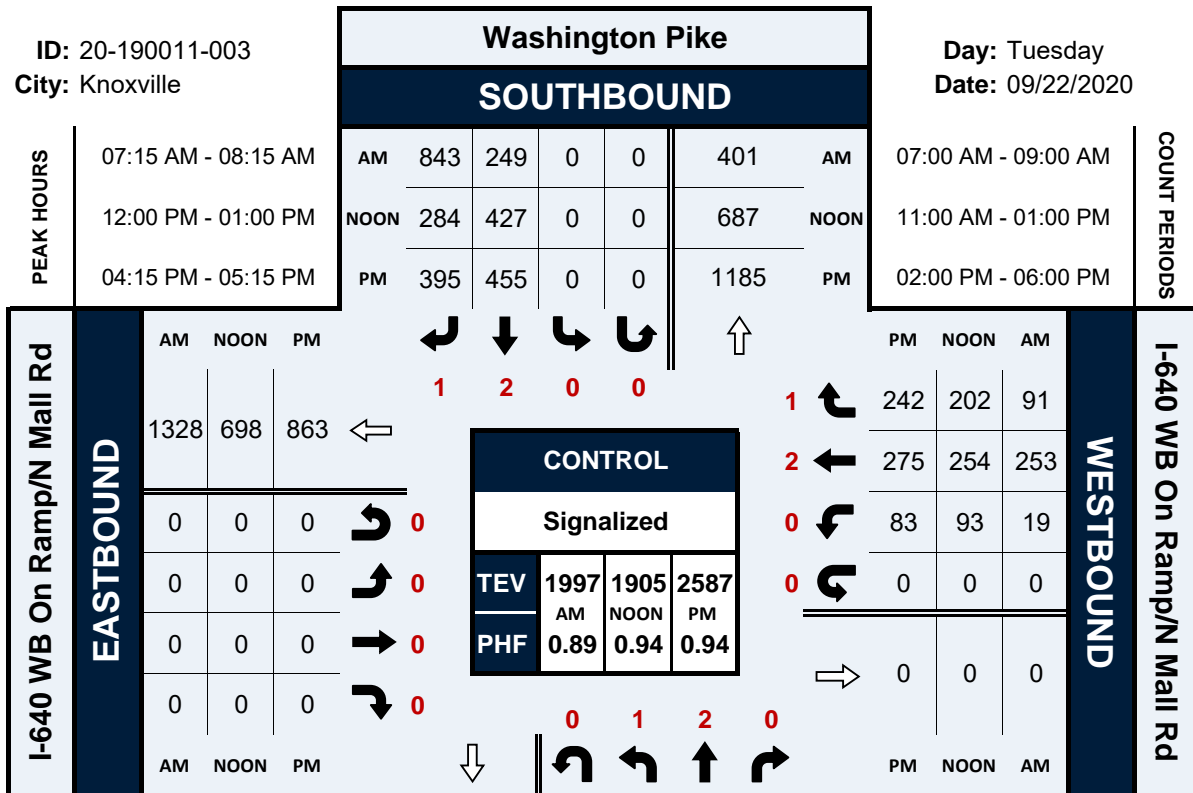


Washington Pike & I-640 WB On Ramp/N Mall Rd

Peak Hour Turning Movement Count

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City: Knoxville

Day: Tuesday
Date: 09/22/2020

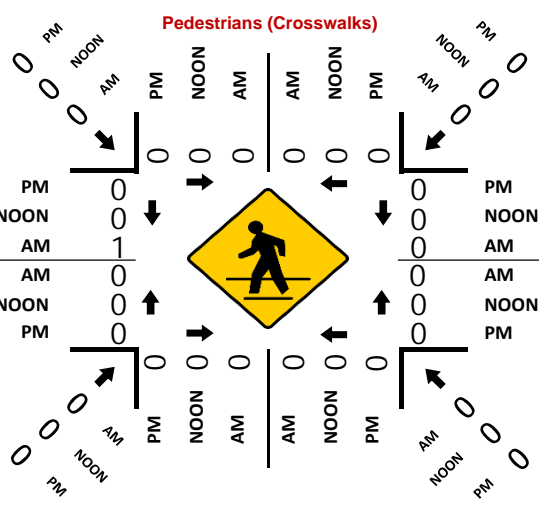
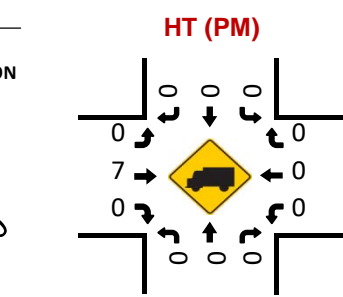
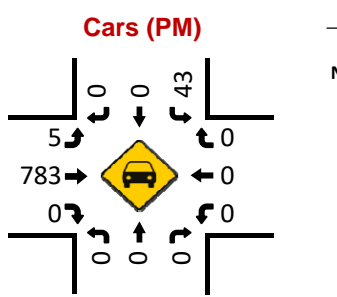
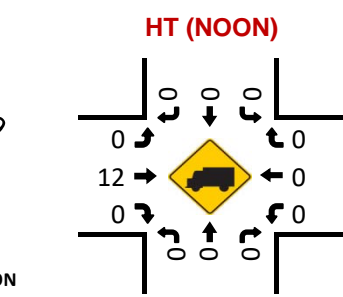
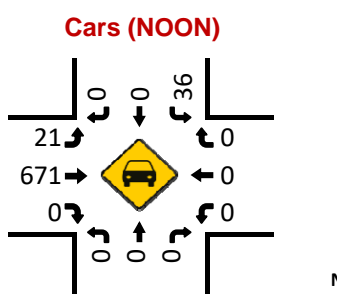
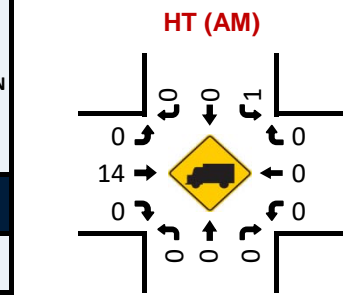
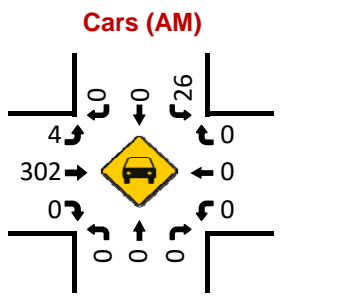
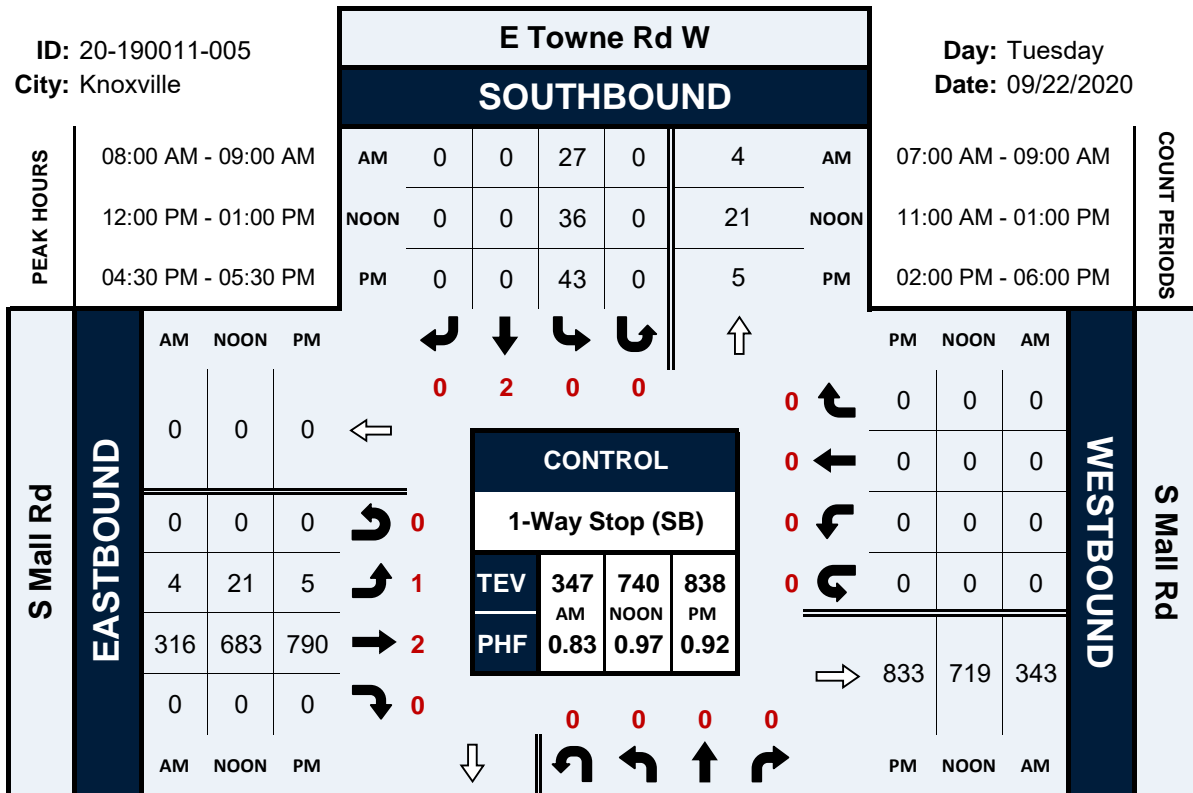


E Towne Rd W & S Mall Rd

Peak Hour Turning Movement Count

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City: Knoxville

Day: Tuesday
Date: 09/22/2020

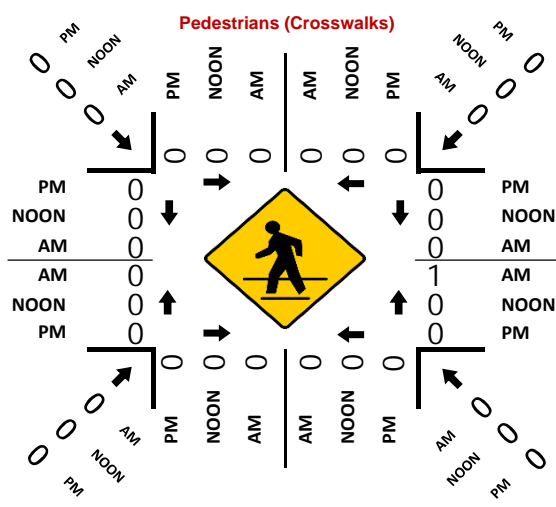
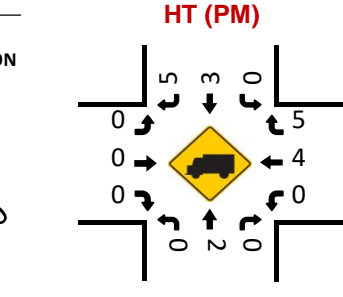
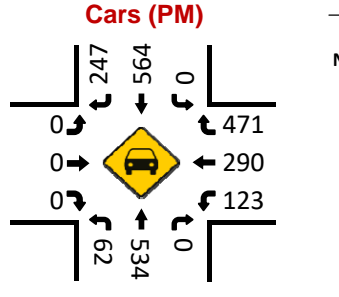
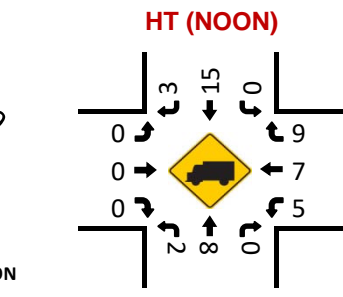
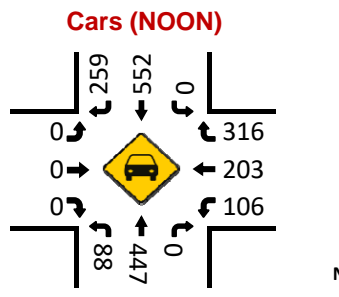
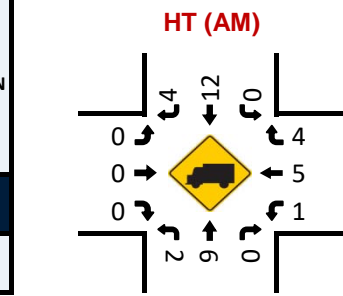
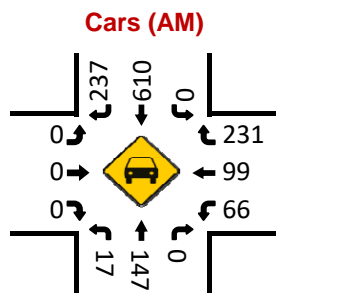
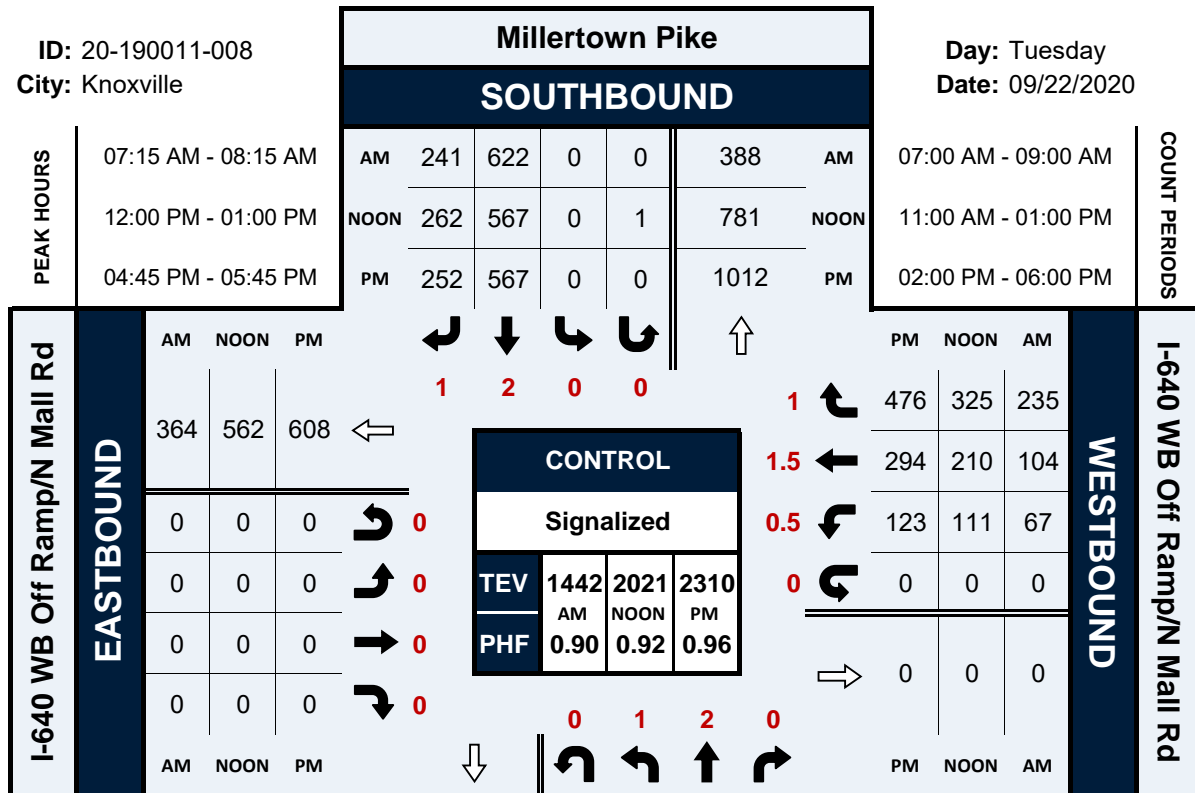


Millertown Pike & I-640 WB Off Ramp/N Mall Rd

Peak Hour Turning Movement Count

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City: Knoxville

Day: Tuesday
Date: 09/22/2020

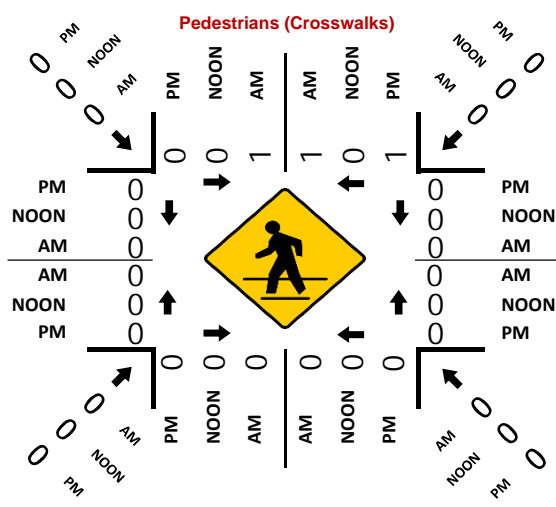
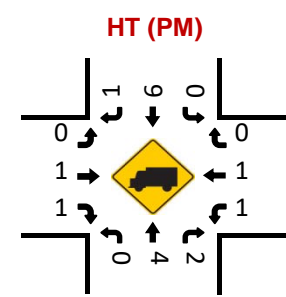
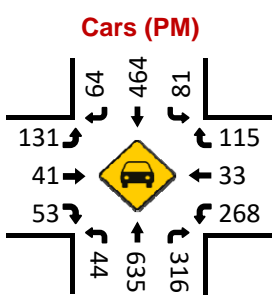
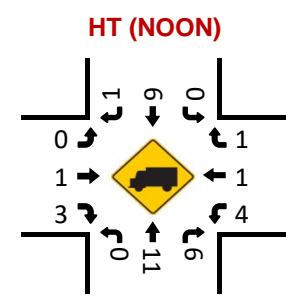
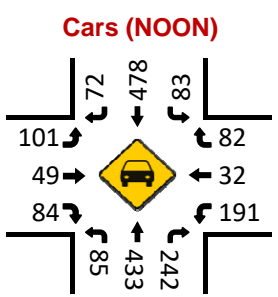
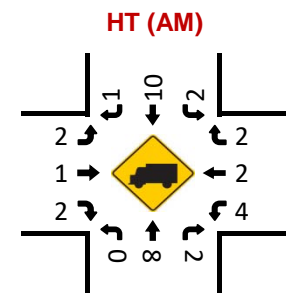
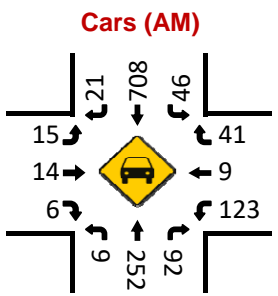
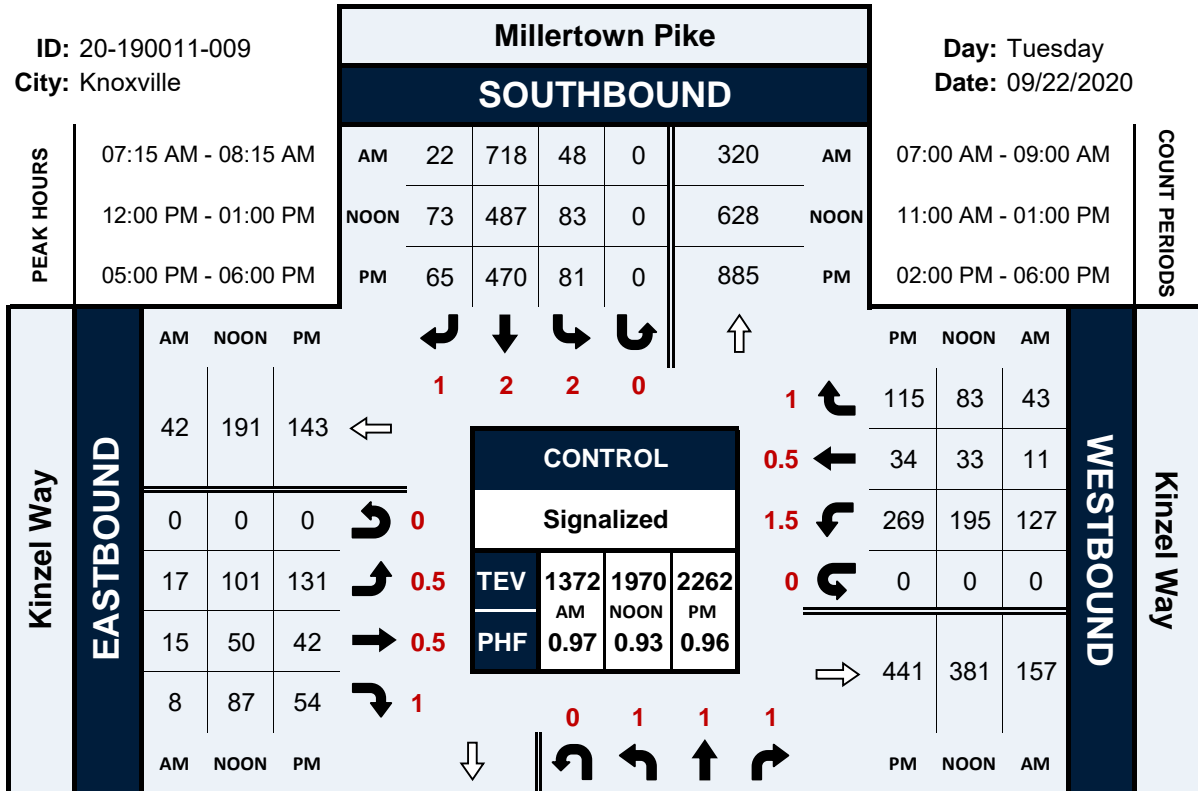


Millertown Pike & Kinzel Way

Peak Hour Turning Movement Count

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City: Knoxville

Day: Tuesday
Date: 09/22/2020

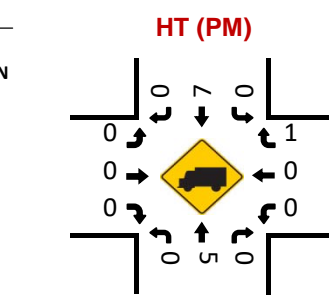
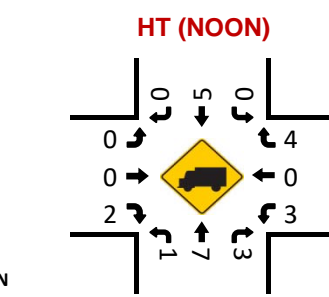
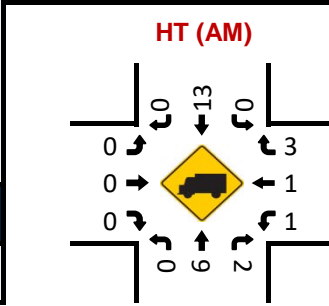
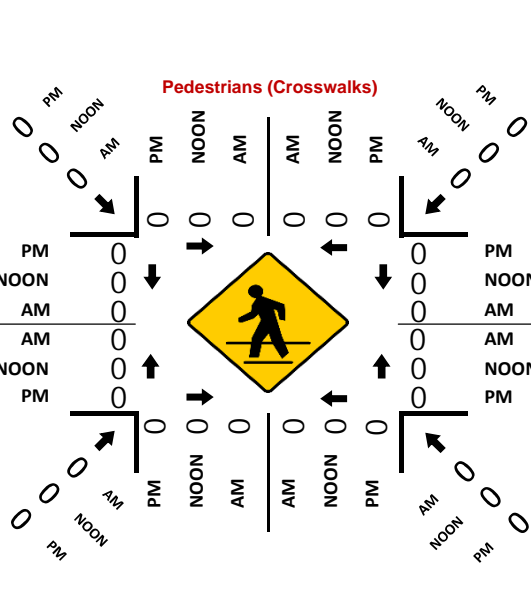
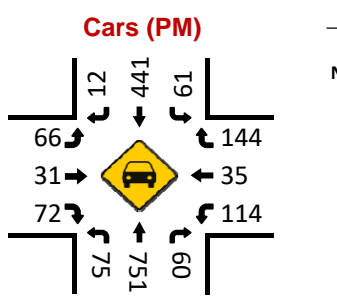
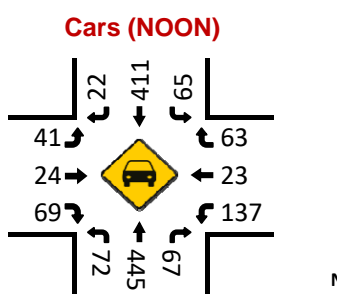
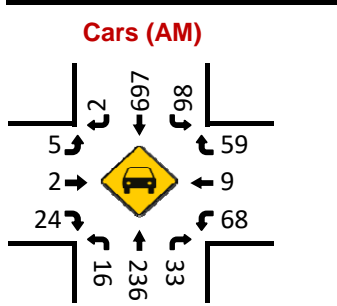
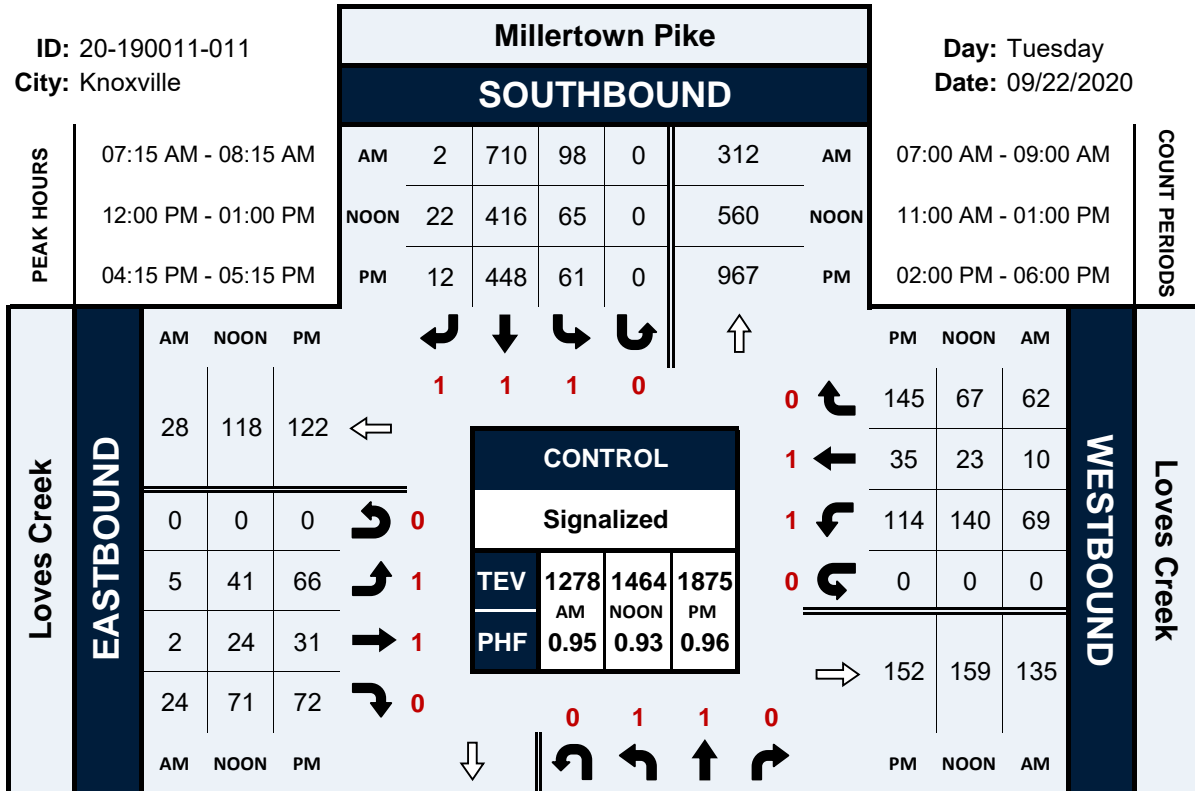


Millertown Pike & Loves Creek

Peak Hour Turning Movement Count

ID: 20-190011-011
City: Knoxville

Day: Tuesday
Date: 09/22/2020

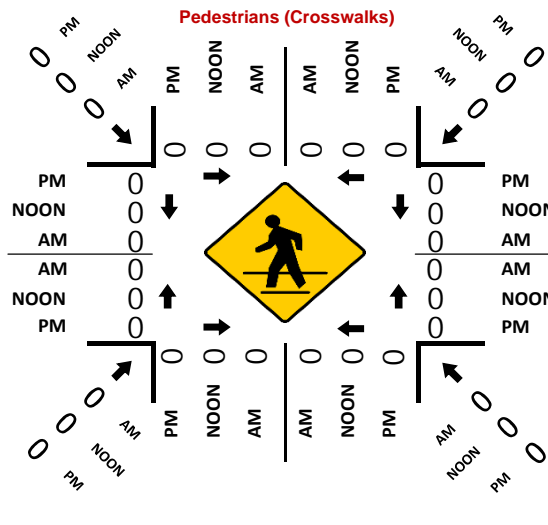
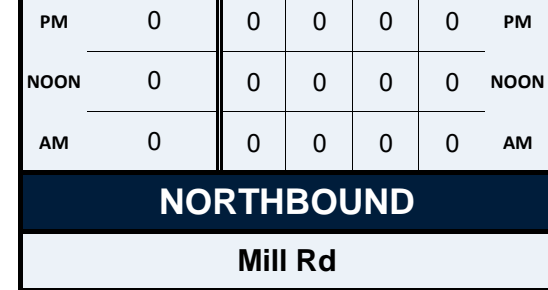
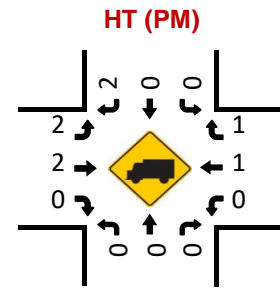
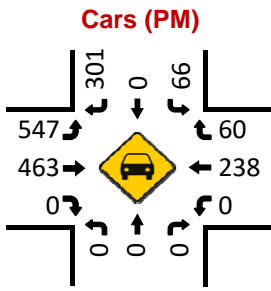
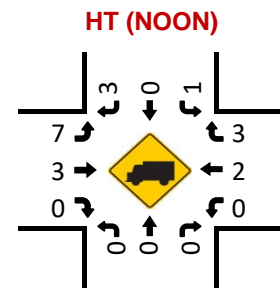
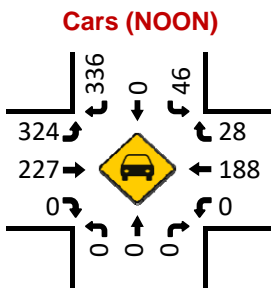
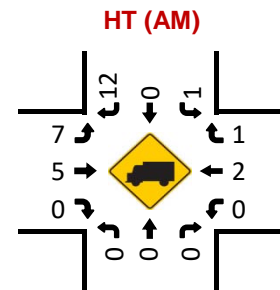
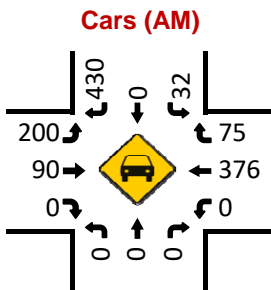
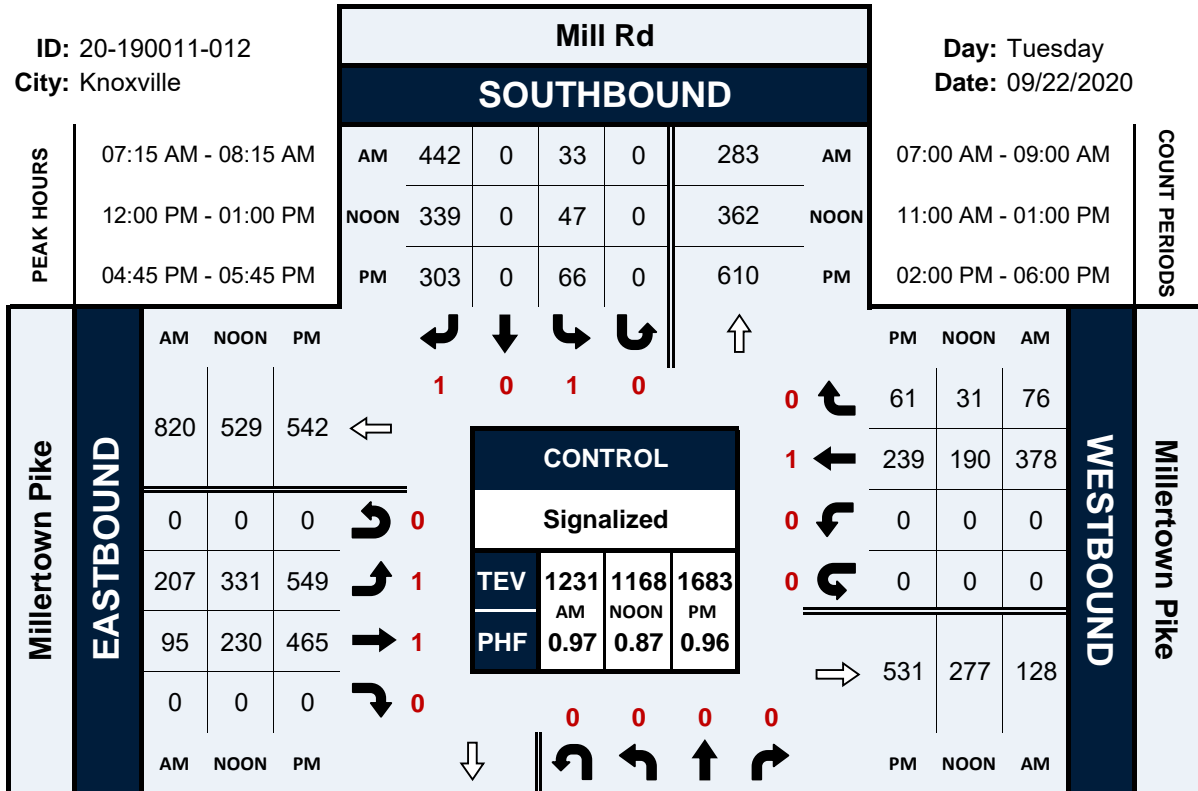


Mill Rd & Millertown Pike

Peak Hour Turning Movement Count

ID: 20-190011-012
City: Knoxville

Day: Tuesday
Date: 09/22/2020

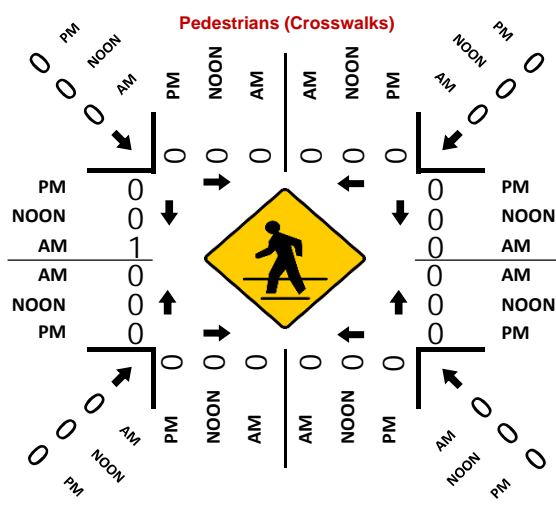
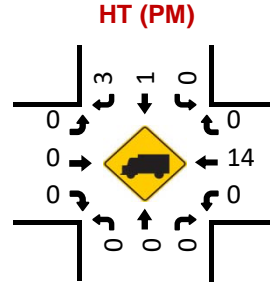
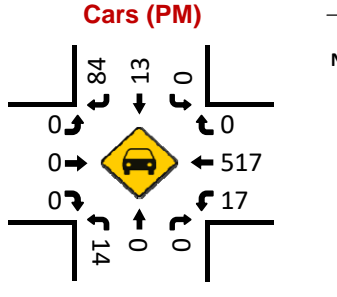
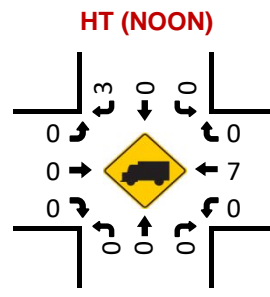
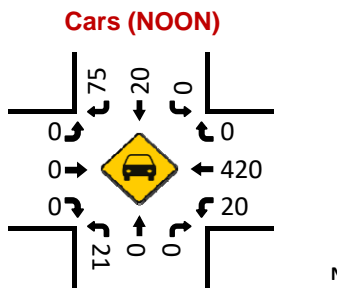
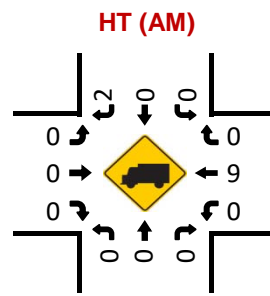
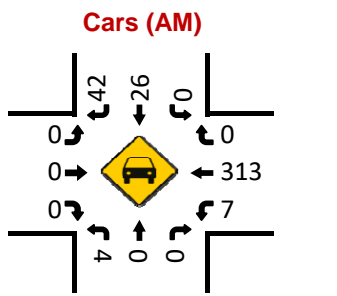
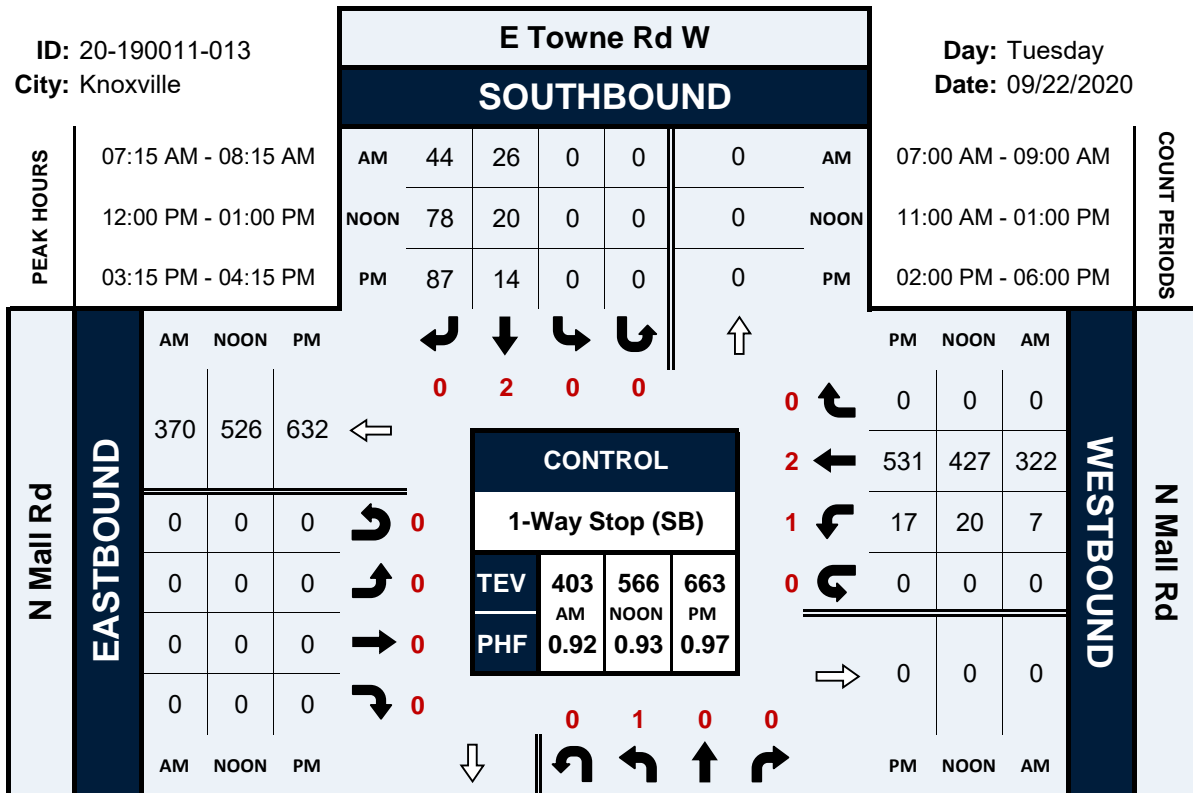


E Towne Rd W & N Mall Rd

Peak Hour Turning Movement Count

ID: 20-190011-013
City: Knoxville

Day: Tuesday
Date: 09/22/2020

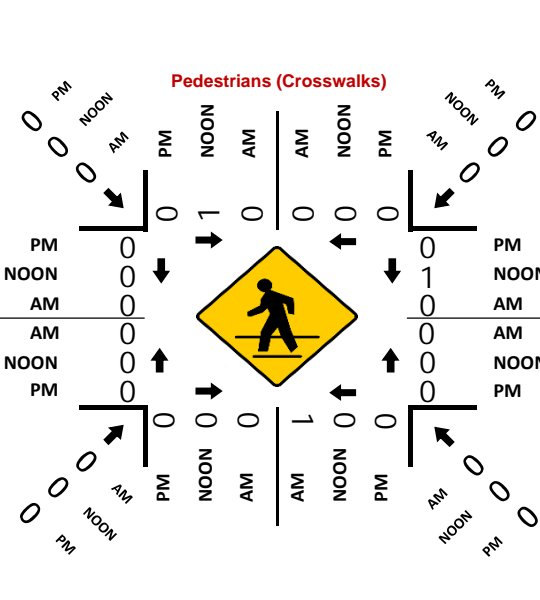
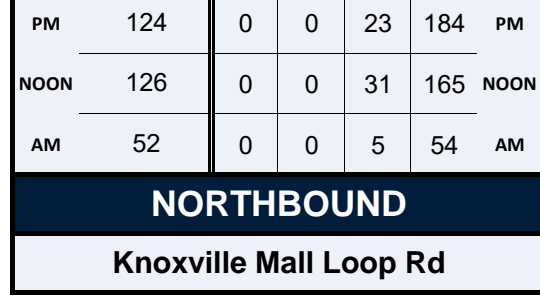
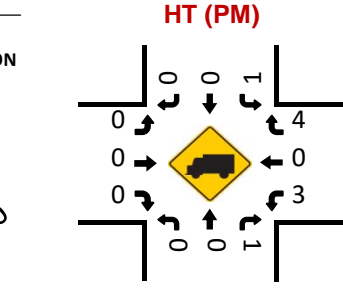
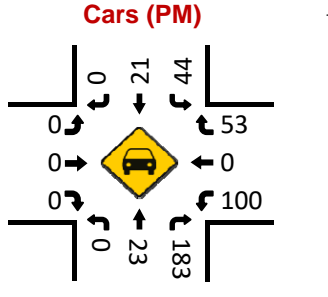
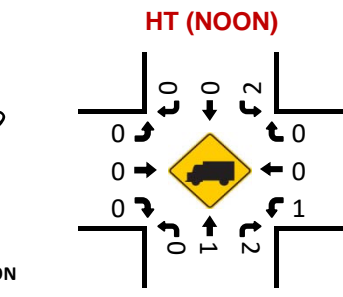
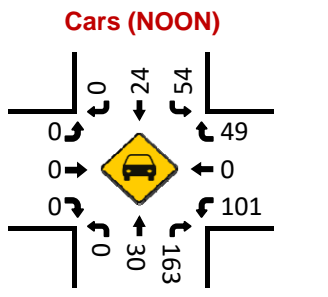
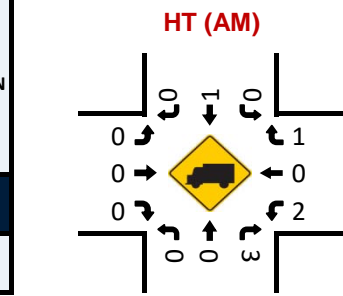
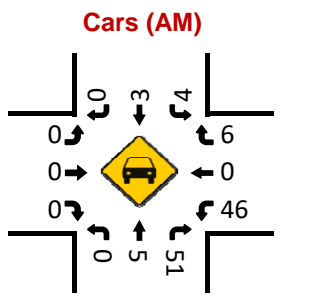
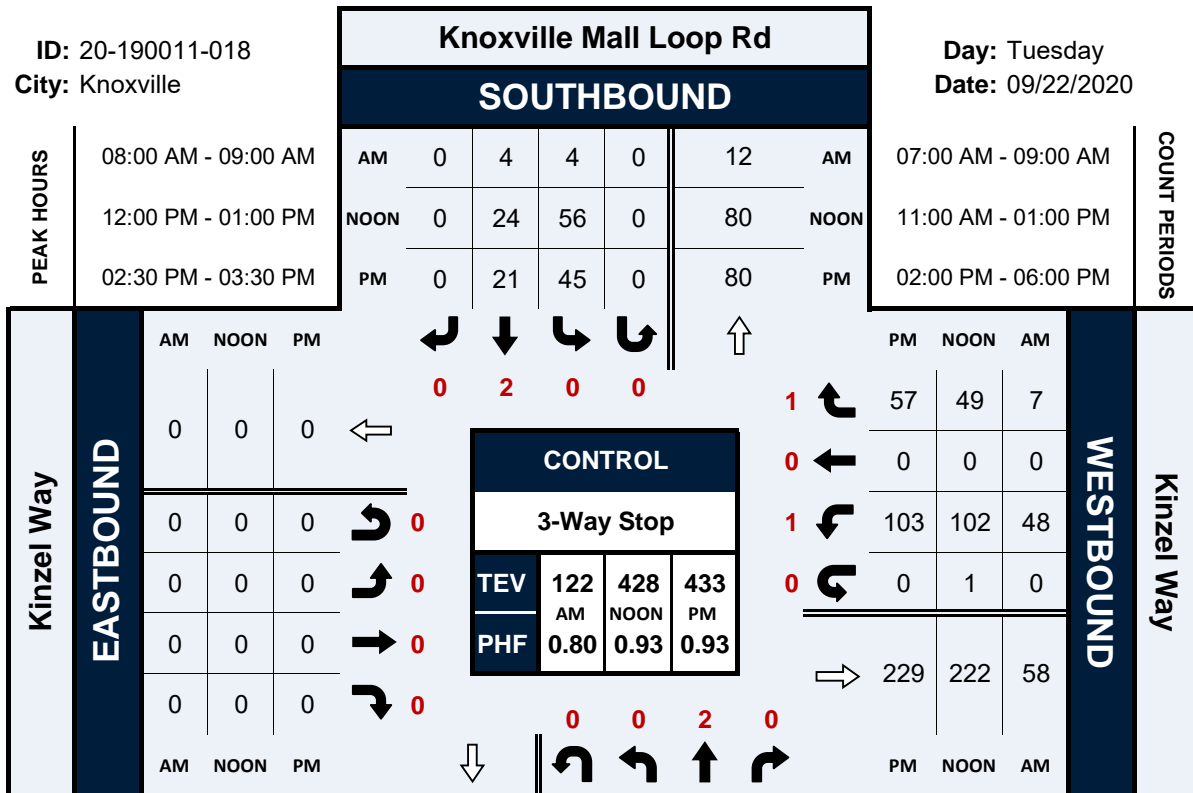


Knoxville Mall Loop Rd & Kinzel Way

Peak Hour Turning Movement Count

ID: 20-190011-018
City: Knoxville

Day: Tuesday
Date: 09/22/2020

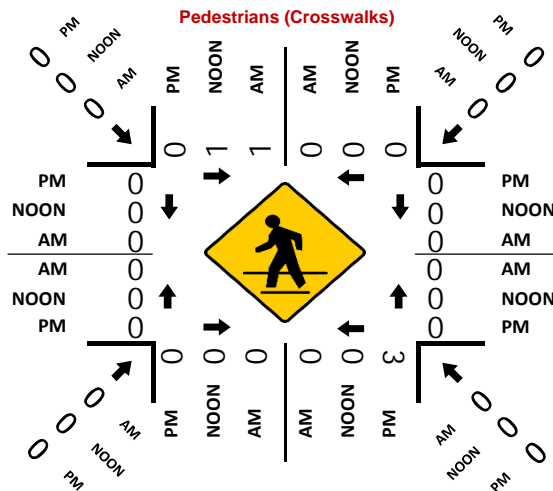
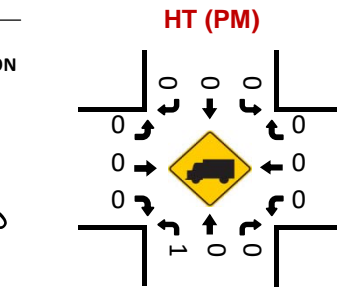
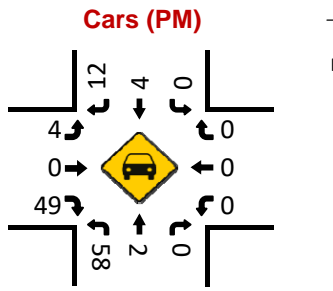
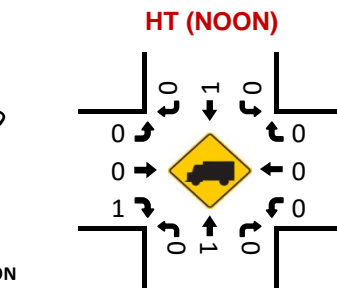
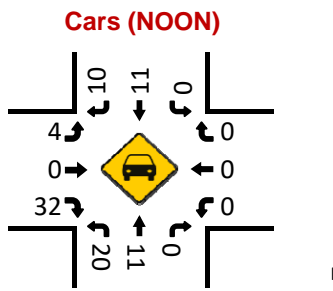
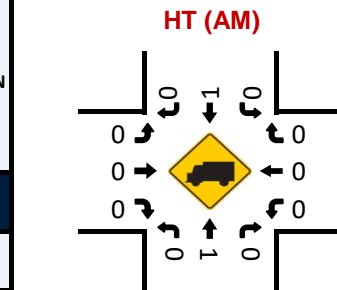
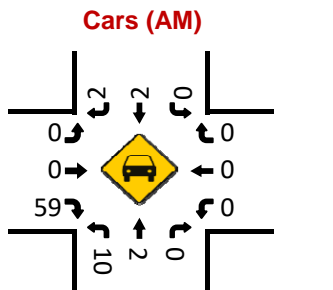
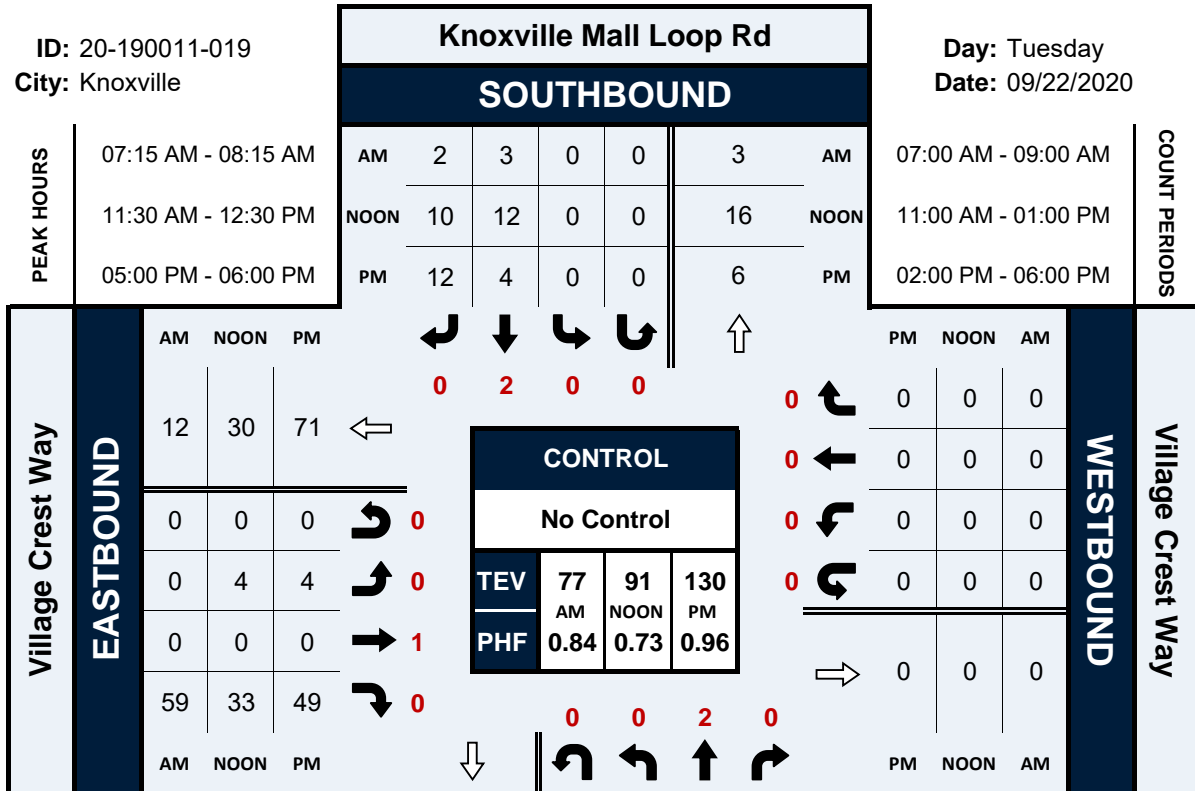


Knoxville Mall Loop Rd & Village Crest Way

Peak Hour Turning Movement Count

ID: 20-190011-019
City: Knoxville

Day: Tuesday
Date: 09/22/2020



CCI Project Name: Project Malibu
 CCI Project Number: 01514-0002
 Intersection: Washington Pike at Mill Rd
 Counted By: TN

File Name : Washington Pike at Mill - 1.14.21
 Site Code : 00000000
 Start Date : 1/14/2021
 Page No : 1

Groups Printed- All Vehicles

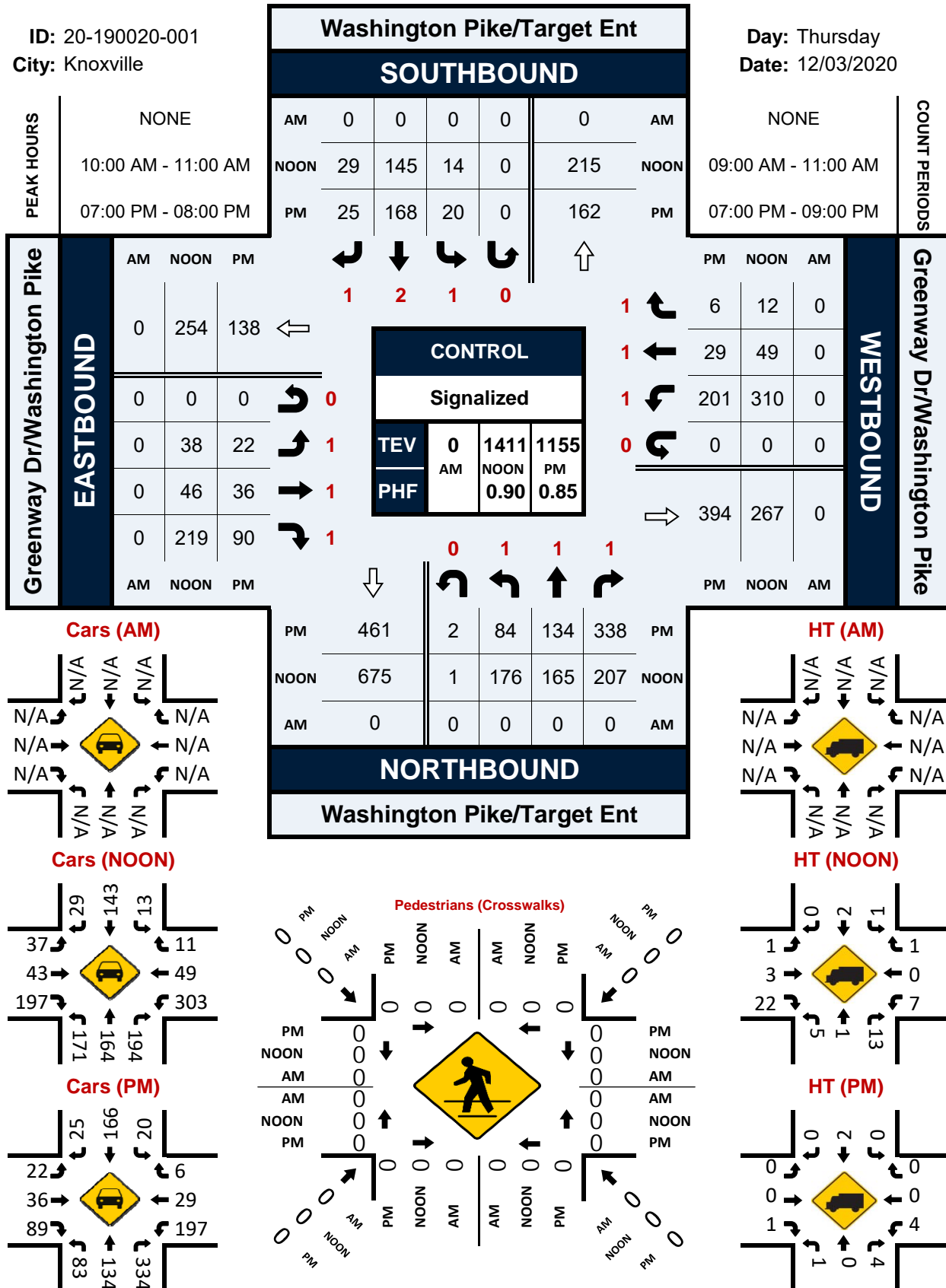
Start Time	Washington Pike Southbound					Mill Westbound					Washington Pike Northbound					Mill Eastbound					Int. Total	
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total		
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0			
10:00 AM	47	68	0	0	115	13	0	48	0	61	0	38	18	0	56	0	0	0	0	0	0	232
10:15 AM	66	76	0	0	142	11	0	34	0	45	0	54	22	0	76	0	0	0	0	0	0	263
10:30 AM	51	69	0	0	120	22	0	40	0	62	0	49	18	0	67	0	0	0	0	0	0	249
10:45 AM	75	75	0	0	150	13	0	43	0	56	0	52	17	0	69	0	0	0	0	0	0	275
Total	239	288	0	0	527	59	0	165	0	224	0	193	75	0	268	0	0	0	0	0	0	1019
Grand Total	239	288	0	0	527	59	0	165	0	224	0	193	75	0	268	0	0	0	0	0	0	1019
Apprch %	45.4	54.6	0.0	0.0		26.3	0.0	73.7	0.0		0.0	72.0	28.0	0.0		0.0	0.0	0.0	0.0	0.0		
Total %	23.5	28.3	0.0	0.0	51.7	5.8	0.0	16.2	0.0	22.0	0.0	18.9	7.4	0.0	26.3	0.0	0.0	0.0	0.0	0.0	0.0	

Washington Pike/Target Ent & Greenway Dr/Washington Pike

Peak Hour Turning Movement Count

ID: 20-190020-001
City: Knoxville

Day: Thursday
Date: 12/03/2020



Project ID: 20-190020-001
 Location: Washington Pike/Target Ent & Greenway Dr/Washington Pike
 City: Knoxville

Day: Thursday
 Date: 12/03/2020

Groups Printed - Cars, PU, Vans - Heavy Trucks

Start Time	Washington Pike/Target Ent										Washington Pike/Target Ent										Greenway Dr/Washington Pike										Greenway Dr/Washington Pike										
	Northbound					Southbound					Eastbound					Westbound					Eastbound					Westbound					Eastbound					Westbound					
	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	
9:00 AM	27	21	41	0	89	2	15	1	0	18	5	5	40	0	50	98	13	2	0	113	5	5	40	0	50	98	13	2	0	113	270										
9:15 AM	30	31	51	0	112	0	17	3	0	20	9	8	44	0	61	79	13	1	0	93	9	8	44	0	61	79	13	1	0	93	286										
9:30 AM	29	29	52	0	110	5	22	5	0	32	10	8	49	0	67	78	20	6	0	104	10	8	49	0	67	78	20	6	0	104	313										
9:45 AM	29	29	52	1	111	2	38	6	0	46	7	11	60	0	78	99	12	3	0	114	7	11	60	0	78	99	12	3	0	114	349										
Total	115	110	196	1	422	9	92	15	0	116	31	32	193	0	256	354	58	12	0	424	31	32	193	0	256	354	58	12	0	424	1218										
10:00 AM	26	34	42	0	102	3	37	6	0	46	16	12	51	0	79	81	9	3	0	93	16	12	51	0	79	81	9	3	0	93	320										
10:15 AM	46	29	43	0	118	1	30	4	0	35	6	12	62	0	80	78	4	2	0	84	6	12	62	0	80	78	4	2	0	84	317										
10:30 AM	52	50	59	1	162	8	40	7	0	55	8	11	48	0	67	77	16	3	0	96	8	11	48	0	67	77	16	3	0	96	380										
10:45 AM	52	52	63	0	167	2	38	12	0	52	8	11	58	0	77	74	20	4	0	98	2	38	12	0	52	8	11	58	0	77	394										
Total	176	165	207	1	549	14	145	29	0	188	38	46	219	0	303	310	49	12	0	371	38	46	219	0	303	310	49	12	0	371	1411										
BREAK																																									
7:00 PM	20	41	95	1	157	4	40	8	0	52	4	11	24	0	39	50	6	4	0	60	4	11	24	0	39	50	6	4	0	60	308										
7:15 PM	24	43	88	1	156	8	52	6	0	66	7	10	25	0	42	63	11	1	0	75	7	10	25	0	42	63	11	1	0	75	339										
7:30 PM	21	25	86	0	132	2	30	7	0	39	6	12	22	0	40	53	5	0	0	58	6	12	22	0	40	53	5	0	0	58	269										
7:45 PM	19	25	69	0	113	6	46	4	0	56	5	3	19	0	27	35	7	1	0	43	5	3	19	0	27	35	7	1	0	43	239										
Total	84	134	338	2	558	20	168	25	0	213	22	36	90	0	148	201	29	6	0	236	22	36	90	0	148	201	29	6	0	236	1155										
8:00 PM	30	31	56	1	118	4	35	6	0	45	4	7	22	0	33	39	3	4	0	46	4	7	22	0	33	39	3	4	0	46	242										
8:15 PM	15	27	58	1	101	3	35	4	0	42	0	8	19	0	27	28	6	1	0	35	0	8	19	0	27	28	6	1	0	35	205										
8:30 PM	13	21	50	0	84	3	26	2	0	31	2	4	16	0	22	21	5	0	0	26	2	4	16	0	22	21	5	0	0	26	163										
8:45 PM	9	16	54	2	81	3	20	5	0	28	2	5	18	0	25	27	4	0	0	31	2	5	18	0	25	27	4	0	0	31	165										
Total	67	95	218	4	384	13	116	17	0	146	8	24	75	0	107	115	18	5	0	138	8	24	75	0	107	115	18	5	0	138	775										
Grand Total	442	504	959	8	1913	56	521	86	0	663	99	138	577	0	814	980	154	35	0	1169	99	138	577	0	814	980	154	35	0	1169	4559										
Approch %	23.1	26.3	50.1	0.4	0.0	8.4	78.6	13.0	0.0	0.0	12.2	17.0	70.9	0.0	0.0	83.8	13.2	3.0	0.0	0.0	12.2	17.0	70.9	0.0	0.0	83.8	13.2	3.0	0.0	0.0	25.6										
Total %	9.7	11.1	21.0	0.2	42.0	1.2	11.4	1.9	0.0	14.5	2.2	3.0	12.7	0.0	17.9	21.5	3.4	0.8	0.0	25.6	2.2	3.0	12.7	0.0	17.9	21.5	3.4	0.8	0.0	25.6											
Cars, PU, Vans	431	500	932	8	1871	55	507	86	0	648	98	133	545	0	776	959	152	34	0	1145	98	133	545	0	776	959	152	34	0	1145	4440										
% Cars, PU, Vans	97.5	99.2	97.2	100.0	97.8	98.2	97.3	100.0	0.0	97.7	99.0	96.4	94.5	0.0	95.3	97.9	98.7	97.1	0.0	97.9	99.0	96.4	94.5	0.0	95.3	97.9	98.7	97.1	0.0	97.9	97.4										
Heavy Trucks	11	4	27	0	42	1	14	0	0	15	1	5	32	0	38	21	2	1	0	24	1	5	32	0	38	21	2	1	0	24	119										
% Heavy Trucks	2.5	0.8	2.8	0.0	2.2	1.8	2.7	0.0	0.0	2.3	1.0	3.6	5.5	0.0	4.7	2.1	1.3	2.9	0.0	2.1	1.0	3.6	5.5	0.0	4.7	2.1	1.3	2.9	0.0	2.1	2.6										

Project ID: 20-190020-001

Location: Washington Pike/Target Ent & Greenway Dr/Washi

City: Knoxville

Day: Thursday

Date: 12/03/2020

PEAK HOURS

NOON

Start Time	Washington Pike/Target Ent Northbound				Washington Pike/Target Ent Southbound				Greenway Dr/Washington Pike Eastbound				Greenway Dr/Washington Pike Westbound				Int. Total					
	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left		Thru	Rgt	Uturn	App. Total	
10:00 AM	26	34	42	0	102	3	37	6	0	46	16	12	51	0	79	81	9	3	0	93	320	
10:15 AM	46	29	43	0	118	1	30	4	0	35	6	12	62	0	80	78	4	2	0	84	317	
10:30 AM	52	50	59	1	162	8	40	7	0	55	8	11	48	0	67	77	16	3	0	96	380	
10:45 AM	52	52	63	0	167	2	38	12	0	52	8	11	58	0	77	74	20	4	0	98	394	
Total Volume	176	165	207	1	549	14	145	29	0	188	38	46	219	0	303	310	49	12	0	371	1411	
% App. Total	32.1	30.1	37.7	0.2	100	0.822	7.4	77.1	15.4	0.0	100	12.5	15.2	72.3	0.0	100	83.6	13.2	3.2	0.0	100	0.895
PHF	0.855																					
Cars, PU, Vans	171	164	194	1	530	13	143	29	0	185	37	43	197	0	277	303	49	11	0	363	1355	
% Cars, PU, Vans	97.2	99.4	93.7	100.0	96.5	92.9	98.6	100.0	0.0	98.4	97.4	93.5	90.0	0.0	91.4	97.7	100.0	91.7	0.0	97.8	96.0	
Heavy Trucks	5	1	13	0	19	1	2	0	0	3	1	3	22	0	26	7	0	1	0	8	56	
% Heavy Trucks	2.8	0.6	6.3	0.0	3.5	7.1	1.4	0.0	0.0	1.6	2.6	6.5	10.0	0.0	8.6	2.3	0.0	8.3	0.0	2.2	4.0	

PM

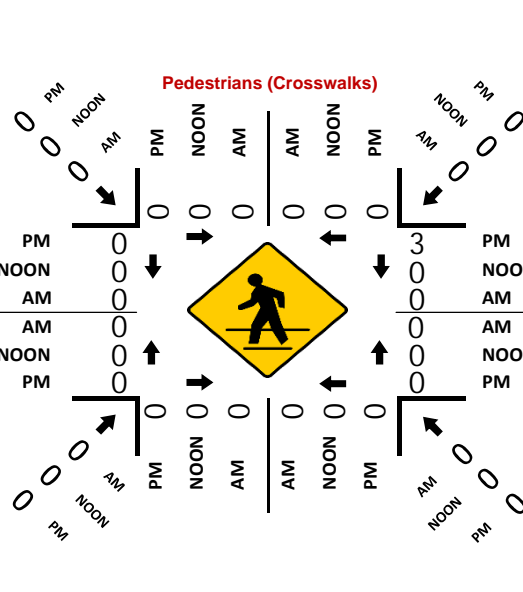
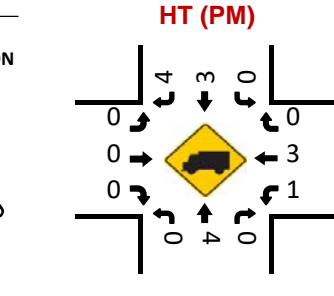
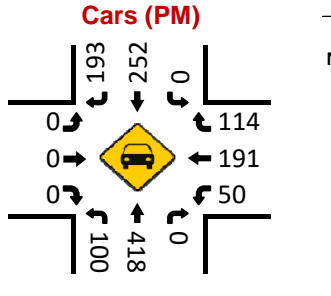
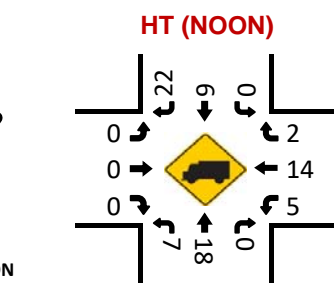
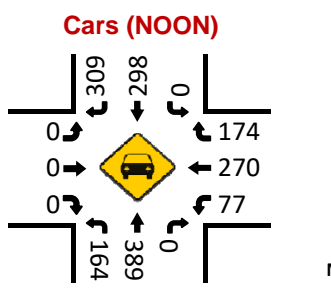
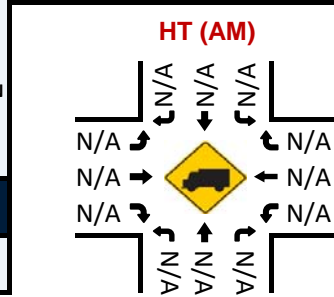
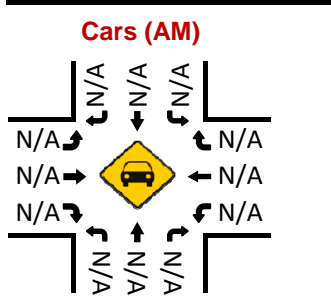
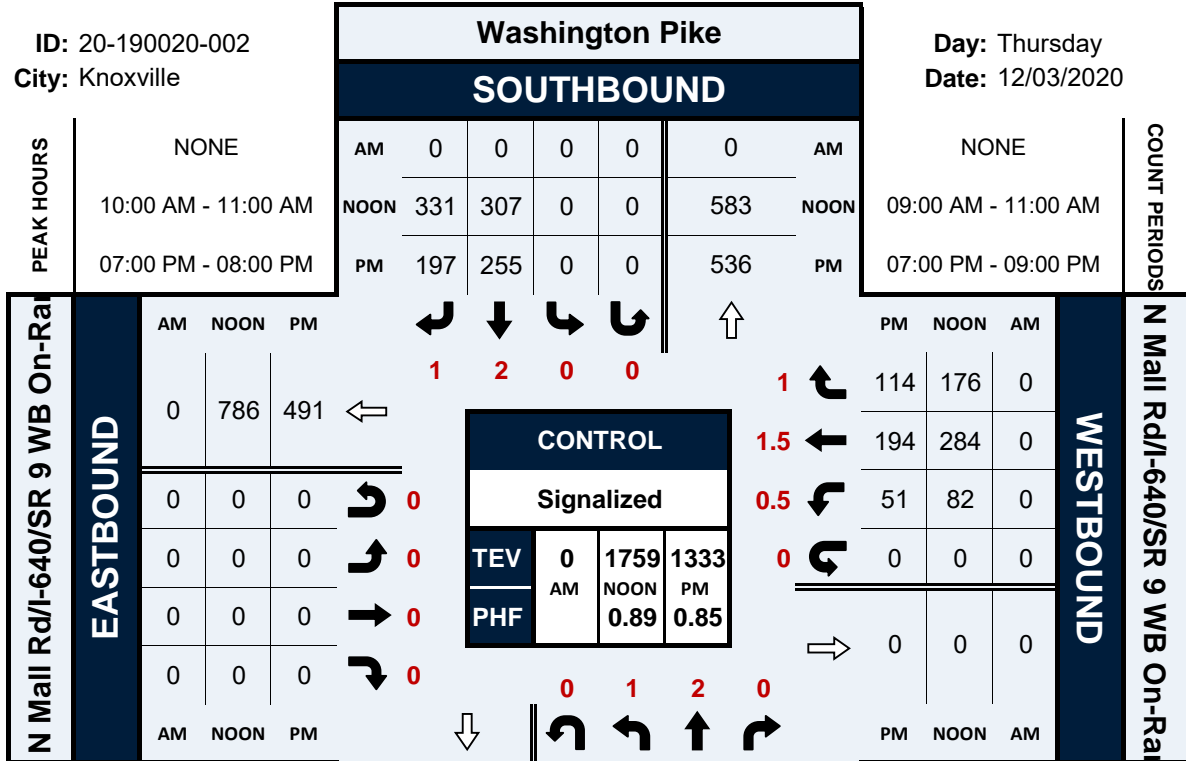
Start Time	Washington Pike/Target Ent Northbound				Washington Pike/Target Ent Southbound				Greenway Dr/Washington Pike Eastbound				Greenway Dr/Washington Pike Westbound				Int. Total					
	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left		Thru	Rgt	Uturn	App. Total	
7:00 PM	20	41	95	1	157	4	40	8	0	52	4	11	24	0	39	50	6	4	0	60	308	
7:15 PM	24	43	88	1	156	8	52	6	0	66	7	10	25	0	42	63	11	1	0	75	339	
7:30 PM	21	25	86	0	132	2	30	7	0	39	6	12	22	0	40	53	5	0	0	58	269	
7:45 PM	19	25	69	0	113	6	46	4	0	56	5	3	19	0	27	35	7	1	0	43	239	
Total Volume	84	134	338	2	558	20	168	25	0	213	22	36	90	0	148	201	29	6	0	236	1155	
% App. Total	15.1	24.0	60.6	0.4	100	0.889	9.4	78.9	11.7	0.0	100	14.9	24.3	60.8	0.0	100	85.2	12.3	2.5	0.0	100	0.852
PHF	0.807																					
Cars, PU, Vans	83	134	334	2	553	20	166	25	0	211	22	36	89	0	147	197	29	6	0	232	1143	
% Cars, PU, Vans	98.8	100.0	98.8	100.0	99.1	100.0	98.8	100.0	0.0	99.1	100.0	100.0	98.9	0.0	99.3	98.0	100.0	100.0	0.0	98.3	99.0	
Heavy Trucks	1	0	4	0	5	0	2	0	0	2	0	0	1	0	1	4	0	0	0	4	12	
% Heavy Trucks	1.2	0.0	1.2	0.0	0.9	0.0	1.2	0.0	0.0	0.9	0.0	0.0	1.1	0.0	0.7	2.0	0.0	0.0	0.0	1.7	1.0	

Washington Pike & N Mall Rd/I-640/SR 9 WB On-Ramp

Peak Hour Turning Movement Count

ID: 20-190020-002
City: Knoxville

Day: Thursday
Date: 12/03/2020



Project ID: 20-190020-002
 Location: Washington Pike & N Mall Rd/I-640/SR 9 WB On-Ramp
 City: Knoxville

Day: Thursday
 Date: 12/03/2020

Groups Printed - Cars, PU, Vans - Heavy Trucks

Start Time	Washington Pike												Washington Pike												N Mall Rd/I-640/SR 9 WB On-Ramp												N Mall Rd/I-640/SR 9 WB On-Ramp											
	Northbound						Southbound						Northbound						Southbound						Eastbound						Westbound																	
	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total												
9:00 AM	38	71	0	0	0	109	0	56	96	0	0	152	0	0	0	0	0	0	0	0	0	0	0	0	12	45	24	0	0	81	342																	
9:15 AM	36	82	0	1	0	119	0	62	77	0	0	139	0	0	0	0	0	0	0	0	0	0	0	0	15	55	30	0	0	100	358																	
9:30 AM	38	85	0	0	0	123	0	55	86	0	0	141	0	0	0	0	0	0	0	0	0	0	0	0	10	63	30	0	0	103	367																	
9:45 AM	40	85	0	0	0	125	0	95	90	0	0	185	0	0	0	0	0	0	0	0	0	0	0	0	12	49	27	0	0	88	398																	
Total	152	323	0	1	0	476	0	268	349	0	0	617	0	0	0	0	0	0	0	0	0	0	0	0	49	212	111	0	0	372	1465																	
10:00 AM	39	85	0	0	0	124	0	66	79	0	0	145	0	0	0	0	0	0	0	0	0	0	0	0	12	68	31	0	0	111	380																	
10:15 AM	45	95	0	0	0	140	0	78	89	0	0	167	0	0	0	0	0	0	0	0	0	0	0	0	21	58	34	0	0	113	420																	
10:30 AM	44	105	0	1	0	150	0	73	89	0	0	162	0	0	0	0	0	0	0	0	0	0	0	0	21	72	62	0	0	155	467																	
10:45 AM	43	122	0	0	0	165	0	90	74	0	0	164	0	0	0	0	0	0	0	0	0	0	0	0	28	86	49	0	0	163	492																	
Total	171	407	0	1	0	579	0	307	331	0	0	638	0	0	0	0	0	0	0	0	0	0	0	0	82	284	176	0	0	542	1759																	
BREAK																																																
7:00 PM	29	119	0	0	0	148	0	71	42	0	0	113	0	0	0	0	0	0	0	0	0	0	0	0	11	52	30	0	0	93	354																	
7:15 PM	28	111	0	0	0	139	0	77	61	0	0	138	0	0	0	0	0	0	0	0	0	0	0	0	15	62	37	0	3	114	391																	
7:30 PM	24	109	0	0	0	133	0	51	50	0	0	101	0	0	0	0	0	0	0	0	0	0	0	0	14	48	22	0	0	84	318																	
7:45 PM	19	83	0	0	0	102	0	56	44	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	11	32	25	0	0	68	270																	
Total	100	422	0	0	0	522	0	255	197	0	0	452	0	0	0	0	0	0	0	0	0	0	0	0	51	194	114	0	3	359	1333																	
8:00 PM	19	77	0	0	0	96	0	50	41	0	0	91	0	0	0	0	0	0	0	0	0	0	0	0	8	33	31	0	0	72	259																	
8:15 PM	15	71	0	0	0	86	0	44	39	0	0	83	0	0	0	0	0	0	0	0	0	0	0	0	7	40	26	0	0	73	242																	
8:30 PM	18	68	0	0	0	86	0	41	21	0	0	62	0	0	0	0	0	0	0	0	0	0	0	0	6	36	10	0	0	52	200																	
8:45 PM	16	61	0	0	0	77	0	37	29	0	0	66	0	0	0	0	0	0	0	0	0	0	0	0	6	26	22	0	1	54	197																	
Total	68	277	0	0	0	345	0	172	130	0	0	302	0	0	0	0	0	0	0	0	0	0	0	0	27	135	89	0	1	251	898																	
Grand Total	491	1429	0	2	0	1922	0	1002	1007	0	0	2009	0	0	0	0	0	0	0	0	0	0	0	0	209	825	490	0	4	1524	5455																	
Approch %	25.5	74.3	0.0	0.1	0.0	0.0	49.9	50.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.7	54.1	32.2	0.0	0.3																				
Total %	9.0	26.2	0.0	0.0	0.0	35.2	0.0	18.4	18.5	0.0	0.0	36.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	15.1	9.0	0.0	0.1	27.9																		
Cars, PU, Vans	481	1394	0	2	0	1877	0	978	961	0	0	1939	0	0	0	0	0	0	0	0	0	0	0	0	198	798	485	0	0	1481	5297																	
% Cars, PU, Vans	98.0	97.6	0.0	100.0	0.0	97.7	0.0	97.6	95.4	0.0	0.0	96.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	94.7	96.7	99.0	0.0	0.0	97.2	97.1																	
Heavy Trucks	10	35	0	0	0	45	0	24	46	0	0	70	0	0	0	0	0	0	0	0	0	0	0	0	11	27	5	0	0	43	158																	
% Heavy Trucks	2.0	2.4	0.0	0.0	0.0	2.3	0.0	2.4	4.6	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	3.3	1.0	0.0	0.0	2.8	2.9																	

Project ID: 20-190020-002

Location: Washington Pike & N Mall Rd/I-640/SR 9 WB On-Ramp

City: Knoxville

Day: Thursday

Date: 12/03/2020

PEAK HOURS

NOON

Start Time	Washington Pike Northbound					Washington Pike Southbound					N Mall Rd/I-640/SR 9 WB On-Ramp Eastbound					N Mall Rd/I-640/SR 9 WB On-Ramp Westbound					
	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	
	10:00 AM	39	85	0	0	124	0	66	79	0	145	0	0	0	0	0	12	68	31	0	111
10:15 AM	45	95	0	0	140	0	78	89	0	167	0	0	0	0	0	21	58	34	0	113	420
10:30 AM	44	105	0	1	150	0	73	89	0	162	0	0	0	0	0	21	72	62	0	155	467
10:45 AM	43	122	0	0	165	0	90	74	0	164	0	0	0	0	0	28	86	49	0	163	492
Total Volume	171	407	0	1	579	0	307	331	0	638	0	0	0	0	0	82	284	176	0	542	1759
% App. Total	29.5	70.3	0.0	0.2	100	0.0	48.1	51.9	0.0	100	0.0	0.0	0.0	0.0	0.0	15.1	52.4	32.5	0.0	100	0.894
PHF	0.877																				
Cars, PU, Vans	164	389	0	1	554	0	298	309	0	607	0	0	0	0	0	77	270	174	0	521	1682
% Cars, PU, Vans	95.9	95.6	0.0	100.0	95.7	0.0	97.1	93.4	0.0	95.1	0.0	0.0	0.0	0.0	0.0	93.9	95.1	98.9	0.0	96.1	95.6
Heavy Trucks	7	18	0	0	25	0	9	22	0	31	0	0	0	0	0	5	14	2	0	21	77
% Heavy Trucks	4.1	4.4	0.0	0.0	4.3	0.0	2.9	6.6	0.0	4.9	0.0	0.0	0.0	0.0	0.0	6.1	4.9	1.1	0.0	3.9	4.4

PM

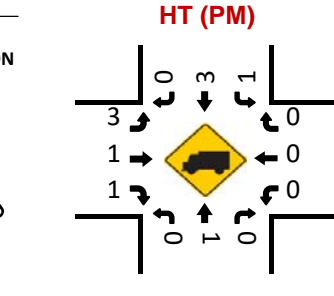
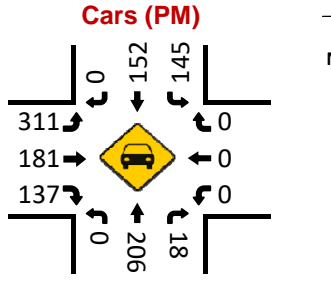
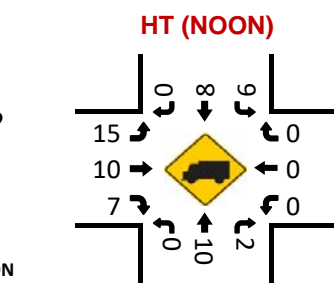
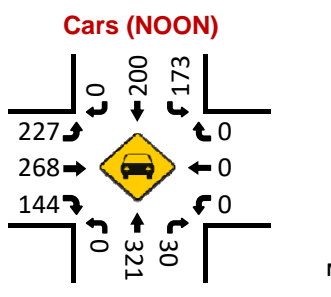
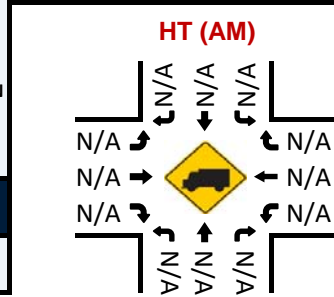
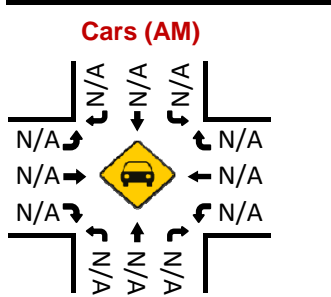
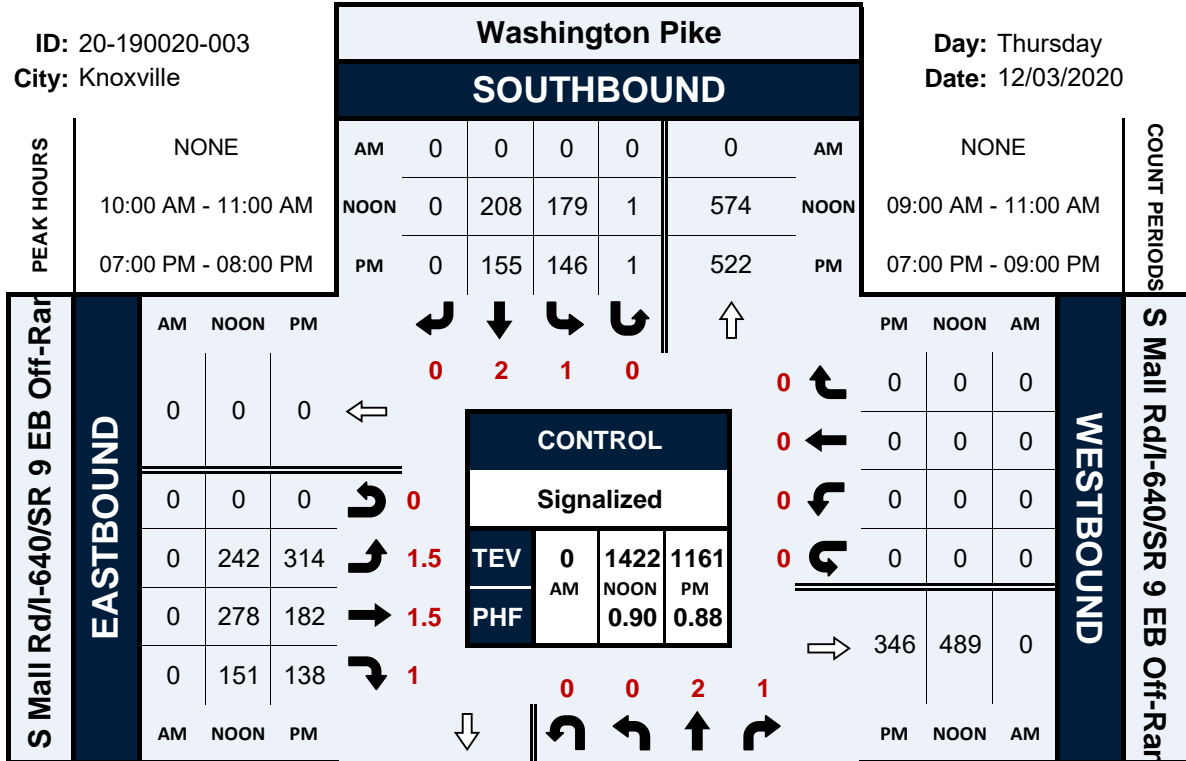
Start Time	Washington Pike Northbound					Washington Pike Southbound					N Mall Rd/I-640/SR 9 WB On-Ramp Eastbound					N Mall Rd/I-640/SR 9 WB On-Ramp Westbound					
	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	
	7:00 PM	29	119	0	0	148	0	71	42	0	113	0	0	0	0	0	11	52	30	0	93
7:15 PM	28	111	0	0	139	0	77	61	0	138	0	0	0	0	0	15	62	37	0	114	391
7:30 PM	24	109	0	0	133	0	51	50	0	101	0	0	0	0	0	14	48	22	0	84	318
7:45 PM	19	83	0	0	102	0	56	44	0	100	0	0	0	0	0	11	32	25	0	68	270
Total Volume	100	422	0	0	522	0	255	197	0	452	0	0	0	0	0	51	194	114	0	359	1333
% App. Total	19.2	80.8	0.0	0.0	100	0.0	56.4	43.6	0.0	100	0.0	0.0	0.0	0.0	0.0	14.2	54.0	31.8	0.0	100	0.852
PHF	0.882																				
Cars, PU, Vans	100	418	0	0	518	0	252	193	0	445	0	0	0	0	0	50	191	114	0	355	1318
% Cars, PU, Vans	100.0	99.1	0.0	0.0	99.2	0.0	98.8	98.0	0.0	98.5	0.0	0.0	0.0	0.0	0.0	98.0	98.5	100.0	0.0	98.9	98.9
Heavy Trucks	0	4	0	0	4	0	3	4	0	7	0	0	0	0	0	1	3	0	0	4	15
% Heavy Trucks	0.0	0.9	0.0	0.0	0.8	0.0	1.2	2.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	2.0	1.5	0.0	0.0	1.1	1.1

Washington Pike & S Mall Rd/I-640/SR 9 EB Off-Ramp

Peak Hour Turning Movement Count

ID: 20-190020-003
City: Knoxville

Day: Thursday
Date: 12/03/2020



Project ID: 20-190020-003

Location: Washington Pike & S Mall Rd/I-640/SR 9 EB Off-Ra

City: Knoxville

Day: Thursday

Date: 12/03/2020

PEAK HOURS

NOON

Start Time	Washington Pike Northbound					Washington Pike Southbound					S Mall Rd/I-640/SR 9 EB Off-Ramp Eastbound					S Mall Rd/I-640/SR 9 EB Off-Ramp Westbound					
	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	
	10:00 AM	0	70	8	0	78	31	50	0	0	81	52	73	45	0	170	0	0	0	0	0
10:15 AM	0	82	10	0	92	49	48	0	0	97	54	58	35	0	147	0	0	0	0	0	336
10:30 AM	0	81	10	0	91	46	53	0	0	99	68	70	32	0	170	0	0	0	0	0	360
10:45 AM	0	98	4	0	102	53	57	0	1	111	68	77	39	0	184	0	0	0	0	0	397
Total Volume	0	331	32	0	363	179	208	0	1	388	242	278	151	0	671	0	0	0	0	0	1422
% App. Total	0.0	91.2	8.8	0.0	100	46.1	53.6	0.0	0.3	100	36.1	41.4	22.5	0.0	100	0.0	0.0	0.0	0.0	0.0	0
PHF					0.890					0.874					0.912						0.895
Cars, PU, Vans	0	321	30	0	351	173	200	0	1	374	227	268	144	0	639	0	0	0	0	0	1364
% Cars, PU, Vans	0.0	97.0	93.8	0.0	96.7	96.6	96.2	0.0	100.0	96.4	93.8	96.4	95.4	0.0	95.2	0.0	0.0	0.0	0.0	0.0	95.9
Heavy Trucks	0	10	2	0	12	6	8	0	0	14	15	10	7	0	32	0	0	0	0	0	58
% Heavy Trucks	0.0	3.0	6.3	0.0	3.3	3.4	3.8	0.0	0.0	3.6	6.2	3.6	4.6	0.0	4.8	0.0	0.0	0.0	0.0	0.0	4.1

Peak Hour for Entire Intersection Begins at 10:00 AM

PM

Start Time	Washington Pike Northbound					Washington Pike Southbound					S Mall Rd/I-640/SR 9 EB Off-Ramp Eastbound					S Mall Rd/I-640/SR 9 EB Off-Ramp Westbound					
	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	
	7:00 PM	0	64	4	0	68	37	43	0	0	80	82	50	40	0	172	0	0	0	0	0
7:15 PM	0	55	4	0	59	47	46	0	0	93	86	56	37	0	179	0	0	0	0	0	331
7:30 PM	0	49	6	0	55	35	32	0	0	67	83	51	29	0	163	0	0	0	0	0	285
7:45 PM	0	39	4	0	43	27	34	0	1	62	63	25	32	0	120	0	0	0	0	0	225
Total Volume	0	207	18	0	225	146	155	0	1	302	314	182	138	0	634	0	0	0	0	0	1161
% App. Total	0.0	92.0	8.0	0.0	100	48.3	51.3	0.0	0.3	100	49.5	28.7	21.8	0.0	100	0.0	0.0	0.0	0.0	0.0	0
PHF					0.827					0.812					0.885						0.877
Cars, PU, Vans	0	206	18	0	224	145	152	0	1	298	311	181	137	0	629	0	0	0	0	0	1151
% Cars, PU, Vans	0.0	99.5	100.0	0.0	99.6	99.3	98.1	0.0	100.0	98.7	99.0	99.5	99.3	0.0	99.2	0.0	0.0	0.0	0.0	0.0	99.1
Heavy Trucks	0	1	0	0	1	1	3	0	0	4	3	1	1	0	5	0	0	0	0	0	10
% Heavy Trucks	0.0	0.5	0.0	0.0	0.4	0.7	1.9	0.0	0.0	1.3	1.0	0.5	0.7	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.9

Peak Hour for Entire Intersection Begins at 07:00 PM

Project ID: 20-190020-004

Location: Millertown Pike & S Mall Rd/I-640/SR 9 EB On-Ramp
City: Knoxville

Day: Thursday
Date: 12/03/2020

Groups Printed - Cars, PU, Vans - Heavy Trucks

Start Time	Millertown Pike Northbound						Millertown Pike Southbound						S Mall Rd/I-640/SR 9 EB On-Ramp Eastbound						S Mall Rd/I-640/SR 9 EB On-Ramp Westbound										
	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total					
9:00 AM	0	34	10	0	0	44	61	51	0	0	112	32	14	5	0	0	51	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	29	11	0	0	40	60	64	0	1	125	41	30	5	0	0	76	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	35	20	0	0	55	62	58	0	0	120	49	38	6	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	41	20	0	0	61	70	82	0	0	152	45	23	4	0	0	72	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	139	61	0	0	200	253	255	0	1	509	167	105	20	0	0	292	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	47	17	0	0	64	66	53	0	0	119	52	24	10	0	0	86	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	49	18	0	0	67	87	52	0	0	139	57	33	8	0	0	98	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	47	17	0	0	64	67	58	0	0	125	66	41	9	0	0	116	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	64	7	0	0	71	70	72	0	1	143	61	30	13	0	0	104	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	207	59	0	0	266	290	235	0	1	526	236	128	40	0	0	404	0	0	0	0	0	0	0	0	0	0	0	0
BREAK																													
7:00 PM	0	49	15	0	0	64	83	56	0	0	139	61	21	11	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0
7:15 PM	0	40	17	0	0	57	44	67	0	2	113	64	25	5	0	0	94	0	0	0	0	0	0	0	0	0	0	0	0
7:30 PM	0	33	12	0	0	45	55	48	0	1	104	55	27	9	0	0	91	0	0	0	0	0	0	0	0	0	0	0	0
7:45 PM	0	35	12	0	0	47	38	45	0	0	83	32	16	4	0	0	52	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	157	56	0	0	213	220	216	0	3	439	212	89	29	0	0	330	0	0	0	0	0	0	0	0	0	0	0	0
8:00 PM	0	31	14	0	0	45	46	38	0	0	84	39	16	4	0	0	59	0	0	0	0	0	0	0	0	0	0	0	0
8:15 PM	0	33	8	0	0	41	38	33	0	0	71	32	18	3	0	0	53	0	0	0	0	0	0	0	0	0	0	0	0
8:30 PM	0	24	5	0	0	29	41	38	0	0	79	36	12	4	0	0	52	0	0	0	0	0	0	0	0	0	0	0	0
8:45 PM	0	32	6	0	0	38	45	28	0	0	73	28	13	3	0	0	44	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	120	33	0	0	153	170	137	0	0	307	135	59	14	0	0	208	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	623	209	0	0	832	933	843	0	5	1781	750	381	103	0	0	1234	0	0	0	0	0	0	0	0	0	0	0	0
Approch %	0.0	74.9	25.1	0.0	0.0		52.4	47.3	0.0	0.3	0.0	60.8	30.9	8.3	0.0	0.0							0.0	0.0	0.0	0.0	0.0	0.0	
Total %	0.0	16.2	5.4	0.0	0.0	21.6	24.3	21.9	0.0	0.1	46.3	19.5	9.9	2.7	0.0	0.0	32.1						0.0	0.0	0.0	0.0	0.0	0.0	
Cars, PU, Vans	0	611	208	0	0	819	907	829	0	5	1741	736	368	99	0	0	1203	0	0	0	0	0	0	0	0	0	0	0	0
% Cars, PU, Vans	0.0	98.1	99.5	0.0	0.0	98.4	97.2	98.3	0.0	100.0	97.8	98.1	96.6	96.1	0.0	0.0	97.5						0.0	0.0	0.0	0.0	0.0	0.0	
Heavy Trucks	0	12	1	0	0	13	26	14	0	0	40	14	13	4	0	0	31	0	0	0	0	0	0	0	0	0	0	0	0
% Heavy Trucks	0.0	1.9	0.5	0.0	0.0	1.6	2.8	1.7	0.0	0.0	2.2	1.9	3.4	3.9	0.0	0.0	2.5						0.0	0.0	0.0	0.0	0.0	0.0	

Project ID: 20-190020-004

Location: Millertown Pike & S Mall Rd/I-640/SR 9 EB On-Ram

City: Knoxville

PEAK HOURS

Day: Thursday

Date: 12/03/2020

NOON

Start Time	Millertown Pike Northbound				Millertown Pike Southbound				S Mall Rd/I-640/SR 9 EB On-Ramp Eastbound				S Mall Rd/I-640/SR 9 EB On-Ramp Westbound					
	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Int. Total	
10:00 AM	0	47	17	0	64	66	53	0	119	52	24	10	0	86	0	0	0	269
10:15 AM	0	49	18	0	67	87	52	0	139	57	33	8	0	98	0	0	0	304
10:30 AM	0	47	17	0	64	67	58	0	125	66	41	9	0	116	0	0	0	305
10:45 AM	0	64	7	0	71	70	72	0	143	61	30	13	0	104	0	0	0	318
Total Volume	0	207	59	0	266	290	235	0	526	236	128	40	0	404	0	0	0	1196
% App. Total	0.0	77.8	22.2	0.0	100	55.1	44.7	0.0	0.2	100	58.4	31.7	9.9	0.0	100	0.0	0.0	0.0
PHF					0.937				0.920					0.871				0.940
Cars, PU, Vans	0	203	59	0	262	281	227	0	509	230	121	37	0	388	0	0	0	1159
% Cars, PU, Vans	0.0	98.1	100.0	0.0	98.5	96.9	96.6	0.0	100.0	96.8	97.5	94.5	92.5	0.0	96.0	0.0	0.0	96.9
Heavy Trucks	0	4	0	0	4	9	8	0	17	6	7	3	0	16	0	0	0	37
% Heavy Trucks	0.0	1.9	0.0	0.0	1.5	3.1	3.4	0.0	0.0	3.2	2.5	5.5	7.5	0.0	4.0	0.0	0.0	3.1

PM

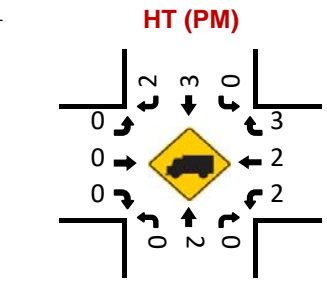
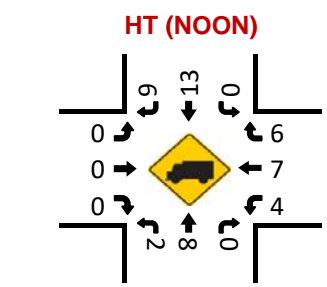
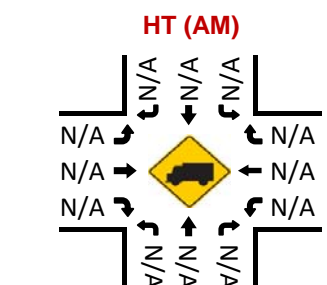
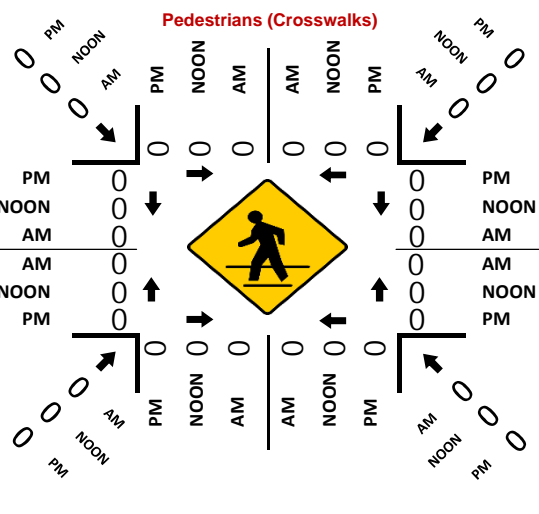
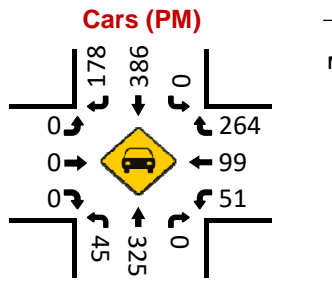
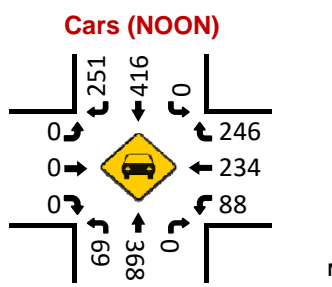
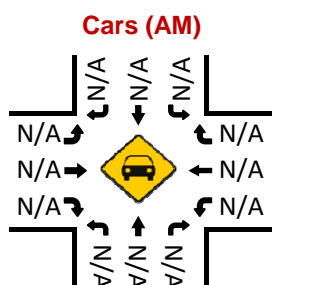
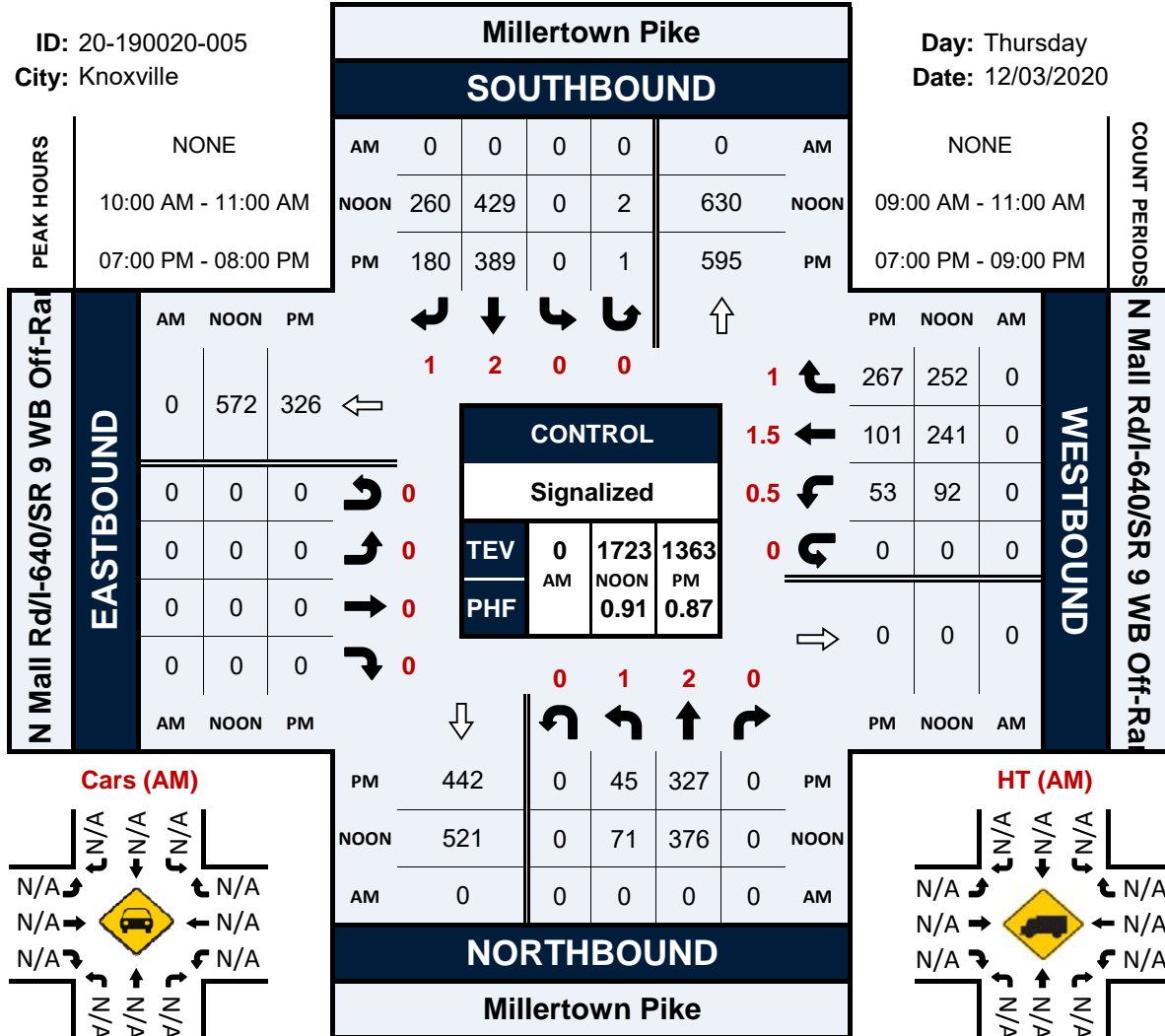
Start Time	Millertown Pike Northbound				Millertown Pike Southbound				S Mall Rd/I-640/SR 9 EB On-Ramp Eastbound				S Mall Rd/I-640/SR 9 EB On-Ramp Westbound					
	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Int. Total	
7:00 PM	0	49	15	0	64	83	56	0	139	61	21	11	0	93	0	0	0	296
7:15 PM	0	40	17	0	57	44	67	0	113	64	25	5	0	94	0	0	0	264
7:30 PM	0	33	12	0	45	55	48	0	104	55	27	9	0	91	0	0	0	240
7:45 PM	0	35	12	0	47	38	45	0	83	32	16	4	0	52	0	0	0	182
Total Volume	0	157	56	0	213	220	216	0	439	212	89	29	0	330	0	0	0	982
% App. Total	0.0	73.7	26.3	0.0	100	50.1	49.2	0.0	0.7	100	64.2	27.0	8.8	0.0	100	0.0	0.0	0.0
PHF					0.832				0.790					0.878				0.829
Cars, PU, Vans	0	156	55	0	211	216	215	0	434	211	89	29	0	329	0	0	0	974
% Cars, PU, Vans	0.0	99.4	98.2	0.0	99.1	98.2	99.5	0.0	100.0	99.5	100.0	100.0	0.0	99.7	0.0	0.0	0.0	99.2
Heavy Trucks	0	1	1	0	2	4	1	0	5	1	0	0	0	1	0	0	0	8
% Heavy Trucks	0.0	0.6	1.8	0.0	0.9	1.8	0.5	0.0	1.1	0.5	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.8

Millertown Pike & N Mall Rd/I-640/SR 9 WB Off-Ramp

Peak Hour Turning Movement Count

ID: 20-190020-005
City: Knoxville

Day: Thursday
Date: 12/03/2020



Project ID: 20-190020-005

Location: Millertown Pike & N Mall Rd/I-640/SR 9 WB Off-Ramp

City: Knoxville

Day: Thursday

Date: 12/03/2020

Groups Printed - Cars, PU, Vans - Heavy Trucks

Start Time	Millertown Pike Northbound						Millertown Pike Southbound						N Mall Rd/I-640/SR 9 WB Off-Ramp Eastbound						N Mall Rd/I-640/SR 9 WB Off-Ramp Westbound					
	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total
9:00 AM	5	61	0	0	0	66	0	97	50	0	0	147	0	0	0	0	0	0	20	32	51	0	0	103
9:15 AM	10	60	0	0	0	70	0	94	53	0	0	147	0	0	0	0	0	0	27	38	60	0	0	125
9:30 AM	7	71	0	0	0	78	0	95	54	0	0	149	0	0	0	0	0	0	26	42	52	0	0	120
9:45 AM	12	78	0	0	0	90	0	123	52	0	0	175	0	0	0	0	0	0	32	46	58	0	0	136
Total	34	270	0	0	0	304	0	409	209	0	0	618	0	0	0	0	0	0	105	158	221	0	0	484
10:00 AM	19	82	0	0	0	101	0	92	61	0	0	153	0	0	0	0	0	0	24	46	50	0	0	120
10:15 AM	13	96	0	0	0	109	0	114	66	1	0	181	0	0	0	0	0	0	24	65	55	0	0	144
10:30 AM	17	83	0	0	0	100	0	101	69	0	0	170	0	0	0	0	0	0	30	71	69	0	0	170
10:45 AM	22	115	0	0	0	137	0	122	64	1	0	187	0	0	0	0	0	0	14	59	78	0	0	151
Total	71	376	0	0	0	447	0	429	260	2	0	691	0	0	0	0	0	0	92	241	252	0	0	585
BREAK																								
7:00 PM	10	100	0	0	0	110	0	132	48	0	0	180	0	0	0	0	0	0	8	24	67	0	0	99
7:15 PM	14	91	0	0	0	105	0	97	62	0	0	159	0	0	0	0	0	0	17	37	72	0	0	126
7:30 PM	13	77	0	0	0	90	0	90	44	1	0	135	0	0	0	0	0	0	13	21	66	0	0	100
7:45 PM	8	59	0	0	0	67	0	70	26	0	0	96	0	0	0	0	0	0	15	19	62	0	0	96
Total	45	327	0	0	0	372	0	389	180	1	0	570	0	0	0	0	0	0	53	101	267	0	0	421
8:00 PM	4	62	0	0	0	66	0	81	39	0	0	120	0	0	0	0	0	0	7	14	62	0	0	83
8:15 PM	4	65	0	0	0	69	0	56	39	0	0	95	0	0	0	0	0	0	11	11	63	0	2	85
8:30 PM	5	55	0	0	0	60	0	69	30	0	0	99	0	0	0	0	0	0	12	13	62	0	0	87
8:45 PM	1	59	0	0	0	60	0	59	29	0	0	88	0	0	0	0	0	0	9	17	39	0	0	65
Total	14	241	0	0	0	255	0	265	137	0	0	402	0	0	0	0	0	0	39	55	226	0	2	320
Grand Total	164	1214	0	0	0	1378	0	1492	786	3	0	2281	0	0	0	0	0	0	289	555	966	0	2	1810
Approch %	11.9	88.1	0.0	0.0	0.0		0.0	65.4	34.5	0.1	0.0		0.0	0.0	0.0	0.0	0.0	0.0	16.0	30.7	53.4	0.0	0.1	
Total %	3.0	22.2	0.0	0.0	0.0	25.2	0.0	27.3	14.4	0.1	0.0	41.7	0.0	0.0	0.0	0.0	0.0	0.0	5.3	10.1	17.7	0.0	0.0	33.1
Cars, PU, Vans	161	1191	0	0	0	1352	0	1462	768	3	0	2233	0	0	0	0	0	0	279	539	942	0	0	1760
% Cars, PU, Vans	98.2	98.1	0.0	0.0	0.0	98.1	0.0	98.0	97.7	100.0		97.9	0.0	0.0	0.0	0.0	0.0	0.0	96.5	97.1	97.5	0.0	0.0	97.2
Heavy Trucks	3	23	0	0	0	26	0	30	18	0	0	48	0	0	0	0	0	0	10	16	24	0	0	50
% Heavy Trucks	1.8	1.9	0.0	0.0	0.0	1.9	0.0	2.0	2.3	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	3.5	2.9	2.5	0.0	0.0	2.8

Project ID: 20-190020-005

Location: Millertown Pike & N Mall Rd/I-640/SR 9 WB Off-Ramp

City: Knoxville

Day: Thursday

Date: 12/03/2020

PEAK HOURS

NOON

Start Time	Millertown Pike Northbound				Millertown Pike Southbound				N Mall Rd/I-640/SR 9 WB Off-Ramp Eastbound				N Mall Rd/I-640/SR 9 WB Off-Ramp Westbound							
	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	App. Total	Int. Total		
10:00 AM	19	82	0	0	101	0	92	61	0	153	0	0	0	0	0	0	0	0	120	374
10:15 AM	13	96	0	0	109	0	114	66	1	181	0	0	0	0	0	0	0	0	144	434
10:30 AM	17	83	0	0	100	0	101	69	0	170	0	0	0	0	0	0	0	0	170	440
10:45 AM	22	115	0	0	137	0	122	64	1	187	0	0	0	0	0	0	0	0	151	475
Total Volume	71	376	0	0	447	0	429	260	2	691	0	0	0	0	0	0	0	0	585	1723
% App. Total	15.9	84.1	0.0	0.0	100	0.0	62.1	37.6	0.3	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.860	0.907
PHF	0.924																			
Cars, PU, Vans	69	368	0	0	437	0	416	251	2	669	0	0	0	0	0	0	0	0	568	1674
% Cars, PU, Vans	97.2	97.9	0.0	0.0	97.8	0.0	97.0	96.5	100.0	96.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	97.1	97.2
Heavy Trucks	2	8	0	0	10	0	13	9	0	22	0	0	0	0	0	0	0	0	4	49
% Heavy Trucks	2.8	2.1	0.0	0.0	2.2	0.0	3.0	3.5	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	2.8

PM

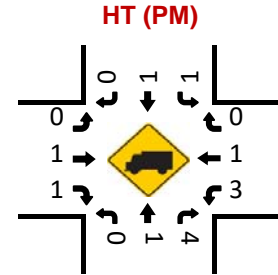
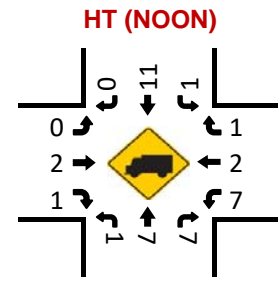
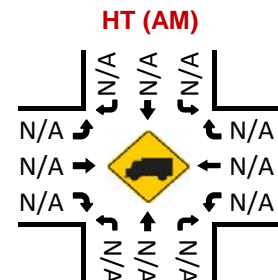
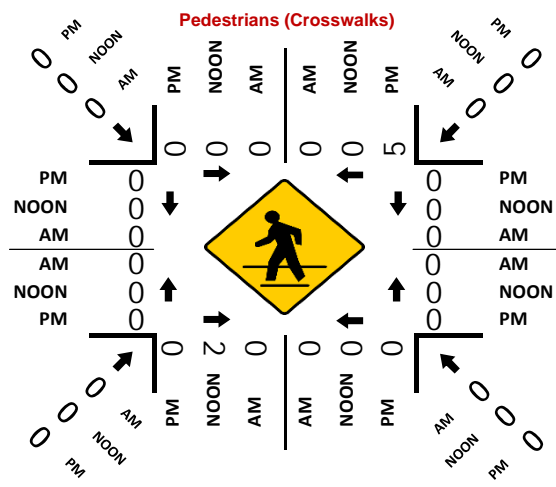
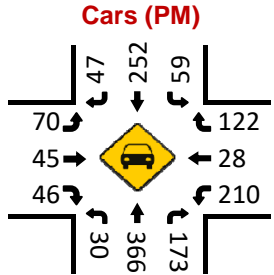
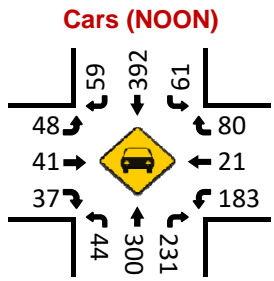
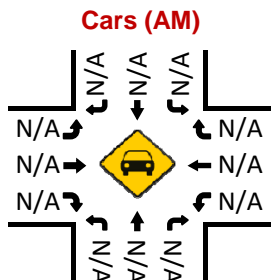
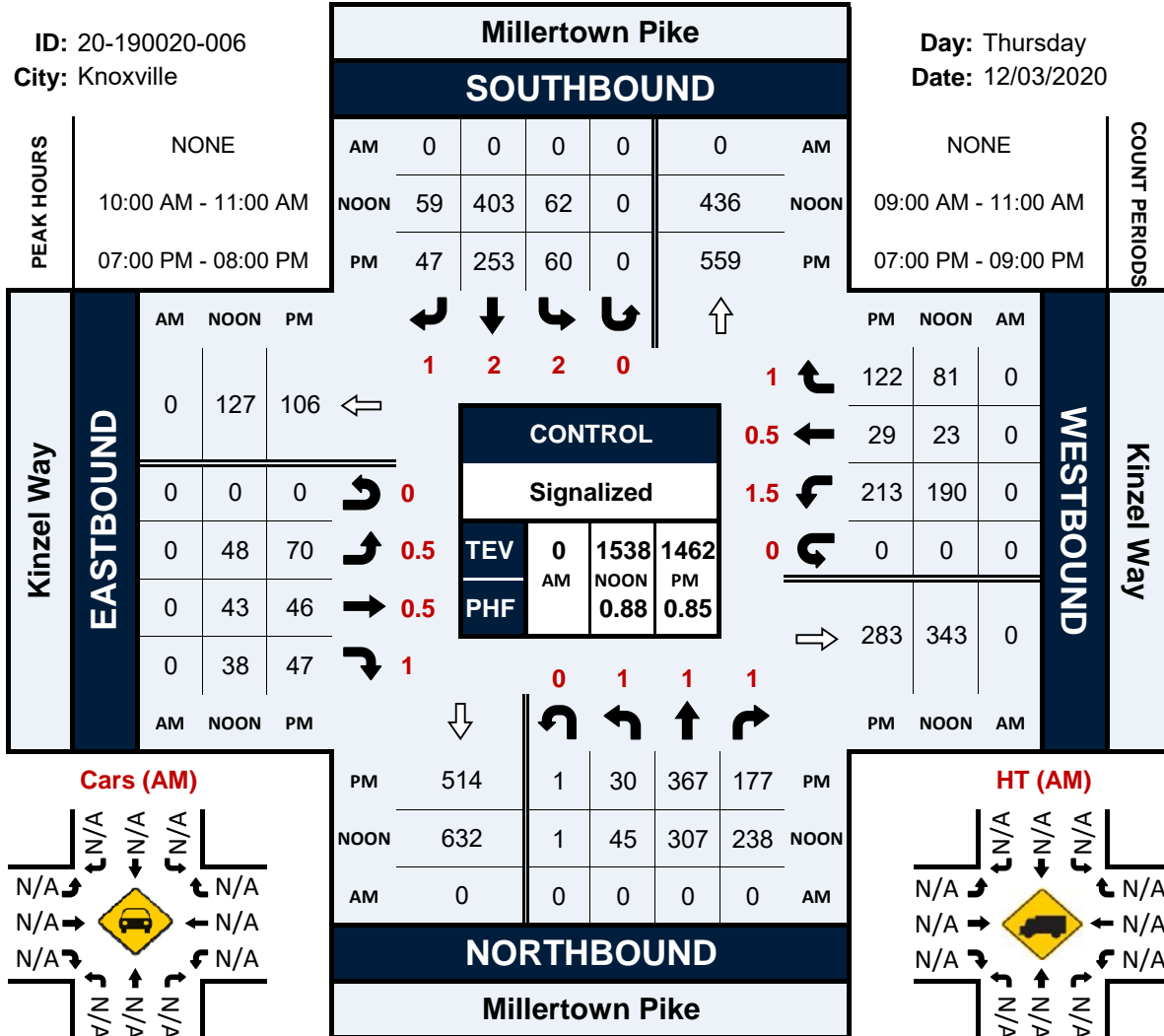
Start Time	Millertown Pike Northbound				Millertown Pike Southbound				N Mall Rd/I-640/SR 9 WB Off-Ramp Eastbound				N Mall Rd/I-640/SR 9 WB Off-Ramp Westbound							
	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	App. Total	Int. Total		
7:00 PM	10	100	0	0	110	0	132	48	0	180	0	0	0	0	0	0	0	0	99	389
7:15 PM	14	91	0	0	105	0	97	62	0	159	0	0	0	0	0	0	0	0	126	390
7:30 PM	13	77	0	0	90	0	90	44	1	135	0	0	0	0	0	0	0	0	100	325
7:45 PM	8	59	0	0	67	0	70	26	0	96	0	0	0	0	0	0	0	0	96	259
Total Volume	45	327	0	0	372	0	389	180	1	570	0	0	0	0	0	0	0	0	421	1363
% App. Total	12.1	87.9	0.0	0.0	100	0.0	68.2	31.6	0.2	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.835	0.874
PHF	0.792																			
Cars, PU, Vans	45	325	0	0	370	0	386	178	1	565	0	0	0	0	0	0	0	0	414	1349
% Cars, PU, Vans	100.0	99.4	0.0	0.0	99.5	0.0	99.2	98.9	100.0	99.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.3	99.0
Heavy Trucks	0	2	0	0	2	0	3	2	0	5	0	0	0	0	0	0	0	0	7	14
% Heavy Trucks	0.0	0.6	0.0	0.0	0.5	0.0	0.8	1.1	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	1.0

Millertown Pike & Kinzel Way

Peak Hour Turning Movement Count

ID: 20-190020-006
City: Knoxville

Day: Thursday
Date: 12/03/2020



Project ID: 20-190020-006
 Location: Millertown Pike & Kinzel Way
 City: Knoxville

Day: Thursday
 Date: 12/03/2020

Groups Printed - Cars, PU, Vans - Heavy Trucks

Start Time	Millertown Pike Northbound						Millertown Pike Southbound						Kinzel Way Eastbound						Kinzel Way Westbound					
	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total
9:00 AM	6	58	38	0	0	102	24	91	10	0	0	125	6	2	8	0	0	16	45	6	10	0	0	61
9:15 AM	11	53	45	0	0	109	13	95	9	0	0	117	8	5	3	0	0	16	36	8	26	0	0	70
9:30 AM	8	63	40	1	0	112	14	103	14	0	0	131	5	6	4	0	0	15	35	4	16	0	0	55
9:45 AM	15	65	48	0	0	128	15	116	14	0	0	145	5	7	11	0	0	23	28	8	13	0	0	49
Total	40	239	171	1	0	451	66	405	47	0	0	518	24	20	26	0	0	70	144	26	65	0	0	235
10:00 AM	6	65	44	1	0	116	15	93	15	0	0	123	8	7	11	0	0	26	38	10	21	0	0	69
10:15 AM	12	77	53	0	2	142	15	108	12	0	0	135	10	12	8	0	0	30	48	5	16	0	0	69
10:30 AM	7	77	58	0	0	142	16	102	16	0	0	134	16	13	5	0	0	34	55	1	27	0	0	83
10:45 AM	20	88	83	0	0	191	16	100	16	0	0	132	14	11	14	0	0	39	49	7	17	0	0	73
Total	45	307	238	1	2	591	62	403	59	0	0	524	48	43	38	0	0	129	190	23	81	0	0	294
BREAK																								
7:00 PM	10	90	54	0	0	154	18	73	16	0	0	107	21	15	17	0	0	53	73	6	39	0	0	118
7:15 PM	7	109	45	1	0	162	13	74	19	0	3	106	14	14	11	0	0	39	55	5	35	0	0	95
7:30 PM	7	89	42	0	0	138	17	58	5	0	2	80	20	10	13	0	0	43	53	7	27	0	0	87
7:45 PM	6	79	36	0	0	121	12	48	7	0	0	67	15	7	6	0	0	28	32	11	21	0	0	64
Total	30	367	177	1	0	575	60	253	47	0	5	360	70	46	47	0	0	163	213	29	122	0	0	364
8:00 PM	7	86	27	1	0	121	14	65	3	0	2	82	15	10	7	0	0	32	42	5	24	0	0	71
8:15 PM	6	80	31	0	0	117	5	44	2	0	0	51	6	7	8	0	0	21	43	4	16	0	0	63
8:30 PM	3	73	31	0	0	107	8	48	3	0	0	59	9	2	8	0	0	19	34	6	19	0	0	59
8:45 PM	2	62	32	0	0	96	4	25	4	0	0	33	6	4	7	0	0	17	51	5	22	0	0	78
Total	18	301	121	1	0	441	31	182	12	0	2	225	36	23	30	0	0	89	170	20	81	0	0	271
Grand Total	133	1214	707	4	2	2058	219	1243	165	0	7	1627	178	132	141	0	0	451	717	98	349	0	0	1164
Approch %	6.5	59.0	34.4	0.2	0.1		13.5	76.4	10.1	0.0	0.4		39.5	29.3	31.3	0.0	0.0		61.6	8.4	30.0	0.0	0.0	
Total %	2.5	22.9	13.3	0.1	0.0	38.8	4.1	23.5	3.1	0.0	0.1	30.7	3.4	2.5	2.7	0.0	0.0	8.5	13.5	1.8	6.6	0.0	0.0	22.0
Cars, PU, Vans	131	1193	683	4		2011	216	1221	164	0		1601	178	127	137	0		442	698	92	348	0		1138
% Cars, PU, Vans	98.5	98.3	96.6	100.0		97.7	98.6	98.2	99.4	0.0		98.4	100.0	96.2	97.2	0.0		98.0	97.4	93.9	99.7	0.0		97.8
Heavy Trucks	2	21	24	0	0	47	3	22	1	0	0	26	0	5	4	0	0	9	19	6	1	0	0	26
% Heavy Trucks	1.5	1.7	3.4	0.0	0.0	2.3	1.4	1.8	0.6	0.0	0.0	1.6	0.0	3.8	2.8	0.0	0.0	2.0	2.6	6.1	0.3	0.0	0.0	2.2

Project ID: 20-190020-006
 Location: Millertown Pike & Kinzel Way
 City: Knoxville

PEAK HOURS

Day: Thursday
 Date: 12/03/2020

NOON

Start Time	Millertown Pike Northbound				Millertown Pike Southbound				Kinzel Way Eastbound				Kinzel Way Westbound								
	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	App. Total	Int. Total			
10:00 AM	6	65	44	1	116	15	93	15	0	123	8	7	11	0	26	38	10	21	0	69	334
10:15 AM	12	77	53	0	142	15	108	12	0	135	10	12	8	0	30	48	5	16	0	69	376
10:30 AM	7	77	58	0	142	16	102	16	0	134	16	13	5	0	34	55	1	27	0	83	393
10:45 AM	20	88	83	0	191	16	100	16	0	132	14	11	14	0	39	49	7	17	0	73	435
Total Volume	45	307	238	1	591	62	403	59	0	524	48	43	38	0	129	190	23	81	0	294	1538
% App. Total	7.6	51.9	40.3	0.2	100	11.8	76.9	11.3	0.0	100	37.2	33.3	29.5	0.0	100	64.6	7.8	27.6	0.0	100	0.886
PHF	0.970																				
Cars, PU, Vans	44	300	231	1	576	61	392	59	0	512	48	41	37	0	126	183	21	80	0	284	1498
% Cars, PU, Vans	97.8	97.7	97.1	100.0	97.5	98.4	97.3	100.0	0.0	97.7	100.0	95.3	97.4	0.0	97.7	96.3	91.3	98.8	0.0	96.6	97.4
Heavy Trucks	1	7	7	0	15	1	11	0	0	12	0	2	1	0	3	7	2	1	0	10	40
% Heavy Trucks	2.2	2.3	2.9	0.0	2.5	1.6	2.7	0.0	0.0	2.3	0.0	4.7	2.6	0.0	2.3	3.7	8.7	1.2	0.0	3.4	2.6

PM

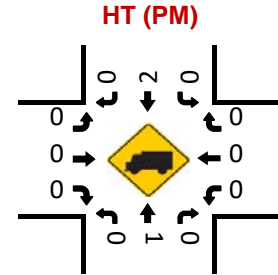
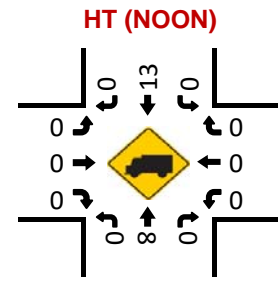
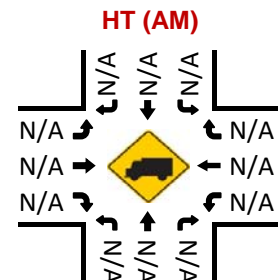
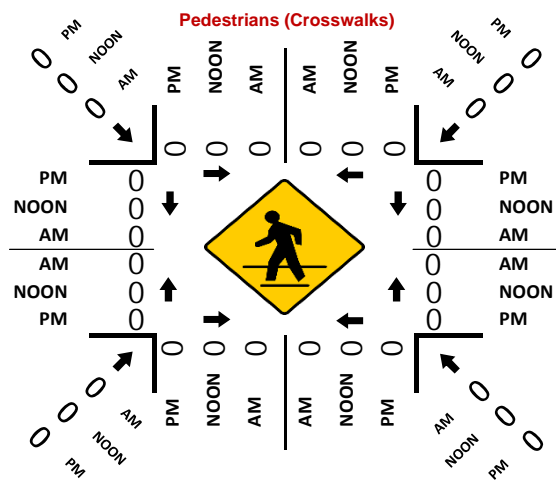
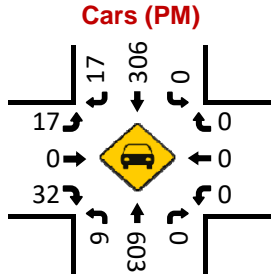
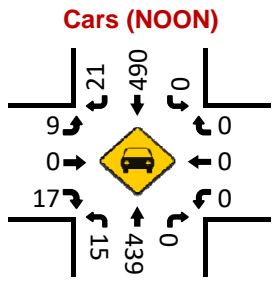
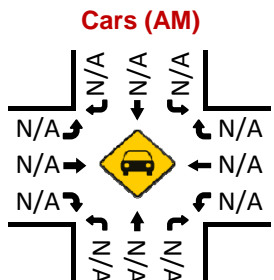
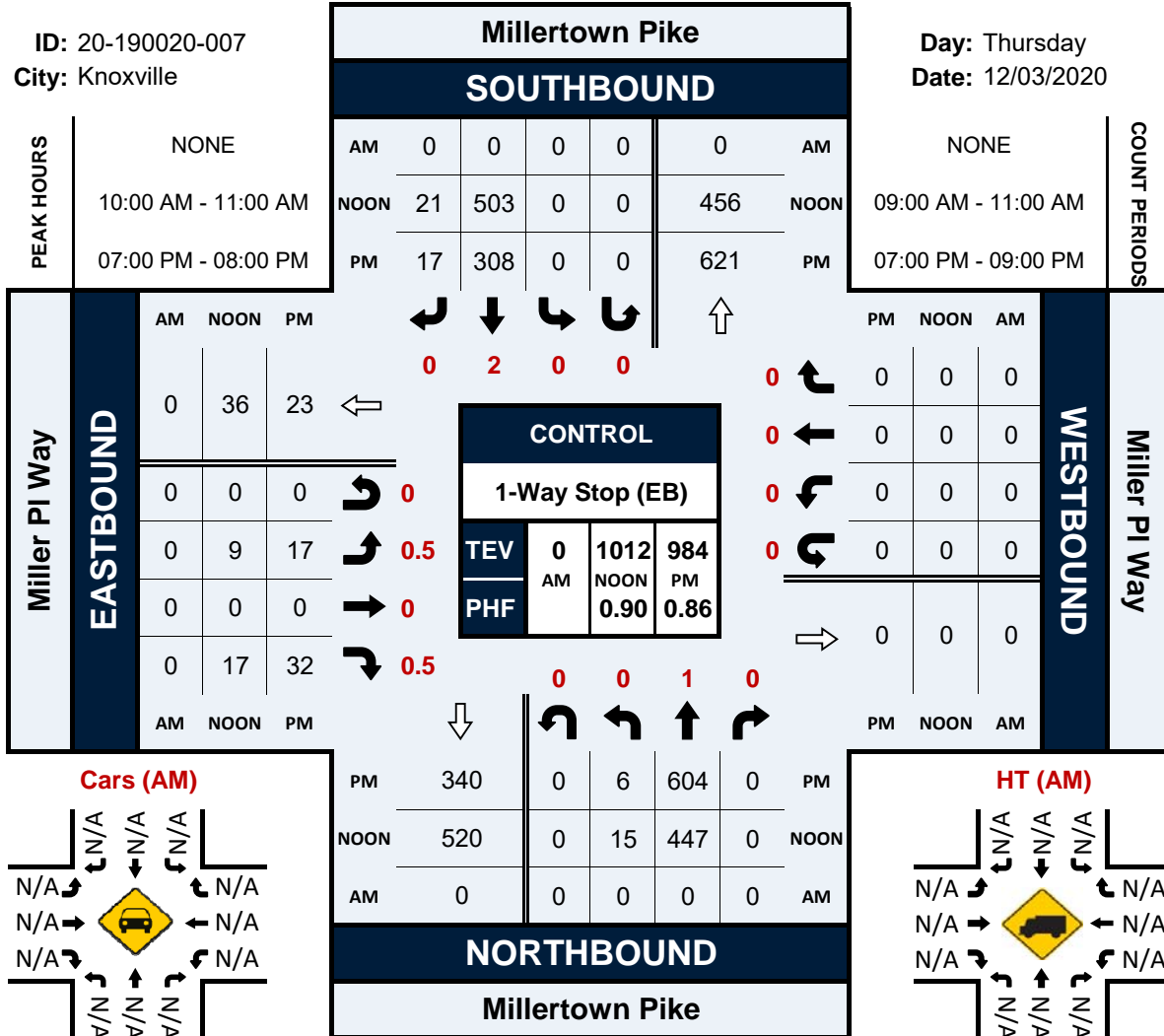
Start Time	Millertown Pike Northbound				Millertown Pike Southbound				Kinzel Way Eastbound				Kinzel Way Westbound								
	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	App. Total	Int. Total			
7:00 PM	10	90	54	0	154	18	73	16	0	107	21	15	17	0	53	73	6	39	0	118	432
7:15 PM	7	109	45	1	162	13	74	19	0	106	14	14	11	0	39	55	5	35	0	95	402
7:30 PM	7	89	42	0	138	17	58	5	0	80	20	10	13	0	43	53	7	27	0	87	348
7:45 PM	6	79	36	0	121	12	48	7	0	67	15	7	6	0	28	32	11	21	0	64	280
Total Volume	30	367	177	1	575	60	253	47	0	360	70	46	47	0	163	213	29	122	0	364	1462
% App. Total	5.2	63.8	30.8	0.2	100	16.7	70.3	13.1	0.0	100	42.9	28.2	28.8	0.0	100	58.5	8.0	33.5	0.0	100	0.771
PHF	0.841																				
Cars, PU, Vans	30	366	173	1	570	59	252	47	0	358	70	45	46	0	161	210	28	122	0	360	1449
% Cars, PU, Vans	100.0	99.7	97.7	100.0	99.1	98.3	99.6	100.0	0.0	99.4	100.0	97.8	97.9	0.0	98.8	98.6	96.6	100.0	0.0	98.9	99.1
Heavy Trucks	0	1	4	0	5	1	1	0	0	2	0	1	1	0	2	3	1	0	0	4	13
% Heavy Trucks	0.0	0.3	2.3	0.0	0.9	1.7	0.4	0.0	0.0	0.6	0.0	2.2	2.1	0.0	1.2	1.4	3.4	0.0	0.0	1.1	0.9

Millertown Pike & Miller PI Way

Peak Hour Turning Movement Count

ID: 20-190020-007
City: Knoxville

Day: Thursday
Date: 12/03/2020



Project ID: 20-190020-007
 Location: Millertown Pike & Miller PI Way
 City: Knoxville

Day: Thursday
 Date: 12/03/2020

Groups Printed - Cars, PU, Vans - Heavy Trucks

Start Time	Millertown Pike Northbound						Millertown Pike Southbound						Miller PI Way Eastbound						Miller PI Way Westbound					
	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total
9:00 AM	2	85	0	0	0	87	0	127	3	0	0	130	1	0	3	0	0	4	0	0	0	0	0	0
9:15 AM	3	86	0	0	0	89	0	110	3	0	0	113	2	0	0	0	0	2	0	0	0	0	0	0
9:30 AM	1	98	0	0	0	99	0	136	6	0	0	142	2	0	4	0	0	6	0	0	0	0	0	0
9:45 AM	4	83	0	0	0	87	0	122	3	0	0	125	5	0	5	0	0	10	0	0	0	0	0	0
Total	10	352	0	0	0	362	0	495	15	0	0	510	10	0	12	0	0	22	0	0	0	0	0	0
10:00 AM	0	103	0	0	0	103	0	128	6	0	0	134	2	0	1	0	0	3	0	0	0	0	0	0
10:15 AM	4	92	0	0	0	96	0	122	7	0	0	129	1	0	7	0	0	8	0	0	0	0	0	0
10:30 AM	8	131	0	0	0	139	0	132	3	0	0	135	3	0	4	0	0	7	0	0	0	0	0	0
10:45 AM	3	121	0	0	0	124	0	121	5	0	0	126	3	0	5	0	0	8	0	0	0	0	0	0
Total	15	447	0	0	0	462	0	503	21	0	0	524	9	0	17	0	0	26	0	0	0	0	0	0
BREAK																								
7:00 PM	1	167	0	0	0	168	0	94	4	0	0	98	5	0	12	0	0	17	0	0	0	0	0	0
7:15 PM	2	169	0	0	0	171	0	94	10	0	0	104	8	0	3	0	0	11	0	0	0	0	0	0
7:30 PM	1	148	0	0	0	149	0	68	2	0	0	70	1	0	7	0	0	8	0	0	0	0	0	0
7:45 PM	2	120	0	0	0	122	0	52	1	0	0	53	3	0	10	0	0	13	0	0	0	0	0	0
Total	6	604	0	0	0	610	0	308	17	0	0	325	17	0	32	0	0	49	0	0	0	0	0	0
8:00 PM	2	125	0	0	0	127	0	79	5	0	0	84	8	0	3	0	0	11	0	0	0	0	0	0
8:15 PM	2	124	0	0	0	126	0	45	5	0	0	50	5	0	4	0	0	9	0	0	0	0	0	0
8:30 PM	4	108	0	0	0	112	0	50	2	0	0	52	6	0	3	0	0	9	0	0	0	0	0	0
8:45 PM	3	82	0	0	0	85	0	34	0	0	0	34	2	0	3	0	0	5	0	0	0	0	0	0
Total	11	439	0	0	0	450	0	208	12	0	0	220	21	0	13	0	0	34	0	0	0	0	0	0
Grand Total	42	1842	0	0	0	1884	0	1514	65	0	0	1579	57	0	74	0	0	131	0	0	0	0	0	0
Approch %	2.2	97.8	0.0	0.0	0.0		0.0	95.9	4.1	0.0	0.0		43.5	0.0	56.5	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total %	1.2	51.3	0.0	0.0	0.0	52.4	0.0	42.1	1.8	0.0	0.0	43.9	1.6	0.0	2.1	0.0	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0
Cars, PU, Vans	42	1820	0	0	0	1862	0	1487	65	0	0	1552	57	0	74	0	0	131	0	0	0	0	0	0
% Cars, PU, Vans	100.0	98.8	0.0	0.0	0.0	98.8	0.0	98.2	100.0	0.0	0.0	98.3	100.0	0.0	100.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Heavy Trucks	0	22	0	0	0	22	0	27	0	0	0	27	0	0	0	0	0	0	0	0	0	0	0	0
% Heavy Trucks	0.0	1.2	0.0	0.0	0.0	1.2	0.0	1.8	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Project ID: 20-190020-007
 Location: Millertown Pike & Miller PI Way
 City: Knoxville

PEAK HOURS

Day: Thursday
 Date: 12/03/2020

NOON

Start Time	Millertown Pike Northbound				Millertown Pike Southbound				Miller PI Way Eastbound				Miller PI Way Westbound									
	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Int. Total	
10:00 AM	0	103	0	0	0	128	6	0	134	2	0	1	0	3	0	0	0	0	0	0	0	240
10:15 AM	4	92	0	0	0	122	7	0	129	1	0	7	0	8	0	0	0	0	0	0	0	233
10:30 AM	8	131	0	0	0	132	3	0	135	3	0	4	0	7	0	0	0	0	0	0	0	281
10:45 AM	3	121	0	0	0	121	5	0	126	3	0	5	0	8	0	0	0	0	0	0	0	258
Total Volume	15	447	0	0	0	503	21	0	524	9	0	17	0	26	0	0	0	0	0	0	0	1012
% App. Total	3.2	96.8	0.0	0.0	100	0.0	96.0	4.0	0.0	100	34.6	0.0	65.4	0.0	100	0.0	0.0	0.0	0.0	0.0	0.0	0.900
PHF									0.970					0.813								0.991
Cars, PU, Vans	15	439	0	0	0	490	21	0	511	9	0	17	0	26	0	0	0	0	0	0	0	991
% Cars, PU, Vans	100.0	98.2	0.0	0.0	98.3	0.0	97.4	100.0	0.0	97.5	100.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	97.9
Heavy Trucks	0	8	0	0	0	13	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	21
% Heavy Trucks	0.0	1.8	0.0	0.0	1.7	0.0	2.6	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1

PM

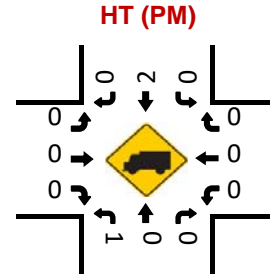
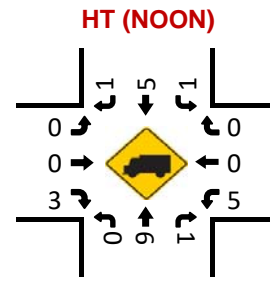
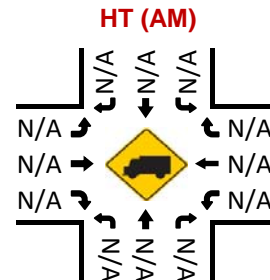
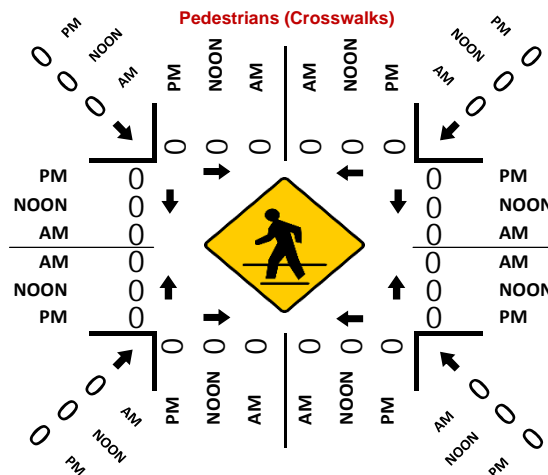
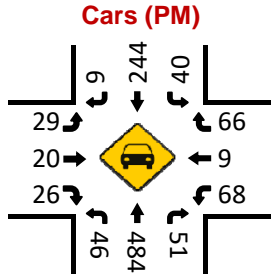
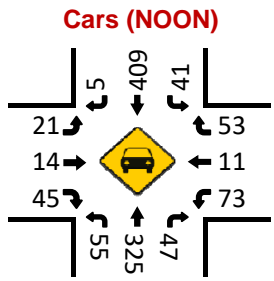
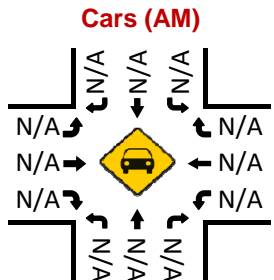
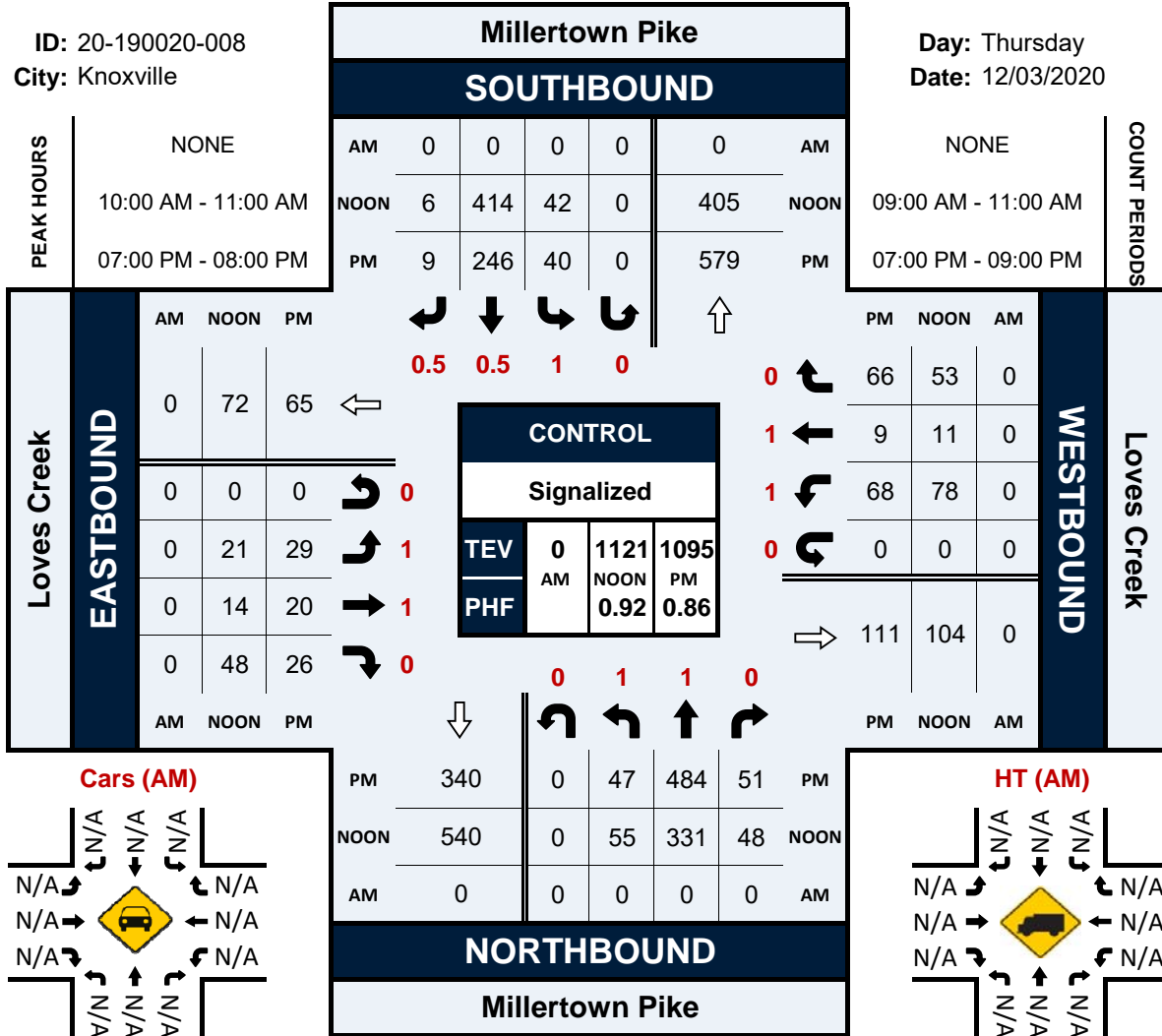
Start Time	Millertown Pike Northbound				Millertown Pike Southbound				Miller PI Way Eastbound				Miller PI Way Westbound									
	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Int. Total	
7:00 PM	1	167	0	0	0	94	4	0	98	5	0	12	0	17	0	0	0	0	0	0	0	283
7:15 PM	2	169	0	0	0	94	10	0	104	8	0	3	0	11	0	0	0	0	0	0	0	286
7:30 PM	1	148	0	0	0	68	2	0	70	1	0	7	0	8	0	0	0	0	0	0	0	227
7:45 PM	2	120	0	0	0	52	1	0	53	3	0	10	0	13	0	0	0	0	0	0	0	188
Total Volume	6	604	0	0	0	308	17	0	325	17	0	32	0	49	0	0	0	0	0	0	0	984
% App. Total	1.0	99.0	0.0	0.0	100	0.0	94.8	5.2	0.0	100	34.7	0.0	65.3	0.0	100	0.0	0.0	0.0	0.0	0.0	0.0	0.860
PHF									0.781					0.721								0.981
Cars, PU, Vans	6	603	0	0	0	306	17	0	323	17	0	32	0	49	0	0	0	0	0	0	0	981
% Cars, PU, Vans	100.0	99.8	0.0	0.0	99.8	0.0	99.4	100.0	0.0	99.4	100.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	99.7
Heavy Trucks	0	1	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	3
% Heavy Trucks	0.0	0.2	0.0	0.0	0.2	0.0	0.6	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3

Millertown Pike & Loves Creek

Peak Hour Turning Movement Count

ID: 20-190020-008
City: Knoxville

Day: Thursday
Date: 12/03/2020



Project ID: 20-190020-008
 Location: Millertown Pike & Loves Creek
 City: Knoxville

Day: Thursday
 Date: 12/03/2020

Groups Printed - Cars, PU, Vans - Heavy Trucks

Start Time	Millertown Pike Northbound						Millertown Pike Southbound						Loves Creek Eastbound						Loves Creek Westbound					
	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total
9:00 AM	8	59	9	0	0	76	9	105	1	0	0	115	2	1	12	0	0	15	13	1	9	0	0	23
9:15 AM	11	61	8	0	0	80	11	95	1	0	0	107	1	1	10	0	0	12	17	2	3	0	0	22
9:30 AM	7	73	7	0	0	87	8	113	1	0	0	122	4	2	12	0	0	18	19	1	10	0	0	30
9:45 AM	6	64	8	0	0	78	13	105	0	0	0	118	4	4	11	0	0	19	22	3	9	0	0	34
Total	32	257	32	0	0	321	41	418	3	0	0	462	11	8	45	0	0	64	71	7	31	0	0	109
10:00 AM	10	78	14	0	0	102	10	92	2	0	0	104	5	3	9	0	0	17	19	0	13	0	0	32
10:15 AM	9	70	9	0	0	88	12	114	1	0	0	127	1	1	11	0	0	13	18	2	9	0	0	29
10:30 AM	15	95	13	0	0	123	10	105	2	0	0	117	3	3	13	0	0	19	26	8	12	0	0	46
10:45 AM	21	88	12	0	0	121	10	103	1	0	0	114	12	7	15	0	0	34	15	1	19	0	0	35
Total	55	331	48	0	0	434	42	414	6	0	0	462	21	14	48	0	0	83	78	11	53	0	0	142
BREAK																								
7:00 PM	11	137	13	0	0	161	15	63	5	0	0	83	12	4	8	0	0	24	28	2	19	0	0	49
7:15 PM	15	127	15	0	0	157	14	87	2	0	0	103	6	5	9	0	0	20	16	3	21	0	0	40
7:30 PM	11	125	11	0	0	147	2	51	1	0	0	54	7	6	6	0	0	19	11	3	12	0	0	26
7:45 PM	10	95	12	0	0	117	9	45	1	0	0	55	4	5	3	0	0	12	13	1	14	0	0	28
Total	47	484	51	0	0	582	40	246	9	0	0	295	29	20	26	0	0	75	68	9	66	0	0	143
8:00 PM	13	91	10	0	0	114	7	46	2	0	0	55	8	3	10	0	0	21	22	1	19	0	0	42
8:15 PM	8	91	13	0	0	112	9	43	1	0	0	53	4	2	3	0	0	9	12	1	21	0	0	34
8:30 PM	7	90	8	0	0	105	3	41	0	0	0	44	2	2	1	0	0	5	14	1	10	0	0	25
8:45 PM	2	77	9	0	0	88	9	24	1	0	0	34	5	2	3	0	0	10	9	1	10	0	0	20
Total	30	349	40	0	0	419	28	154	4	0	0	186	19	9	17	0	0	45	57	4	60	0	0	121
Grand Total	164	1421	171	0	0	1756	151	1232	22	0	0	1405	80	51	136	0	0	267	274	31	210	0	0	515
Approch %	9.3	80.9	9.7	0.0	0.0		10.7	87.7	1.6	0.0	0.0		30.0	19.1	50.9	0.0	0.0		53.2	6.0	40.8	0.0	0.0	
Total %	4.2	36.0	4.3	0.0	0.0	44.5	3.8	31.2	0.6	0.0	0.0	35.6	2.0	1.3	3.4	0.0	0.0	6.8	6.9	0.8	5.3	0.0	0.0	13.1
Cars, PU, Vans	162	1405	167	0	0	1734	147	1218	21	0	0	1386	78	51	133	0	0	262	264	31	208	0	0	503
% Cars, PU, Vans	98.8	98.9	97.7	0.0	0.0	98.7	97.4	98.9	95.5	0.0	0.0	98.6	97.5	100.0	97.8	0.0	0.0	98.1	96.4	100.0	99.0	0.0	0.0	97.7
Heavy Trucks	2	16	4	0	0	22	4	14	1	0	0	19	2	0	3	0	0	5	10	0	2	0	0	12
% Heavy Trucks	1.2	1.1	2.3	0.0	0.0	1.3	2.6	1.1	4.5	0.0	0.0	1.4	2.5	0.0	2.2	0.0	0.0	1.9	3.6	0.0	1.0	0.0	0.0	2.3

Project ID: 20-190020-008
 Location: Millertown Pike & Loves Creek
 City: Knoxville

PEAK HOURS

Day: Thursday
 Date: 12/03/2020

NOON

Start Time	Millertown Pike Northbound				Millertown Pike Southbound				Loves Creek Eastbound				Loves Creek Westbound								
	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	App. Total	Int. Total			
10:00 AM	10	78	14	0	102	10	92	2	0	104	5	3	9	0	17	19	0	13	0	32	255
10:15 AM	9	70	9	0	88	12	114	1	0	127	1	1	11	0	13	18	2	9	0	29	257
10:30 AM	15	95	13	0	123	10	105	2	0	117	3	3	13	0	19	26	8	12	0	46	305
10:45 AM	21	88	12	0	121	10	103	1	0	114	12	7	15	0	34	15	1	19	0	35	304
Total Volume	55	331	48	0	434	42	414	6	0	462	21	14	48	0	83	78	11	53	0	142	1121
% App. Total	12.7	76.3	11.1	0.0	100	9.1	89.6	1.3	0.0	100	25.3	16.9	57.8	0.0	100	54.9	7.7	37.3	0.0	100	0.919
PHF	0.909																				
Cars, PU, Vans	55	325	47	0	427	41	409	5	0	455	21	14	45	0	80	73	11	53	0	137	1099
% Cars, PU, Vans	100.0	98.2	97.9	0.0	98.4	97.6	98.8	83.3	0.0	98.5	100.0	100.0	93.8	0.0	96.4	93.6	100.0	100.0	0.0	96.5	98.0
Heavy Trucks	0	6	1	0	7	1	5	1	0	7	0	0	3	0	3	5	0	0	0	5	22
% Heavy Trucks	0.0	1.8	2.1	0.0	1.6	2.4	1.2	16.7	0.0	1.5	0.0	0.0	6.3	0.0	3.6	6.4	0.0	0.0	0.0	3.5	2.0

PM

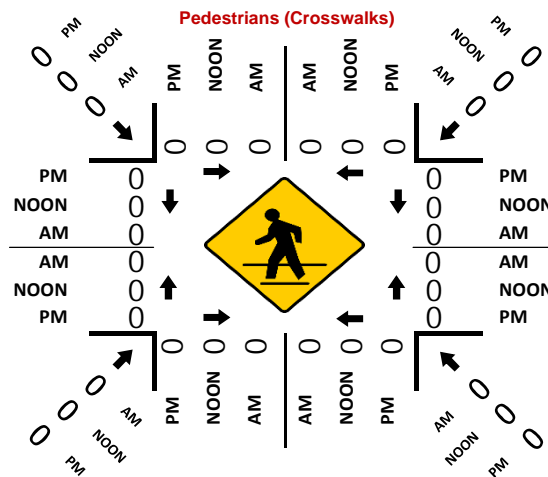
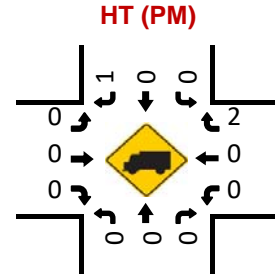
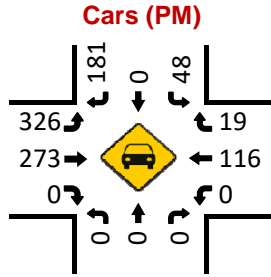
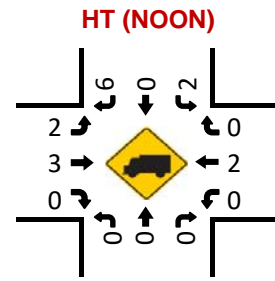
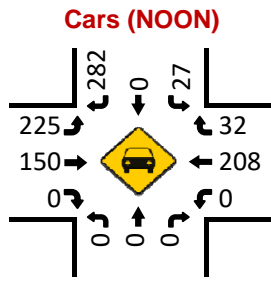
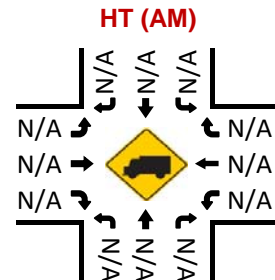
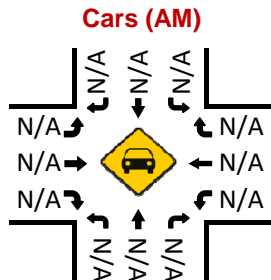
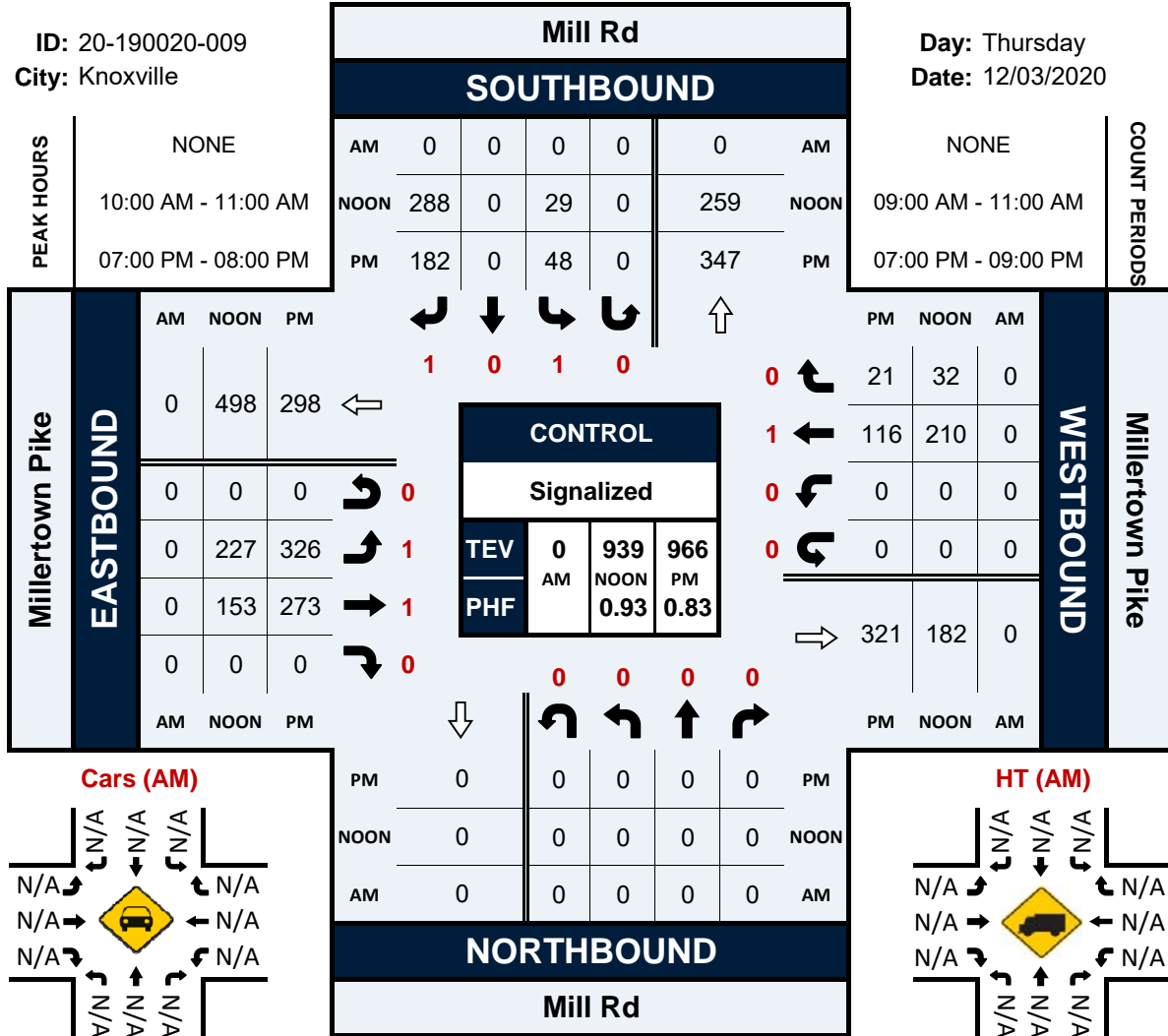
Start Time	Millertown Pike Northbound				Millertown Pike Southbound				Loves Creek Eastbound				Loves Creek Westbound								
	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	Left	Thru	Rgt	Uturn	App. Total	Int. Total			
7:00 PM	11	137	13	0	161	15	63	5	0	83	12	4	8	0	24	28	2	19	0	49	317
7:15 PM	15	127	15	0	157	14	87	2	0	103	6	5	9	0	20	16	3	21	0	40	320
7:30 PM	11	125	11	0	147	2	51	1	0	54	7	6	6	0	19	11	3	12	0	26	246
7:45 PM	10	95	12	0	117	9	45	1	0	55	4	5	3	0	12	13	1	14	0	28	212
Total Volume	47	484	51	0	582	40	246	9	0	295	29	20	26	0	75	68	9	66	0	143	1095
% App. Total	8.1	83.2	8.8	0.0	100	13.6	83.4	3.1	0.0	100	38.7	26.7	34.7	0.0	100	47.6	6.3	46.2	0.0	100	0.855
PHF	0.716																				
Cars, PU, Vans	46	484	51	0	581	40	244	9	0	293	29	20	26	0	75	68	9	66	0	143	1092
% Cars, PU, Vans	97.9	100.0	100.0	0.0	99.8	100.0	99.2	100.0	0.0	99.3	100.0	100.0	100.0	0.0	100.0	100.0	100.0	100.0	0.0	100.0	99.7
Heavy Trucks	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	3
% Heavy Trucks	2.1	0.0	0.0	0.0	0.2	0.0	0.8	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3

Mill Rd & Millertown Pike

Peak Hour Turning Movement Count

ID: 20-190020-009
City: Knoxville

Day: Thursday
Date: 12/03/2020



Project ID: 20-190020-009
 Location: Mill Rd & Millertown Pike
 City: Knoxville

Day: Thursday
 Date: 12/03/2020

Groups Printed - Cars, PU, Vans - Heavy Trucks

Start Time	Mill Rd Northbound						Mill Rd Southbound						Millertown Pike Eastbound						Millertown Pike Westbound					
	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total
9:00 AM	0	0	0	0	0	0	4	0	76	0	80	37	32	0	0	0	69	0	51	8	0	0	59	208
9:15 AM	0	0	0	0	0	0	6	0	67	0	73	40	32	0	0	0	72	0	42	6	0	0	48	193
9:30 AM	0	0	0	0	0	0	4	0	80	0	84	51	31	0	0	0	82	0	52	3	0	0	55	221
9:45 AM	0	0	0	0	0	0	4	0	68	0	72	54	27	0	0	0	81	0	50	9	0	0	59	212
Total	0	0	0	0	0	0	18	0	291	0	309	182	122	0	0	0	304	0	195	26	0	0	221	834
10:00 AM	0	0	0	0	0	0	5	0	69	0	74	58	34	0	0	0	92	0	47	7	0	0	54	220
10:15 AM	0	0	0	0	0	0	9	0	82	0	91	38	36	0	0	0	74	0	47	5	0	0	52	217
10:30 AM	0	0	0	0	0	0	8	0	66	0	74	65	40	0	0	0	105	0	63	10	0	0	73	252
10:45 AM	0	0	0	0	0	0	7	0	71	0	78	66	43	0	0	0	109	0	53	10	0	0	63	250
Total	0	0	0	0	0	0	29	0	288	0	317	227	153	0	0	0	380	0	210	32	0	0	242	939
BREAK																								
7:00 PM	0	0	0	0	0	0	18	0	52	0	70	90	85	0	0	0	175	0	42	5	0	0	47	292
7:15 PM	0	0	0	0	0	0	8	0	61	0	69	84	80	0	0	0	164	0	32	8	0	0	40	273
7:30 PM	0	0	0	0	0	0	14	0	34	0	48	84	62	0	0	0	146	0	23	1	0	0	24	218
7:45 PM	0	0	0	0	0	0	8	0	35	0	43	68	46	0	0	0	114	0	19	7	0	0	26	183
Total	0	0	0	0	0	0	48	0	182	0	230	326	273	0	0	0	599	0	116	21	0	0	137	966
8:00 PM	0	0	0	0	0	0	9	0	44	0	53	72	52	0	0	0	124	0	19	3	0	0	22	199
8:15 PM	0	0	0	0	0	0	12	0	29	0	41	66	57	0	0	0	123	0	16	2	0	0	18	182
8:30 PM	0	0	0	0	0	0	7	0	27	0	34	54	39	0	0	0	93	0	20	3	0	0	23	150
8:45 PM	0	0	0	0	0	0	6	0	27	0	33	58	37	0	0	0	95	0	13	8	0	0	21	149
Total	0	0	0	0	0	0	34	0	127	0	161	250	185	0	0	0	435	0	68	16	0	0	84	680
Grand Total	0	0	0	0	0	0	129	0	888	0	1017	985	733	0	0	0	1718	0	589	95	0	0	684	3419
Approch %	0.0	0.0	0.0	0.0	0.0	0.0	12.7	0.0	87.3	0.0	0.0	57.3	42.7	0.0	0.0	0.0	50.2	0.0	86.1	13.9	0.0	0.0	20.0	
Total %	0.0	0.0	0.0	0.0	0.0	0.0	3.8	0.0	26.0	0.0	29.7	28.8	21.4	0.0	0.0	0.0	50.2	0.0	17.2	2.8	0.0	0.0	20.0	
Cars, PU, Vans	0	0	0	0	0	0	127	0	870	0	997	973	728	0	0	0	1701	0	586	92	0	0	678	3376
% Cars, PU, Vans	0.0	0.0	0.0	0.0	0.0	0.0	98.4	0.0	98.0	0.0	98.0	98.8	99.3	0.0	0.0	0.0	99.0	0.0	99.5	96.8	0.0	0.0	99.1	98.7
Heavy Trucks	0	0	0	0	0	0	2	0	18	0	20	12	5	0	0	0	17	0	3	3	0	0	6	43
% Heavy Trucks	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	2.0	0.0	2.0	1.2	0.7	0.0	0.0	0.0	1.0	0.0	0.5	3.2	0.0	0.0	0.9	1.3

Project ID: 20-190020-009

Location: Mill Rd & Millertown Pike

City: Knoxville

Day: Thursday

Date: 12/03/2020

PEAK HOURS

NOON

Start Time	Mill Rd Northbound				Mill Rd Southbound				Millertown Pike Eastbound				Millertown Pike Westbound					
	Left	Thru	Rgt	Uturm	Left	Thru	Rgt	Uturm	Left	Thru	Rgt	Uturm	Left	Thru	Rgt	Uturm		
	App. Total				App. Total				App. Total				App. Total					
Peak Hour Analysis from 09:00 AM to 11:00 AM																		
Peak Hour for Entire Intersection Begins at 10:00 AM																		
10:00 AM	0	0	0	0	5	0	69	0	74	58	34	0	0	92	0	47	7	0
10:15 AM	0	0	0	0	9	0	82	0	91	38	36	0	0	74	0	47	5	0
10:30 AM	0	0	0	0	8	0	66	0	74	65	40	0	0	105	0	63	10	0
10:45 AM	0	0	0	0	7	0	71	0	78	66	43	0	0	109	0	53	10	0
Total Volume	0	0	0	0	29	0	288	0	317	227	153	0	0	380	0	210	32	0
% App. Total	0.0	0.0	0.0	0.0	9.1	0.0	90.9	0.0	100	59.7	40.3	0.0	0.0	100	0.0	86.8	13.2	0.0
PHF	0.871				0.872				0.829				0.932					
Cars, PU, Vans	0	0	0	0	27	0	282	0	309	225	150	0	0	375	0	208	32	0
% Cars, PU, Vans	0.0	0.0	0.0	0.0	93.1	0.0	97.9	0.0	97.5	99.1	98.0	0.0	0.0	98.7	0.0	99.0	100.0	0.0
Heavy Trucks	0	0	0	0	2	0	6	0	8	2	3	0	0	5	0	2	0	0
% Heavy Trucks	0.0	0.0	0.0	0.0	6.9	0.0	2.1	0.0	2.5	0.9	2.0	0.0	0.0	1.3	0.0	1.0	0.0	0.0

PM

Start Time	Mill Rd Northbound				Mill Rd Southbound				Millertown Pike Eastbound				Millertown Pike Westbound					
	Left	Thru	Rgt	Uturm	Left	Thru	Rgt	Uturm	Left	Thru	Rgt	Uturm	Left	Thru	Rgt	Uturm		
	App. Total				App. Total				App. Total				App. Total					
Peak Hour Analysis from 07:00 PM to 09:00 PM																		
Peak Hour for Entire Intersection Begins at 07:00 PM																		
7:00 PM	0	0	0	0	18	0	52	0	70	90	85	0	0	175	0	42	5	0
7:15 PM	0	0	0	0	8	0	61	0	69	84	80	0	0	164	0	32	8	0
7:30 PM	0	0	0	0	14	0	34	0	48	84	62	0	0	146	0	23	1	0
7:45 PM	0	0	0	0	8	0	35	0	43	68	46	0	0	114	0	19	7	0
Total Volume	0	0	0	0	48	0	182	0	230	326	273	0	0	599	0	116	21	0
% App. Total	0.0	0.0	0.0	0.0	20.9	0.0	79.1	0.0	100	54.4	45.6	0.0	0.0	100	0.0	84.7	15.3	0.0
PHF	0.821				0.856				0.827				0.729					
Cars, PU, Vans	0	0	0	0	48	0	181	0	229	326	273	0	0	599	0	116	19	0
% Cars, PU, Vans	0.0	0.0	0.0	0.0	100.0	0.0	99.5	0.0	99.6	100.0	100.0	0.0	0.0	100.0	0.0	100.0	90.5	0.0
Heavy Trucks	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
% Heavy Trucks	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX B | ANALYSES FOR EXISTING AND BACKGROUND TRAFFIC

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	ROUNDAABOUT
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: Mill Road & Washington Pike

Knoxville Center TIS
2020 Existing AM

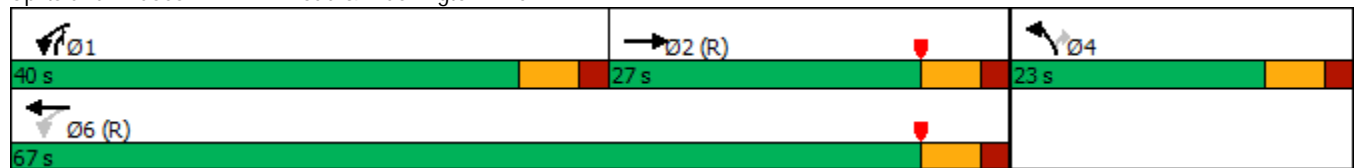
	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↖	↗	↖	↗
Traffic Volume (vph)	280	56	491	1003	47	280
Future Volume (vph)	280	56	491	1003	47	280
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.977					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1820	0	1770	1863	1770	1583
Flt Permitted			0.430		0.950	
Satd. Flow (perm)	1820	0	801	1863	1770	1583
Satd. Flow (RTOR)	10					208
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	354	0	517	1056	49	295
Turn Type	NA		pm+pt	NA	Prot	pm+ov
Protected Phases	2		1	6	4	1
Permitted Phases			6			4
Detector Phase	2		1	6	4	1
Switch Phase						
Minimum Initial (s)	12.0		10.0	12.0	10.0	10.0
Minimum Split (s)	19.0		17.0	19.0	17.0	17.0
Total Split (s)	27.0		40.0	67.0	23.0	40.0
Total Split (%)	30.0%		44.4%	74.4%	25.6%	44.4%
Maximum Green (s)	21.0		34.0	61.0	17.0	34.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
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)	6.0		6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	C-Max		None	C-Max	None	None
Act Effect Green (s)	47.2		74.3	76.7	10.1	30.8
Actuated g/C Ratio	0.52		0.83	0.85	0.11	0.34
v/c Ratio	0.37		0.58	0.67	0.25	0.44
Control Delay	18.4		5.8	7.5	39.8	6.7
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	18.4		5.8	7.5	39.8	6.7
LOS	B		A	A	D	A
Approach Delay	18.4			6.9	11.4	
Approach LOS	B			A	B	
Queue Length 50th (ft)	127		81	272	26	30
Queue Length 95th (ft)	259		128	448	60	60
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200		100	
Base Capacity (vph)	959		1027	1587	334	876
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	0.37		0.50	0.67	0.15	0.34

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.67
 Intersection Signal Delay: 9.4
 Intersection Capacity Utilization 71.1%
 Analysis Period (min) 15

Intersection LOS: A
 ICU Level of Service C

Splits and Phases: 1: Mill Road & Washington Pike



Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

Knoxville Center TIS
2020 Existing AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	50	283	1002	88	4	107	38	316	2	14	2
Future Volume (vph)	5	50	283	1002	88	4	107	38	316	2	14	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Fr _t			0.850			0.850			0.850			0.850
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	3539	1583
Fl _t Permitted	0.695			0.608			0.440			0.976		
Satd. Flow (perm)	1295	1863	1583	1133	1863	1583	820	1863	1583	1818	3539	1583
Satd. Flow (RTOR)			234			101			343			151
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	54	308	1089	96	4	116	41	343	2	15	2
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	7	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	16.0	34.0	19.0	61.0	79.0	79.0	19.0	19.0	19.0	16.0	16.0	16.0
Total Split (%)	12.3%	26.2%	14.6%	46.9%	60.8%	60.8%	14.6%	14.6%	14.6%	12.3%	12.3%	12.3%
Maximum Green (s)	11.0	28.0	14.0	56.0	73.0	73.0	14.0	14.0	14.0	11.0	11.0	11.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	C-Max	None	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	38.3	30.6	48.5	103.1	99.7	99.7	16.9	14.7	14.7	9.1	6.7	6.7
Actuated g/C Ratio	0.29	0.24	0.37	0.79	0.77	0.77	0.13	0.11	0.11	0.07	0.05	0.05
v/c Ratio	0.01	0.12	0.42	0.89	0.07	0.00	0.60	0.20	0.71	0.02	0.08	0.01
Control Delay	18.4	41.2	9.4	20.7	6.0	0.0	78.6	68.1	31.3	43.5	59.1	0.0
Queue Delay	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.4	41.2	9.4	21.3	6.0	0.0	78.6	68.1	31.3	43.5	59.1	0.0
LOS	B	D	A	C	A	A	E	E	C	D	E	A
Approach Delay		14.2			20.0			45.3			51.2	
Approach LOS		B			C			D			D	
Queue Length 50th (ft)	2	36	40	333	13	0	103	36	103	2	6	0
Queue Length 95th (ft)	8	75	116	#1220	56	0	161	75	171	9	18	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	335		170	160			150		75
Base Capacity (vph)	464	439	759	1224	1429	1238	222	241	503	192	299	272
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	2	21	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.12	0.41	0.91	0.07	0.00	0.52	0.17	0.68	0.01	0.05	0.01

Lanes, Volumes, Timings
 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road

Knoxville Center TIS
 2020 Existing AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑	↑	↑↑			↑↑	↑
Traffic Volume (vph)	0	0	0	23	304	109	278	372	0	0	299	1012
Future Volume (vph)	0	0	0	23	304	109	278	372	0	0	299	1012
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.997		0.950					
Satd. Flow (prot)	0	0	0	0	3529	1583	1770	3539	0	0	3539	1583
Flt Permitted					0.997		0.529					
Satd. Flow (perm)	0	0	0	0	3529	1583	985	3539	0	0	3539	1583
Satd. Flow (RTOR)							115					271
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	344	115	293	392	0	0	315	1065
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0			10.0	10.0
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0			19.0	19.0
Total Split (s)				29.0	29.0	29.0	23.0	101.0			78.0	78.0
Total Split (%)				22.3%	22.3%	22.3%	17.7%	77.7%			60.0%	60.0%
Maximum Green (s)				23.0	23.0	23.0	18.0	95.0			72.0	72.0
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5			4.5	4.5
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5			1.5	1.5
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					6.0	6.0	5.0	6.0			6.0	6.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			2.0	2.0
Recall Mode				None	None	None	None	C-Max			C-Max	C-Max
Act Effect Green (s)					18.2	18.2	100.8	99.8			84.2	84.2
Actuated g/C Ratio					0.14	0.14	0.78	0.77			0.65	0.65
v/c Ratio					0.70	0.36	0.35	0.14			0.14	0.95
Control Delay					60.7	11.4	4.1	2.4			8.2	24.5
Queue Delay					0.0	0.0	0.0	0.0			0.0	4.1
Total Delay					60.7	11.4	4.1	2.4			8.2	28.6
LOS					E	B	A	A			A	C
Approach Delay					48.4			3.1			23.9	
Approach LOS					D			A			C	
Queue Length 50th (ft)					147	0	29	21			31	555
Queue Length 95th (ft)					192	53	40	27			m48	m#414
Internal Link Dist (ft)		569			2042			923			673	
Turn Bay Length (ft)						475	105					75
Base Capacity (vph)					624	374	872	2717			2293	1121
Starvation Cap Reductn					0	0	0	0			0	35
Spillback Cap Reductn					0	0	0	0			0	0
Storage Cap Reductn					0	0	0	0			0	0
Reduced v/c Ratio					0.55	0.31	0.34	0.14			0.14	0.98

Timing Plan: AM Peak
 Cannon & Cannon, Inc.

Synchro 10 Report
 Page 5

Lanes, Volumes, Timings

Knoxville Center TIS

4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road

2020 Existing AM

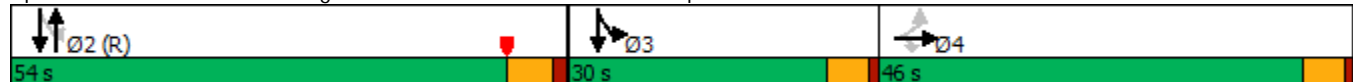


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	240	181	197	0	0	0	0	391	34	118	224	0
Future Volume (vph)	240	181	197	0	0	0	0	391	34	118	224	0
Lane Util. Factor	0.91	0.91	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.982								0.950		
Satd. Flow (prot)	1610	3329	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.982								0.500		
Satd. Flow (perm)	1610	3329	1583	0	0	0	0	3539	1583	931	3539	0
Satd. Flow (RTOR)			219							59		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)	43%											
Lane Group Flow (vph)	152	316	219	0	0	0	0	434	38	131	249	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	46.0	46.0	46.0					54.0	54.0	30.0		
Total Split (%)	35.4%	35.4%	35.4%					41.5%	41.5%	23.1%		
Maximum Green (s)	41.0	41.0	41.0					48.0	48.0	25.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	18.5	18.5	18.5					89.3	89.3	96.5	100.5	
Actuated g/C Ratio	0.14	0.14	0.14					0.69	0.69	0.74	0.77	
v/c Ratio	0.67	0.67	0.53					0.18	0.03	0.18	0.09	
Control Delay	66.2	59.4	10.7					8.1	1.1	2.5	1.7	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	66.2	59.4	10.7					8.1	1.1	2.5	1.7	
LOS	E	E	B					A	A	A	A	
Approach Delay		45.4						7.5			2.0	
Approach LOS		D						A			A	
Queue Length 50th (ft)	136	141	0					61	0	10	10	
Queue Length 95th (ft)	203	180	67					103	7	17	14	
Internal Link Dist (ft)		2101			1667			717			923	
Turn Bay Length (ft)	265		265						150	120		
Base Capacity (vph)	507	1049	649					2431	1106	987	3248	
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	0.30	0.30	0.34					0.18	0.03	0.13	0.08	

Intersection Summary

Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 127 (98%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 23.1	Intersection LOS: C
Intersection Capacity Utilization 101.3%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road



Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↑	
Traffic Vol, veh/h	0	379	0	0	32	0
Future Vol, veh/h	0	379	0	0	32	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	451	0	0	38	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	226	-
Stage 1	-	-	0	-
Stage 2	-	-	226	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	742	0
Stage 1	0	-	-	0
Stage 2	0	-	790	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	742	-
Mov Cap-2 Maneuver	-	-	742	-
Stage 1	-	-	-	-
Stage 2	-	-	790	-

Approach	EB	SB
HCM Control Delay, s	0	10.1
HCM LOS		B

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	742
HCM Lane V/C Ratio	-	0.051
HCM Control Delay (s)	-	10.1
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.2

Intersection												
Int Delay, s/veh	0.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗						↘				
Traffic Vol, veh/h	76	322	13	0	0	0	0	0	6	0	0	0
Future Vol, veh/h	76	322	13	0	0	0	0	0	6	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	88	374	15	0	0	0	0	0	7	0	0	0

Major/Minor	Major1			Minor1		
Conflicting Flow All	0	0	0	-	558	195
Stage 1	-	-	-	-	558	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.14	-	-	-	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.22	-	-	-	4.02	3.32
Pot Cap-1 Maneuver	-	-	-	0	437	814
Stage 1	-	-	-	0	510	-
Stage 2	-	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	0	814
Mov Cap-2 Maneuver	-	-	-	-	0	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-

Approach	EB	NB
HCM Control Delay, s		9.5
HCM LOS		A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	814	-	-	-
HCM Lane V/C Ratio	0.009	-	-	-
HCM Control Delay (s)	9.5	-	-	-
HCM Lane LOS	A	-	-	-
HCM 95th %tile Q(veh)	0	-	-	-

Lanes, Volumes, Timings
 7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

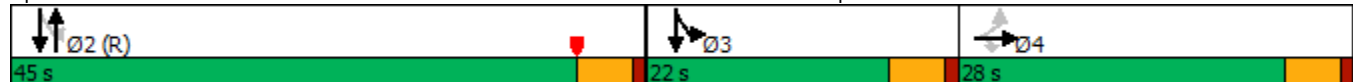
Knoxville Center TIS
 2020 Existing AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	131	24	0	0	0	0	88	96	606	227	0
Future Volume (vph)	120	131	24	0	0	0	0	88	96	606	227	0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1770	1863	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.692		
Satd. Flow (perm)	1770	1863	1583	0	0	0	0	3539	1583	1289	3539	0
Satd. Flow (RTOR)			80							103		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)												
Lane Group Flow (vph)	129	141	26	0	0	0	0	95	103	652	244	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	28.0	28.0	28.0					45.0	45.0	22.0		
Total Split (%)	29.5%	29.5%	29.5%					47.4%	47.4%	23.2%		
Maximum Green (s)	23.0	23.0	23.0					40.0	40.0	17.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	11.8	11.8	11.8					56.1	56.1	68.2	73.2	
Actuated g/C Ratio	0.12	0.12	0.12					0.59	0.59	0.72	0.77	
v/c Ratio	0.59	0.61	0.10					0.05	0.11	0.66	0.09	
Control Delay	49.9	50.5	0.8					10.1	2.9	8.3	2.2	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	49.9	50.5	0.8					10.1	2.9	8.3	2.2	
LOS	D	D	A					B	A	A	A	
Approach Delay		45.9						6.4			6.6	
Approach LOS		D						A			A	
Queue Length 50th (ft)	75	82	0					11	0	82	11	
Queue Length 95th (ft)	127	135	0					28	25	74	16	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	428	451	443					2090	977	1078	2910	
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	0.30	0.31	0.06					0.05	0.11	0.60	0.08	

Intersection Summary

Cycle Length: 95	
Actuated Cycle Length: 95	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.66	
Intersection Signal Delay: 15.0	Intersection LOS: B
Intersection Capacity Utilization 73.8%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp



Lanes, Volumes, Timings
8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp

Knoxville Center TIS
2020 Existing AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕↕	↗	↘	↕↕			↕↕	↗
Traffic Volume (vph)	0	0	0	80	125	282	23	184	0	0	746	289
Future Volume (vph)	0	0	0	80	125	282	23	184	0	0	746	289
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.981		0.950					
Satd. Flow (prot)	0	0	0	0	3472	1583	1770	3539	0	0	3539	1583
Flt Permitted					0.981		0.346					
Satd. Flow (perm)	0	0	0	0	3472	1583	645	3539	0	0	3539	1583
Satd. Flow (RTOR)						297						304
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	216	297	24	194	0	0	785	304
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2			2	
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				30.0	30.0	30.0	65.0	65.0			65.0	65.0
Total Split (%)				31.6%	31.6%	31.6%	68.4%	68.4%			68.4%	68.4%
Maximum Green (s)				23.0	23.0	23.0	59.0	59.0			59.0	59.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)					12.5	12.5	69.5	69.5			69.5	69.5
Actuated g/C Ratio					0.13	0.13	0.73	0.73			0.73	0.73
v/c Ratio					0.47	0.64	0.05	0.07			0.30	0.25
Control Delay					41.1	11.2	0.7	0.9			2.3	0.7
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					41.1	11.2	0.7	0.9			2.3	0.7
LOS					D	B	A	A			A	A
Approach Delay					23.8			0.8			1.9	
Approach LOS					C			A			A	
Queue Length 50th (ft)					64	0	0	0			13	0
Queue Length 95th (ft)					95	71	0	0			32	0
Internal Link Dist (ft)		1096			753			650			484	
Turn Bay Length (ft)						180	95					
Base Capacity (vph)					840	608	471	2587			2587	1239
Starvation Cap Reductn					0	0	0	0			0	0
Spillback Cap Reductn					0	0	0	0			0	0
Storage Cap Reductn					0	0	0	0			0	0
Reduced v/c Ratio					0.26	0.49	0.05	0.07			0.30	0.25

Intersection Summary

Cycle Length: 95	
Actuated Cycle Length: 95	
Offset: 12 (13%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.64	
Intersection Signal Delay: 7.9	Intersection LOS: A
Intersection Capacity Utilization 73.8%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp



Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way

Knoxville Center TIS
2020 Existing AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗	↖	↕	↗	↖	↕	↗	↖↗	↖↗	↖
Traffic Volume (vph)	20	18	10	152	13	52	11	312	113	58	862	26
Future Volume (vph)	20	18	10	152	13	52	11	312	113	58	862	26
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.974		0.950	0.960		0.950			0.950		
Satd. Flow (prot)	0	1814	1583	1681	1699	1583	1770	1863	1583	3433	3539	1583
Flt Permitted		0.974		0.950	0.960		0.276			0.950		
Satd. Flow (perm)	0	1814	1583	1681	1699	1583	514	1863	1583	3433	3539	1583
Satd. Flow (RTOR)			80			80			119			80
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	0	40	11	86	88	55	12	328	119	61	907	27
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4	5	3	3	1	5	2	3	1	6	4
Permitted Phases			4			3	2		2			6
Detector Phase	4	4	5	3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0	6.0	7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0	14.0	16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	14.0	14.0	15.0	21.0	21.0	15.0	15.0	45.0	21.0	15.0	45.0	14.0
Total Split (%)	14.7%	14.7%	15.8%	22.1%	22.1%	15.8%	15.8%	47.4%	22.1%	15.8%	47.4%	14.7%
Maximum Green (s)	9.0	9.0	10.0	16.0	16.0	10.0	10.0	40.0	16.0	10.0	40.0	9.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	2.0	3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)		8.0	16.6	10.6	10.6	18.1	59.3	54.5	71.1	6.5	59.5	68.0
Actuated g/C Ratio		0.08	0.17	0.11	0.11	0.19	0.62	0.57	0.75	0.07	0.63	0.72
v/c Ratio		0.26	0.03	0.46	0.47	0.15	0.03	0.31	0.10	0.26	0.41	0.02
Control Delay		44.7	0.2	46.7	46.9	2.9	5.3	10.8	1.2	46.7	11.4	0.8
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		44.7	0.2	46.7	46.9	2.9	5.3	10.8	1.2	46.7	11.4	0.8
LOS		D	A	D	D	A	A	B	A	D	B	A
Approach Delay		35.1			36.3			8.2			13.3	
Approach LOS		D			D			A			B	
Queue Length 50th (ft)		23	0	52	53	0	2	70	0	20	82	0
Queue Length 95th (ft)		55	0	96	98	12	m4	196	22	m30	177	m0
Internal Link Dist (ft)		713			953			484			243	
Turn Bay Length (ft)				155		245			180	120		105
Base Capacity (vph)		175	405	283	286	421	470	1069	1270	361	2215	1137
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio		0.23	0.03	0.30	0.31	0.13	0.03	0.31	0.09	0.17	0.41	0.02

Intersection Summary

Cycle Length: 95
 Actuated Cycle Length: 95
 Offset: 89 (94%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.47
 Intersection Signal Delay: 15.6
 Intersection LOS: B
 Intersection Capacity Utilization 47.2%
 ICU Level of Service A
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Millertown Pike & Kinzel Way

 Ø1	 Ø2 (R)	 Ø3	 Ø4
15 s	45 s	21 s	14 s
 Ø5	 Ø6 (R)		
15 s	45 s		

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	2	5	391	955	8
Future Vol, veh/h	0	2	5	391	955	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	2	5	430	1049	9

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1494	529	1058	0	-	0
Stage 1	1054	-	-	-	-	-
Stage 2	440	-	-	-	-	-
Critical Hdwy	6.63	6.93	4.13	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	124	495	656	-	-	-
Stage 1	297	-	-	-	-	-
Stage 2	648	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	123	495	656	-	-	-
Mov Cap-2 Maneuver	123	-	-	-	-	-
Stage 1	294	-	-	-	-	-
Stage 2	648	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.3	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	656	-	-	495	-	-
HCM Lane V/C Ratio	0.008	-	-	0.004	-	-
HCM Control Delay (s)	10.5	0	0	12.3	-	-
HCM Lane LOS	B	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	-	0	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road

Knoxville Center TIS
2020 Existing AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	2	29	83	12	74	19	294	42	118	852	2
Future Volume (vph)	6	2	29	83	12	74	19	294	42	118	852	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.859			0.871			0.981				
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1600	0	1770	1622	0	1770	1827	0	1770	1863	0
Flt Permitted	0.698			0.424			0.154			0.453		
Satd. Flow (perm)	1300	1600	0	790	1622	0	287	1827	0	844	1863	0
Satd. Flow (RTOR)		31			78			9				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	6	33	0	87	91	0	20	353	0	124	899	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	15.0	16.0		15.0	16.0		15.0	24.0		14.0	24.0	
Total Split (s)	22.0	16.0		22.0	16.0		14.0	43.0		14.0	43.0	
Total Split (%)	23.2%	16.8%		23.2%	16.8%		14.7%	45.3%		14.7%	45.3%	
Maximum Green (s)	17.0	11.0		17.0	11.0		9.0	38.0		9.0	38.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effect Green (s)	10.8	7.3		17.5	15.3		63.7	57.5		68.7	66.2	
Actuated g/C Ratio	0.11	0.08		0.18	0.16		0.67	0.61		0.72	0.70	
v/c Ratio	0.03	0.22		0.36	0.28		0.07	0.32		0.18	0.69	
Control Delay	26.7	19.2		34.0	12.4		3.7	5.7		6.6	18.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	26.7	19.2		34.0	12.4		3.7	5.7		6.6	18.8	
LOS	C	B		C	B		A	A		A	B	
Approach Delay		20.3			23.0			5.6			17.3	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)	3	1		43	6		2	47		24	309	
Queue Length 95th (ft)	12	29		78	49		5	68		52	#793	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)				175			125			65		
Base Capacity (vph)	374	212		352	348		341	1109		701	1298	
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	0.02	0.16		0.25	0.26		0.06	0.32		0.18	0.69	

Lanes, Volumes, Timings
12: Millertown Pike & Mill Road

Knoxville Center TIS
2020 Existing AM

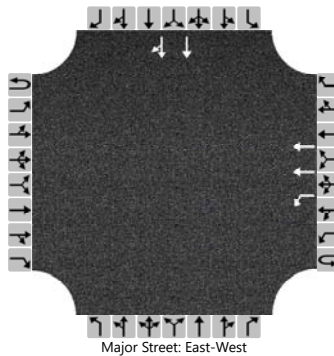


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	40	530	248	114	454	91
Future Volume (vph)	40	530	248	114	454	91
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.977	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1820	0
Flt Permitted	0.950		0.169			
Satd. Flow (perm)	1770	1583	315	1863	1820	0
Satd. Flow (RTOR)		197			11	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)						
Lane Group Flow (vph)	43	570	267	123	586	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	25.5	35.5	35.5	46.0	46.0	
Total Split (%)	23.8%	33.2%	33.2%	43.0%	43.0%	
Maximum Green (s)	20.0	30.0	30.0	40.0	40.0	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	9.3	29.2	55.9	59.2	27.0	
Actuated g/C Ratio	0.13	0.42	0.81	0.86	0.39	
v/c Ratio	0.18	0.73	0.37	0.08	0.82	
Control Delay	37.6	17.1	5.5	2.4	30.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	37.6	17.1	5.5	2.4	30.9	
LOS	D	B	A	A	C	
Approach Delay	18.5			4.5	30.9	
Approach LOS	B			A	C	
Queue Length 50th (ft)	18	122	28	12	232	
Queue Length 95th (ft)	58	296	82	26	441	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85	330			
Base Capacity (vph)	575	1013	964	1735	1175	
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	0.07	0.56	0.28	0.07	0.50	

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	BJH			Intersection	N Mall Rd at East Towne W		
Agency/Co.	Cannon & Cannon, Inc.			Jurisdiction	City of Knoxville		
Date Performed	10/21/2020			East/West Street	North Mall Road		
Analysis Year	2020			North/South Street	East Towne Road (West)		
Time Analyzed	AM Peak			Peak Hour Factor	0.84		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Existing 2020 AM						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	0	0	0	1	2	0		0	0	0		0	2	0
Configuration						L	T								T	TR
Volume (veh/h)						8	386								31	0
Percent Heavy Vehicles (%)						2									2	2
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						5.3									6.5	6.9
Critical Headway (sec)						0.00									6.54	6.94
Base Follow-Up Headway (sec)						3.1									4.0	3.3
Follow-Up Headway (sec)						3.12									4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						10									18	18
Capacity, c (veh/h)						1154									481	481
v/c Ratio						0.01									0.04	0.04
95% Queue Length, Q ₉₅ (veh)						0.0									0.1	0.1
Control Delay (s/veh)						8.1									12.8	12.8
Level of Service (LOS)						A									B	B
Approach Delay (s/veh)					0.2								12.8			
Approach LOS													B			

Intersection	
Intersection Delay, s/veh	10.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑↑				
Traffic Vol, veh/h	0	0	0	0	382	11	2	72	0	0	0	0
Future Vol, veh/h	0	0	0	0	382	11	2	72	0	0	0	0
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	531	15	3	100	0	0	0	0
Number of Lanes	0	0	0	0	2	0	0	2	0	0	0	0

Approach	WB	NB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NB	
Conflicting Lanes Left	2	0
Conflicting Approach Right		WB
Conflicting Lanes Right	0	2
HCM Control Delay	10.9	9.1
HCM LOS	B	A

Lane	NBLn1	NBLn2	WBLn1	WBLn2
Vol Left, %	8%	0%	0%	0%
Vol Thru, %	92%	100%	100%	92%
Vol Right, %	0%	0%	0%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	26	48	255	138
LT Vol	2	0	0	0
Through Vol	24	48	255	127
RT Vol	0	0	0	11
Lane Flow Rate	36	67	354	192
Geometry Grp	7	7	7	7
Degree of Util (X)	0.058	0.107	0.475	0.255
Departure Headway (Hd)	5.826	5.787	4.83	4.774
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	615	620	746	755
Service Time	3.556	3.517	2.548	2.492
HCM Lane V/C Ratio	0.059	0.108	0.475	0.254
HCM Control Delay	8.9	9.2	11.9	9.1
HCM Lane LOS	A	A	B	A
HCM 95th-tile Q	0.2	0.4	2.6	1

Intersection

Int Delay, s/veh 0.1

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations			↑↑			↑
Traffic Vol, veh/h	0	0	400	8	0	6
Future Vol, veh/h	0	0	400	8	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	482	10	0	7

Major/Minor Major2 Minor2

Conflicting Flow All	-	0	-	246
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	754
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	754
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach WB SB

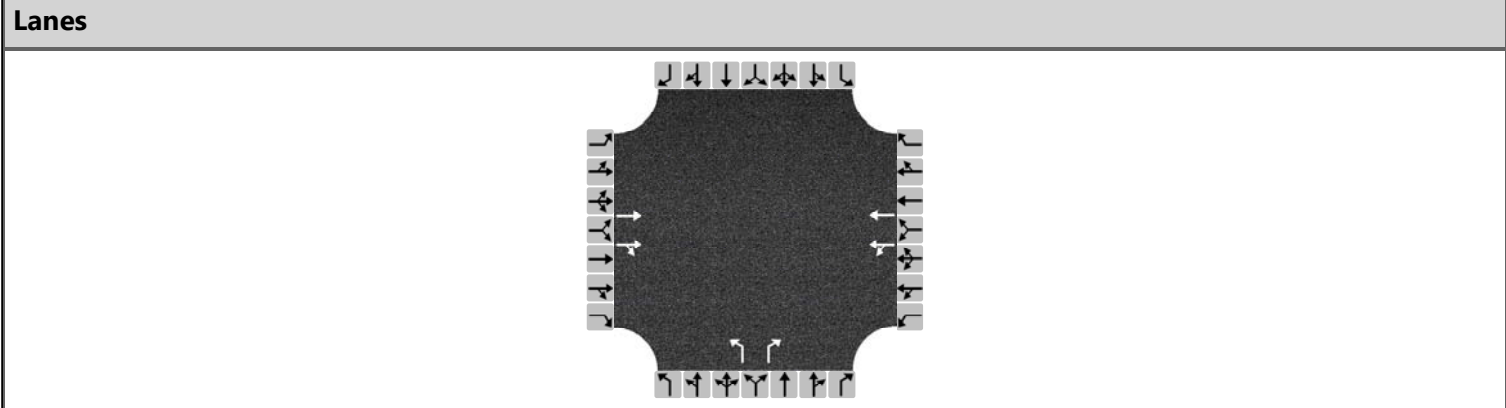
HCM Control Delay, s	0	9.8
HCM LOS		A

Minor Lane/Major Mvmt WBT WBR SBLn1

Capacity (veh/h)	-	-	754
HCM Lane V/C Ratio	-	-	0.01
HCM Control Delay (s)	-	-	9.8
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	BJH	Intersection	Knoxville Ctr at E Towne
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	City of Knoxville
Date Performed	10/21/2020	East/West Street	Knoxville Center Drive
Analysis Year	2020	North/South Street	East Towne Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.87
Time Analyzed	AM Peak		
Project Description	Existing 2020 AM		



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume		12	46	17	8		14		68			
% Thrus in Shared Lane			50	50								
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	T	TR		LT	T		L	R				
Flow Rate, v (veh/h)	7	60		24	5		16	78				
Percent Heavy Vehicles	2	2		2	2		2	2				

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20				
Initial Degree of Utilization, x	0.006	0.053		0.021	0.004		0.014	0.069				
Final Departure Headway, hd (s)	4.77	4.15		5.20	4.79		5.24	4.04				
Final Degree of Utilization, x	0.009	0.069		0.035	0.006		0.023	0.088				
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3				
Service Time, ts (s)	2.47	1.85		2.90	2.49		2.94	1.74				

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	7	60		24	5		16	78				
Capacity	755	868		693	752		687	891				
95% Queue Length, Q ₉₅ (veh)	0.0	0.2		0.1	0.0		0.1	0.3				
Control Delay (s/veh)	7.5	7.2		8.1	7.5		8.1	7.1				
Level of Service, LOS	A	A		A	A		A	A				
Approach Delay (s/veh)	7.2			8.0			7.3					
Approach LOS	A			A			A					
Intersection Delay, s/veh LOS	7.4						A					

Intersection	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	↑
Traffic Vol, veh/h	72	2	5	23	11	0
Future Vol, veh/h	72	2	5	23	11	0
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	97	3	7	31	15	0
Number of Lanes	2	0	0	2	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	7.6	7.6	8.2
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	39%	0%
Vol Thru, %	0%	100%	100%	92%	61%	100%
Vol Right, %	0%	0%	0%	8%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	11	0	48	26	13	15
LT Vol	11	0	0	0	5	0
Through Vol	0	0	48	24	8	15
RT Vol	0	0	0	2	0	0
Lane Flow Rate	15	0	65	35	17	21
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.022	0	0.082	0.044	0.023	0.027
Departure Headway (Hd)	5.263	4.762	4.578	4.524	4.806	4.609
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	672	0	783	792	743	775
Service Time	3.062	2.561	2.305	2.251	2.546	2.348
HCM Lane V/C Ratio	0.022	0	0.083	0.044	0.023	0.027
HCM Control Delay	8.2	7.6	7.7	7.5	7.7	7.5
HCM Lane LOS	A	N	A	A	A	A
HCM 95th-tile Q	0.1	0	0.3	0.1	0.1	0.1

Intersection	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	58	8	6	65	5	5
Future Vol, veh/h	58	8	6	65	5	5
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	67	9	7	76	6	6
Number of Lanes	1	1	2	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	8.3	7.2	7.8
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	100%	0%	75%	0%
Vol Thru, %	100%	3%	0%	0%	25%	100%
Vol Right, %	0%	97%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	4	67	58	8	7	3
LT Vol	0	0	58	0	5	0
Through Vol	4	2	0	0	2	3
RT Vol	0	65	0	8	0	0
Lane Flow Rate	5	78	67	9	8	4
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.006	0.086	0.097	0.01	0.011	0.005
Departure Headway (Hd)	4.673	3.993	5.192	3.991	5.085	4.71
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	757	885	688	892	696	750
Service Time	2.453	1.773	2.939	1.738	2.875	2.5
HCM Lane V/C Ratio	0.007	0.088	0.097	0.01	0.011	0.005
HCM Control Delay	7.5	7.2	8.5	6.8	7.9	7.5
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0	0.3	0.3	0	0	0

Intersection						
Int Delay, s/veh	7.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	0	71	12	4	4	2
Future Vol, veh/h	0	71	12	4	4	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	83	14	5	5	2

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	37	4	7	0	0
Stage 1	6	-	-	-	-
Stage 2	31	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-
Pot Cap-1 Maneuver	971	1078	1612	-	-
Stage 1	1016	-	-	-	-
Stage 2	987	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	962	1078	1612	-	-
Mov Cap-2 Maneuver	962	-	-	-	-
Stage 1	1007	-	-	-	-
Stage 2	987	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.6	5.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1612	-	1078	-	-
HCM Lane V/C Ratio	0.009	-	0.077	-	-
HCM Control Delay (s)	7.3	0	8.6	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Lanes, Volumes, Timings
1: Mill Road & Washington Pike

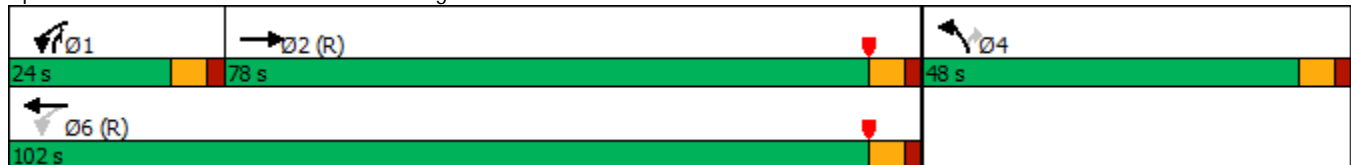
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	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↖	↗	↖	↗
Traffic Volume (vph)	874	110	306	454	83	610
Future Volume (vph)	874	110	306	454	83	610
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.985					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1835	0	1770	1863	1770	1583
Flt Permitted			0.051		0.950	
Satd. Flow (perm)	1835	0	95	1863	1770	1583
Satd. Flow (RTOR)	6					85
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1036	0	322	478	87	642
Turn Type	NA		pm+pt	NA	Prot	pm+ov
Protected Phases	2		1	6	4	1
Permitted Phases			6			4
Detector Phase	2		1	6	4	1
Switch Phase						
Minimum Initial (s)	12.0		10.0	12.0	10.0	10.0
Minimum Split (s)	19.0		17.0	19.0	17.0	17.0
Total Split (s)	78.0		24.0	102.0	48.0	24.0
Total Split (%)	52.0%		16.0%	68.0%	32.0%	16.0%
Maximum Green (s)	72.0		18.0	96.0	42.0	18.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
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)	6.0		6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	C-Max		None	C-Max	None	None
Act Effect Green (s)	73.1		124.8	124.8	13.2	64.9
Actuated g/C Ratio	0.49		0.83	0.83	0.09	0.43
v/c Ratio	1.15		0.55	0.31	0.56	0.88
Control Delay	117.8		35.8	3.6	78.7	47.9
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	117.8		35.8	3.6	78.7	47.9
LOS	F		D	A	E	D
Approach Delay	117.8			16.6	51.6	
Approach LOS	F			B	D	
Queue Length 50th (ft)	~1206		202	84	83	502
Queue Length 95th (ft)	#1473		322	143	139	#740
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200		100	
Base Capacity (vph)	897		588	1549	495	733
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	1.15		0.55	0.31	0.18	0.88

Intersection Summary

Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow	
Natural Cycle: 140	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.15	
Intersection Signal Delay: 67.4	Intersection LOS: E
Intersection Capacity Utilization 100.4%	ICU Level of Service G
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: Mill Road & Washington Pike



Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	95	290	457	59	11	272	286	846	58	293	50
Future Volume (vph)	48	95	290	457	59	11	272	286	846	58	293	50
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	3539	1583
Flt Permitted	0.714			0.604			0.334			0.568		
Satd. Flow (perm)	1330	1863	1583	1125	1863	1583	622	1863	1583	1058	3539	1583
Satd. Flow (RTOR)			157			155			790			209
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	53	106	322	508	66	12	302	318	940	64	326	56
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	7	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	16.0	34.0	28.0	28.0	46.0	46.0	28.0	41.0	41.0	17.0	30.0	30.0
Total Split (%)	13.3%	28.3%	23.3%	23.3%	38.3%	38.3%	23.3%	34.2%	34.2%	14.2%	25.0%	25.0%
Maximum Green (s)	11.0	28.0	23.0	23.0	40.0	40.0	23.0	36.0	36.0	12.0	25.0	25.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	C-Max	None	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	45.8	36.5	62.1	65.2	53.2	53.2	44.8	34.6	34.6	27.5	20.2	20.2
Actuated g/C Ratio	0.38	0.30	0.52	0.54	0.44	0.44	0.37	0.29	0.29	0.23	0.17	0.17
v/c Ratio	0.10	0.19	0.36	0.69	0.08	0.02	0.72	0.59	0.92	0.22	0.55	0.13
Control Delay	17.9	35.8	10.9	25.9	24.7	0.0	34.5	37.2	20.4	25.1	48.4	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0
Total Delay	17.9	35.8	10.9	25.9	24.7	0.0	34.5	37.2	24.0	25.1	48.4	0.6
LOS	B	D	B	C	C	A	C	D	C	C	D	A
Approach Delay		17.1			25.2			28.8			39.0	
Approach LOS		B			C			C			D	
Queue Length 50th (ft)	20	67	79	259	32	0	131	159	111	30	117	0
Queue Length 95th (ft)	45	118	144	397	68	0	224	262	#488	56	163	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	335		170	160			150		75
Base Capacity (vph)	577	566	935	740	825	788	452	580	1036	354	748	499
Starvation Cap Reductn	0	0	0	0	0	0	0	0	51	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.19	0.34	0.69	0.08	0.02	0.67	0.55	0.95	0.18	0.44	0.11

Lanes, Volumes, Timings
 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road

Knoxville Center TIS
 2020 Existing PM

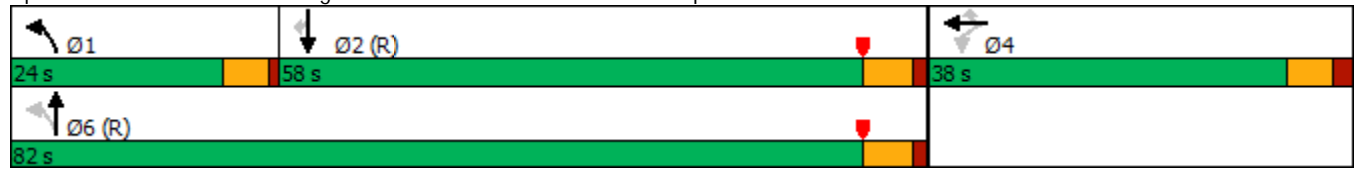


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑	↑	↑↑			↑↑	↑
Traffic Volume (vph)	0	0	0	100	330	290	232	1132	0	0	546	474
Future Volume (vph)	0	0	0	100	330	290	232	1132	0	0	546	474
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.988		0.950					
Satd. Flow (prot)	0	0	0	0	3497	1583	1770	3539	0	0	3539	1583
Flt Permitted					0.988		0.369					
Satd. Flow (perm)	0	0	0	0	3497	1583	687	3539	0	0	3539	1583
Satd. Flow (RTOR)						82						276
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	468	315	252	1230	0	0	593	515
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0			10.0	10.0
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0			19.0	19.0
Total Split (s)				38.0	38.0	38.0	24.0	82.0			58.0	58.0
Total Split (%)				31.7%	31.7%	31.7%	20.0%	68.3%			48.3%	48.3%
Maximum Green (s)				32.0	32.0	32.0	19.0	76.0			52.0	52.0
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5			4.5	4.5
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5			1.5	1.5
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					6.0	6.0	5.0	6.0			6.0	6.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			2.0	2.0
Recall Mode				None	None	None	None	C-Max			C-Max	C-Max
Act Effect Green (s)					24.9	24.9	84.1	83.1			67.3	67.3
Actuated g/C Ratio					0.21	0.21	0.70	0.69			0.56	0.56
v/c Ratio					0.65	0.80	0.44	0.50			0.30	0.51
Control Delay					47.1	48.1	4.1	2.8			16.9	11.3
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					47.1	48.1	4.1	2.8			16.9	11.3
LOS					D	D	A	A			B	B
Approach Delay					47.5			3.0			14.3	
Approach LOS					D			A			B	
Queue Length 50th (ft)					174	174	16	43			104	78
Queue Length 95th (ft)					215	265	m22	51			176	191
Internal Link Dist (ft)		569			2042			923			673	
Turn Bay Length (ft)						475	105					75
Base Capacity (vph)					932	482	652	2450			1983	1008
Starvation Cap Reductn					0	0	0	0			0	0
Spillback Cap Reductn					0	0	0	0			0	0
Storage Cap Reductn					0	0	0	0			0	0
Reduced v/c Ratio					0.50	0.65	0.39	0.50			0.30	0.51

Intersection Summary
























Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 7 (6%), Referenced to phase 2:SBT and 6:NBTL, Start of Yellow
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.80
 Intersection Signal Delay: 17.1
 Intersection LOS: B
 Intersection Capacity Utilization 70.8%
 ICU Level of Service C
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road



Lanes, Volumes, Timings
4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road

Knoxville Center TIS
2020 Existing PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 						 			 	
Traffic Volume (vph)	829	511	344	0	0	0	0	528	53	314	331	0
Future Volume (vph)	829	511	344	0	0	0	0	528	53	314	331	0
Lane Util. Factor	0.91	0.91	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.979								0.950		
Satd. Flow (prot)	1610	3319	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.979								0.385		
Satd. Flow (perm)	1610	3319	1583	0	0	0	0	3539	1583	717	3539	0
Satd. Flow (RTOR)			351							64		
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 (%)	47%											
Lane Group Flow (vph)	448	919	351	0	0	0	0	539	54	320	338	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	47.0	47.0	47.0					46.0	46.0	27.0		
Total Split (%)	39.2%	39.2%	39.2%					38.3%	38.3%	22.5%		
Maximum Green (s)	42.0	42.0	42.0					40.0	40.0	22.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	41.4	41.4	41.4					49.2	49.2	63.6	67.6	
Actuated g/C Ratio	0.34	0.34	0.34					0.41	0.41	0.53	0.56	
v/c Ratio	0.81	0.80	0.45					0.37	0.08	0.64	0.17	
Control Delay	47.8	41.6	4.8					27.5	5.6	24.7	7.5	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	47.8	41.6	4.8					27.5	5.6	24.7	7.5	
LOS	D	D	A					C	A	C	A	
Approach Delay		35.7						25.5			15.9	
Approach LOS		D						C			B	
Queue Length 50th (ft)	328	336	0					156	0	128	49	
Queue Length 95th (ft)	#519	435	63					224	23	169	21	
Internal Link Dist (ft)		2101			1667			751			923	
Turn Bay Length (ft)	265		265						150	120		
Base Capacity (vph)	584	1205	798					1451	687	624	2247	
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	0.77	0.76	0.44					0.37	0.08	0.51	0.15	

Intersection

Int Delay, s/veh 0.7

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	948	0	0	52	0
Future Vol, veh/h	0	948	0	0	52	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1019	0	0	56	0

Major/Minor Major1 Minor2

Conflicting Flow All	-	0	510	-
Stage 1	-	-	0	-
Stage 2	-	-	510	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	493	0
Stage 1	0	-	-	0
Stage 2	0	-	568	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	493	-
Mov Cap-2 Maneuver	-	-	493	-
Stage 1	-	-	-	-
Stage 2	-	-	568	-

Approach EB SB

HCM Control Delay, s	0	13.2
HCM LOS		B

Minor Lane/Major Mvmt EBT SBLn1

Capacity (veh/h)	-	493
HCM Lane V/C Ratio	-	0.113
HCM Control Delay (s)	-	13.2
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.4

Intersection												
Int Delay, s/veh	0.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗						↖				
Traffic Vol, veh/h	234	750	24	0	0	0	0	5	28	0	0	0
Future Vol, veh/h	234	750	24	0	0	0	0	5	28	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	263	843	27	0	0	0	0	6	31	0	0	0

Major/Minor	Major1			Minor1		
Conflicting Flow All	0	0	0	-	1383	435
Stage 1	-	-	-	-	1383	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.14	-	-	-	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.22	-	-	-	4.02	3.32
Pot Cap-1 Maneuver	-	-	-	0	143	569
Stage 1	-	-	-	0	209	-
Stage 2	-	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	0	569
Mov Cap-2 Maneuver	-	-	-	-	0	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-

Approach	EB	NB
HCM Control Delay, s		11.8
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	569	-	-	-
HCM Lane V/C Ratio	0.065	-	-	-
HCM Control Delay (s)	11.8	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.2	-	-	-

Lanes, Volumes, Timings
7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

Knoxville Center TIS
2020 Existing PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	446	259	52	0	0	0	0	286	122	414	418	0
Future Volume (vph)	446	259	52	0	0	0	0	286	122	414	418	0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1770	1863	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.561		
Satd. Flow (perm)	1770	1863	1583	0	0	0	0	3539	1583	1045	3539	0
Satd. Flow (RTOR)			64							126		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)												
Lane Group Flow (vph)	460	267	54	0	0	0	0	295	126	427	431	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	38.0	38.0	38.0					50.0	50.0	32.0		
Total Split (%)	31.7%	31.7%	31.7%					41.7%	41.7%	26.7%		
Maximum Green (s)	33.0	33.0	33.0					45.0	45.0	27.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	36.7	36.7	36.7					56.5	56.5	68.3	73.3	
Actuated g/C Ratio	0.31	0.31	0.31					0.47	0.47	0.57	0.61	
v/c Ratio	0.85	0.47	0.10					0.18	0.16	0.64	0.20	
Control Delay	50.0	32.5	4.2					20.4	4.6	19.8	7.6	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	50.0	32.5	4.2					20.4	4.6	19.8	7.6	
LOS	D	C	A					C	A	B	A	
Approach Delay		40.9						15.6			13.7	
Approach LOS		D						B			B	
Queue Length 50th (ft)	346	182	4					65	0	71	37	
Queue Length 95th (ft)	#476	m259	m13					115	39	265	118	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	551	580	537					1666	811	890	2610	
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	0.83	0.46	0.10					0.18	0.16	0.48	0.17	

Lanes, Volumes, Timings

8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕↕	↗	↖	↕↕			↕↕	↗
Traffic Volume (vph)	0	0	0	148	353	571	74	643	0	0	680	302
Future Volume (vph)	0	0	0	148	353	571	74	643	0	0	680	302
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.985		0.950					
Satd. Flow (prot)	0	0	0	0	3486	1583	1770	3539	0	0	3539	1583
Flt Permitted					0.985		0.364					
Satd. Flow (perm)	0	0	0	0	3486	1583	678	3539	0	0	3539	1583
Satd. Flow (RTOR)							277					199
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	506	577	75	649	0	0	687	305
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2			2	
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				40.0	40.0	40.0	80.0	80.0			80.0	80.0
Total Split (%)				33.3%	33.3%	33.3%	66.7%	66.7%			66.7%	66.7%
Maximum Green (s)				33.0	33.0	33.0	74.0	74.0			74.0	74.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)					31.0	31.0	76.0	76.0			76.0	76.0
Actuated g/C Ratio					0.26	0.26	0.63	0.63			0.63	0.63
v/c Ratio					0.56	0.94	0.17	0.29			0.31	0.28
Control Delay					41.0	46.8	5.1	5.9			14.2	8.5
Queue Delay					0.0	4.9	0.0	0.1			0.0	0.0
Total Delay					41.0	51.7	5.1	6.0			14.2	8.5
LOS					D	D	A	A			B	A
Approach Delay					46.7			5.9			12.4	
Approach LOS					D			A			B	
Queue Length 50th (ft)					175	248	28	163			111	65
Queue Length 95th (ft)					231	#473	m9	m38			140	92
Internal Link Dist (ft)		1096			753			650			484	
Turn Bay Length (ft)						180	95					
Base Capacity (vph)					958	636	429	2242			2242	1076
Starvation Cap Reductn					0	0	0	0			0	0
Spillback Cap Reductn					0	32	0	418			0	0
Storage Cap Reductn					0	0	0	0			0	0
Reduced v/c Ratio					0.53	0.96	0.17	0.36			0.31	0.28

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 114 (95%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.94
 Intersection Signal Delay: 24.0 Intersection LOS: C
 Intersection Capacity Utilization 81.0% 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.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp



Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way

Knoxville Center TIS
2020 Existing PM









Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕	↕	↕	↕	↕	↕	↕	↕↕	↕↕	↕
Traffic Volume (vph)	157	50	65	323	41	138	53	767	382	97	564	78
Future Volume (vph)	157	50	65	323	41	138	53	767	382	97	564	78
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.964		0.950	0.963		0.950			0.950		
Satd. Flow (prot)	0	1796	1583	1681	1704	1583	1770	1863	1583	3433	3539	1583
Flt Permitted		0.964		0.950	0.963		0.393			0.950		
Satd. Flow (perm)	0	1796	1583	1681	1704	1583	732	1863	1583	3433	3539	1583
Satd. Flow (RTOR)			67			142			320			80
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)				44%								
Lane Group Flow (vph)	0	214	67	186	189	142	55	791	394	100	581	80
Turn Type	Split	NA	pm+ov	Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4	5	3	3	1	5	2	3	1	6	4
Permitted Phases			4			3	2		2			6
Detector Phase	4	4	5	3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0	6.0	7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0	14.0	16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	25.0	25.0	17.0	26.0	26.0	16.0	17.0	53.0	26.0	16.0	52.0	25.0
Total Split (%)	20.8%	20.8%	14.2%	21.7%	21.7%	13.3%	14.2%	44.2%	21.7%	13.3%	43.3%	20.8%
Maximum Green (s)	20.0	20.0	12.0	21.0	21.0	11.0	12.0	48.0	21.0	11.0	47.0	20.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	2.0	3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)		17.9	29.6	18.3	18.3	26.3	62.4	55.8	79.1	8.0	59.3	78.2
Actuated g/C Ratio		0.15	0.25	0.15	0.15	0.22	0.52	0.46	0.66	0.07	0.49	0.65
v/c Ratio		0.80	0.15	0.73	0.73	0.31	0.13	0.91	0.34	0.44	0.33	0.08
Control Delay		70.8	8.6	64.6	64.6	5.0	8.9	41.5	4.3	59.0	18.4	1.6
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0	0.0
Total Delay		70.8	8.6	64.6	64.6	5.0	8.9	45.7	4.3	59.0	18.4	1.6
LOS		E	A	E	E	A	A	D	A	E	B	A
Approach Delay		55.9			48.2			31.0			22.0	
Approach LOS		E			D			C			C	
Queue Length 50th (ft)		159	0	143	146	0	16	638	29	40	116	0
Queue Length 95th (ft)		#260	35	226	229	32	m24	m#875	m89	68	181	18
Internal Link Dist (ft)		713			953			484			243	
Turn Bay Length (ft)				155		245			180	120		105
Base Capacity (vph)		299	508	294	298	493	515	865	1180	314	1748	1068
Starvation Cap Reductn		0	0	0	0	0	0	41	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio		0.72	0.13	0.63	0.63	0.29	0.11	0.96	0.33	0.32	0.33	0.07

Intersection Summary

Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 103 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.91	
Intersection Signal Delay: 34.2	Intersection LOS: C
Intersection Capacity Utilization 72.7%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 9: Millertown Pike & Kinzel Way

 Ø1 16 s	 Ø2 (R) 53 s	 Ø3 26 s	 Ø4 25 s
 Ø5 17 s	 Ø6 (R) 52 s		

Intersection						
Int Delay, s/veh	2.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	36	42	11	1087	730	35
Future Vol, veh/h	36	42	11	1087	730	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	37	43	11	1121	753	36

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1914	395	789	0	-	0
Stage 1	771	-	-	-	-	-
Stage 2	1143	-	-	-	-	-
Critical Hdwy	6.63	6.93	4.13	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	67	605	829	-	-	-
Stage 1	418	-	-	-	-	-
Stage 2	303	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	65	605	829	-	-	-
Mov Cap-2 Maneuver	65	-	-	-	-	-
Stage 1	403	-	-	-	-	-
Stage 2	303	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	60.3	0.1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	829	-	65	605	-	-
HCM Lane V/C Ratio	0.014	-	0.571	0.072	-	-
HCM Control Delay (s)	9.4	0	117.3	11.4	-	-
HCM Lane LOS	A	A	F	B	-	-
HCM 95th %tile Q(veh)	0	-	2.4	0.2	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road

Knoxville Center TIS
2020 Existing PM











Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	79	37	86	137	42	174	90	907	72	73	538	14
Future Volume (vph)	79	37	86	137	42	174	90	907	72	73	538	14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.895			0.879			0.989				0.996
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1667	0	1770	1637	0	1770	1842	0	1770	1855	0
Flt Permitted	0.360			0.341			0.318			0.059		
Satd. Flow (perm)	671	1667	0	635	1637	0	592	1842	0	110	1855	0
Satd. Flow (RTOR)		78			139			5			2	
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)	81	126	0	140	221	0	92	999	0	74	563	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	15.0	16.0		15.0	16.0		15.0	24.0		14.0	24.0	
Total Split (s)	24.0	18.0		24.0	18.0		14.0	64.0		14.0	64.0	
Total Split (%)	20.0%	15.0%		20.0%	15.0%		11.7%	53.3%		11.7%	53.3%	
Maximum Green (s)	19.0	13.0		19.0	13.0		9.0	59.0		9.0	59.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effect Green (s)	20.1	10.3		27.6	16.1		78.2	71.8		75.7	68.9	
Actuated g/C Ratio	0.17	0.09		0.23	0.13		0.65	0.60		0.63	0.57	
v/c Ratio	0.40	0.59		0.52	0.65		0.20	0.90		0.45	0.53	
Control Delay	40.9	33.2		43.3	28.5		3.2	18.9		21.6	19.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	40.9	33.2		43.3	28.5		3.2	18.9		21.6	19.4	
LOS	D	C		D	C		A	B		C	B	
Approach Delay		36.2			34.2			17.6			19.6	
Approach LOS		D			C			B			B	
Queue Length 50th (ft)	51	36		90	60		6	188		17	251	
Queue Length 95th (ft)	85	95		136	141		m15	m#1052		59	427	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)				175			125			65		
Base Capacity (vph)	328	254		330	346		477	1104		195	1065	
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	0.25	0.50		0.42	0.64		0.19	0.90		0.38	0.53	

Intersection Summary

Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 119 (99%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 22.5	Intersection LOS: C
Intersection Capacity Utilization 91.7%	ICU Level of Service F
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 11: Millertown Pike & Loves Creek Road

 Ø1 14 s	 Ø2 (R) 64 s	 Ø3 24 s	 Ø4 18 s
 Ø5 14 s	 Ø6 (R) 64 s	 Ø7 24 s	 Ø8 18 s

Lanes, Volumes, Timings
12: Millertown Pike & Mill Road

Knoxville Center TIS
2020 Existing PM

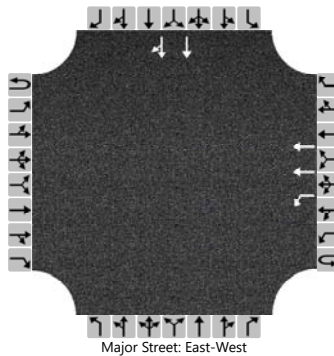


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	79	364	659	558	287	73
Future Volume (vph)	79	364	659	558	287	73
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.973	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1812	0
Flt Permitted	0.950		0.278			
Satd. Flow (perm)	1770	1583	518	1863	1812	0
Satd. Flow (RTOR)		379			14	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Shared Lane Traffic (%)						
Lane Group Flow (vph)	82	379	686	581	375	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	25.5	35.5	35.5	46.0	46.0	
Total Split (%)	23.8%	33.2%	33.2%	43.0%	43.0%	
Maximum Green (s)	20.0	30.0	30.0	40.0	40.0	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	9.9	40.3	57.2	58.6	22.1	
Actuated g/C Ratio	0.13	0.54	0.77	0.79	0.30	
v/c Ratio	0.35	0.37	0.78	0.40	0.69	
Control Delay	38.1	2.3	17.8	4.9	31.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	38.1	2.3	17.8	4.9	31.0	
LOS	D	A	B	A	C	
Approach Delay	8.7			11.9	31.0	
Approach LOS	A			B	C	
Queue Length 50th (ft)	37	0	161	85	157	
Queue Length 95th (ft)	88	41	#436	161	264	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85	330			
Base Capacity (vph)	500	1075	928	1754	1030	
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	0.16	0.35	0.74	0.33	0.36	

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	BJH			Intersection	N Mall Rd at East Towne W		
Agency/Co.	Cannon & Cannon, Inc.			Jurisdiction	City of Knoxville		
Date Performed	10/21/2020			East/West Street	North Mall Road		
Analysis Year	2020			North/South Street	East Towne Road (West)		
Time Analyzed	PM Peak			Peak Hour Factor	0.93		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Existing 2020 PM						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	0	0	0	1	2	0		0	0	0		0	2	0
Configuration						L	T								T	TR
Volume (veh/h)						20	637								17	0
Percent Heavy Vehicles (%)						2									2	2
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						5.3									6.5	6.9
Critical Headway (sec)						0.00									6.54	6.94
Base Follow-Up Headway (sec)						3.1									4.0	3.3
Follow-Up Headway (sec)						3.12									4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						22									9	9
Capacity, c (veh/h)						1154									342	342
v/c Ratio						0.02									0.03	0.03
95% Queue Length, Q ₉₅ (veh)						0.1									0.1	0.1
Control Delay (s/veh)						8.2									15.8	15.8
Level of Service (LOS)						A									C	C
Approach Delay (s/veh)						0.2									15.8	
Approach LOS															C	

Intersection	
Intersection Delay, s/veh	13.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑↑				
Traffic Vol, veh/h	0	0	0	0	637	22	1	232	0	0	0	0
Future Vol, veh/h	0	0	0	0	637	22	1	232	0	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	671	23	1	244	0	0	0	0
Number of Lanes	0	0	0	0	2	0	0	2	0	0	0	0

Approach	WB	NB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NB	
Conflicting Lanes Left	2	0
Conflicting Approach Right		WB
Conflicting Lanes Right	0	2
HCM Control Delay	15	10.9
HCM LOS	B	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2
Vol Left, %	1%	0%	0%	0%
Vol Thru, %	99%	100%	100%	91%
Vol Right, %	0%	0%	0%	9%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	78	155	425	234
LT Vol	1	0	0	0
Through Vol	77	155	425	212
RT Vol	0	0	0	22
Lane Flow Rate	82	163	447	247
Geometry Grp	7	7	7	7
Degree of Util (X)	0.141	0.278	0.651	0.355
Departure Headway (Hd)	6.151	6.145	5.244	5.178
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	579	581	684	691
Service Time	3.935	3.928	3.005	2.939
HCM Lane V/C Ratio	0.142	0.281	0.654	0.357
HCM Control Delay	10	11.3	17.3	10.8
HCM Lane LOS	A	B	C	B
HCM 95th-tile Q	0.5	1.1	4.8	1.6

Intersection

Int Delay, s/veh 0.4

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations			↑↑			↑
Traffic Vol, veh/h	0	0	668	34	0	26
Future Vol, veh/h	0	0	668	34	0	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	696	35	0	27

Major/Minor Major2 Minor2

Conflicting Flow All	-	0	-	366
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	631
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	631
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach WB SB

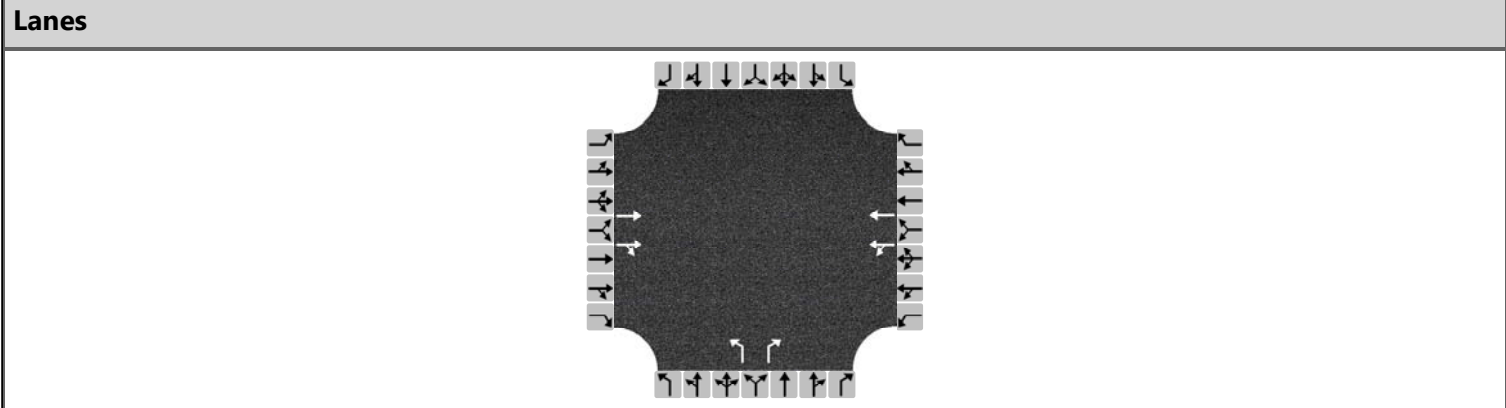
HCM Control Delay, s	0	11
HCM LOS		B

Minor Lane/Major Mvmt WBT WBR SBLn1

Capacity (veh/h)	-	-	631
HCM Lane V/C Ratio	-	-	0.043
HCM Control Delay (s)	-	-	11
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.1

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	BJH	Intersection	Knoxville Ctr at E Towne
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	City of Knoxville
Date Performed	10/21/2020	East/West Street	Knoxville Center Drive
Analysis Year	2020	North/South Street	East Towne Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.91
Time Analyzed	PM Peak		
Project Description	Existing 2020 PM		



Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume		11	40	86	28		47		215			
% Thrus in Shared Lane			50	50								
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	T	TR		LT	T		L	R				
Flow Rate, v (veh/h)	6	50		110	15		52	236				
Percent Heavy Vehicles	2	2		2	2		2	2				

Departure Headway and Service Time												
Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20				
Initial Degree of Utilization, x	0.005	0.044		0.098	0.014		0.046	0.210				
Final Departure Headway, hd (s)	5.36	4.74		5.70	5.26		5.50	4.31				
Final Degree of Utilization, x	0.009	0.066		0.174	0.022		0.079	0.283				
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3				
Service Time, ts (s)	3.06	2.44		3.40	2.96		3.20	2.01				

Capacity, Delay and Level of Service												
Flow Rate, v (veh/h)	6	50		110	15		52	236				
Capacity	672	760		632	684		654	836				
95% Queue Length, Q ₉₅ (veh)	0.0	0.2		0.6	0.1		0.3	1.2				
Control Delay (s/veh)	8.1	7.8		9.6	8.1		8.7	8.7				
Level of Service, LOS	A	A		A	A		A	A				
Approach Delay (s/veh)	7.8			9.4			8.7					
Approach LOS	A			A			A					
Intersection Delay, s/veh LOS	8.8						A					

Intersection	
Intersection Delay, s/veh	8.4
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	↑
Traffic Vol, veh/h	216	5	18	94	34	7
Future Vol, veh/h	216	5	18	94	34	7
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	232	5	19	101	37	8
Number of Lanes	2	0	0	2	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	8.5	8	8.6
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	36%	0%
Vol Thru, %	0%	0%	100%	94%	64%	100%
Vol Right, %	0%	100%	0%	6%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	34	7	144	77	49	63
LT Vol	34	0	0	0	18	0
Through Vol	0	0	144	72	31	63
RT Vol	0	7	0	5	0	0
Lane Flow Rate	37	8	155	83	53	67
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.06	0.01	0.201	0.106	0.074	0.091
Departure Headway (Hd)	5.868	4.664	4.671	4.626	5.034	4.851
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	613	771	757	763	715	742
Service Time	3.575	2.37	2.47	2.424	2.743	2.56
HCM Lane V/C Ratio	0.06	0.01	0.205	0.109	0.074	0.09
HCM Control Delay	8.9	7.4	8.7	8	8.1	8
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0.2	0	0.7	0.4	0.2	0.3

Intersection	
Intersection Delay, s/veh	9.5
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	124	68	28	221	54	25
Future Vol, veh/h	124	68	28	221	54	25
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	144	79	33	257	63	29
Number of Lanes	1	1	2	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	9.6	9.6	9.2
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	100%	0%	87%	0%
Vol Thru, %	100%	4%	0%	0%	13%	100%
Vol Right, %	0%	96%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	19	230	124	68	62	17
LT Vol	0	0	124	0	54	0
Through Vol	19	9	0	0	8	17
RT Vol	0	221	0	68	0	0
Lane Flow Rate	22	268	144	79	72	19
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.032	0.34	0.237	0.104	0.118	0.029
Departure Headway (Hd)	5.252	4.575	5.922	4.717	5.847	5.41
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	681	785	604	756	612	660
Service Time	2.988	2.312	3.678	2.472	3.596	3.159
HCM Lane V/C Ratio	0.032	0.341	0.238	0.104	0.118	0.029
HCM Control Delay	8.2	9.7	10.5	8	9.4	8.3
HCM Lane LOS	A	A	B	A	A	A
HCM 95th-tile Q	0.1	1.5	0.9	0.3	0.4	0.1

Intersection						
Int Delay, s/veh	6.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	5	59	71	2	5	14
Future Vol, veh/h	5	59	71	2	5	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
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	5	64	77	2	5	15

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	168	10	20	0	0
Stage 1	13	-	-	-	-
Stage 2	155	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-
Pot Cap-1 Maneuver	806	1069	1595	-	-
Stage 1	1008	-	-	-	-
Stage 2	857	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	767	1069	1595	-	-
Mov Cap-2 Maneuver	767	-	-	-	-
Stage 1	960	-	-	-	-
Stage 2	857	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.7	7.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1595	-	1037	-	-
HCM Lane V/C Ratio	0.048	-	0.067	-	-
HCM Control Delay (s)	7.4	0	8.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	-	-

Lanes, Volumes, Timings
1: Mill Road & Washington Pike

Knoxville Center TIS
2022 Background AM

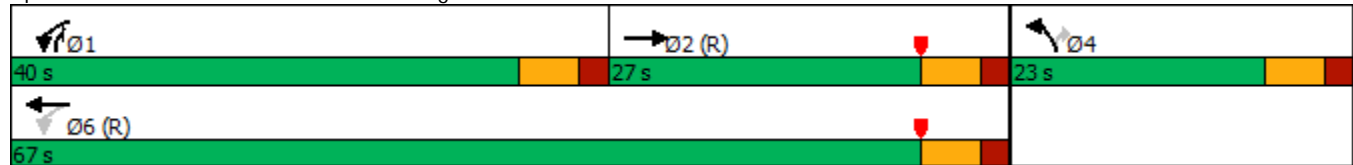
	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↖	↗	↖	↗
Traffic Volume (vph)	291	58	511	1044	49	291
Future Volume (vph)	291	58	511	1044	49	291
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.978					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1822	0	1770	1863	1770	1583
Flt Permitted			0.408		0.950	
Satd. Flow (perm)	1822	0	760	1863	1770	1583
Satd. Flow (RTOR)	10					196
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	367	0	538	1099	52	306
Turn Type	NA		pm+pt	NA	Prot	pm+ov
Protected Phases	2		1	6	4	1
Permitted Phases			6			4
Detector Phase	2		1	6	4	1
Switch Phase						
Minimum Initial (s)	12.0		10.0	12.0	10.0	10.0
Minimum Split (s)	19.0		17.0	19.0	17.0	17.0
Total Split (s)	27.0		40.0	67.0	23.0	40.0
Total Split (%)	30.0%		44.4%	74.4%	25.6%	44.4%
Maximum Green (s)	21.0		34.0	61.0	17.0	34.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
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)	6.0		6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	C-Max		None	C-Max	None	None
Act Effect Green (s)	45.1		74.2	76.6	10.2	32.9
Actuated g/C Ratio	0.50		0.82	0.85	0.11	0.37
v/c Ratio	0.40		0.61	0.69	0.26	0.44
Control Delay	20.4		6.2	8.2	40.0	7.1
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	20.4		6.2	8.2	40.0	7.1
LOS	C		A	A	D	A
Approach Delay	20.4			7.6	11.9	
Approach LOS	C			A	B	
Queue Length 50th (ft)	141		86	299	28	37
Queue Length 95th (ft)	280		137	506	62	63
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200		100	
Base Capacity (vph)	917		1011	1586	334	875
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	0.40		0.53	0.69	0.16	0.35

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.69
 Intersection Signal Delay: 10.2
 Intersection Capacity Utilization 73.3%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service D

Splits and Phases: 1: Mill Road & Washington Pike



Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	52	294	1042	92	4	111	40	329	2	15	2
Future Volume (vph)	5	52	294	1042	92	4	111	40	329	2	15	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	3539	1583
Flt Permitted	0.692			0.596			0.435			0.952		
Satd. Flow (perm)	1289	1863	1583	1110	1863	1583	810	1863	1583	1773	3539	1583
Satd. Flow (RTOR)			223			101			358			151
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	57	320	1133	100	4	121	43	358	2	16	2
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	7	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	16.0	34.0	19.0	61.0	79.0	79.0	19.0	19.0	19.0	16.0	16.0	16.0
Total Split (%)	12.3%	26.2%	14.6%	46.9%	60.8%	60.8%	14.6%	14.6%	14.6%	12.3%	12.3%	12.3%
Maximum Green (s)	11.0	28.0	14.0	56.0	73.0	73.0	14.0	14.0	14.0	11.0	11.0	11.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	C-Max	None	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	35.6	28.0	46.0	102.8	99.4	99.4	17.2	15.0	15.0	9.2	6.8	6.8
Actuated g/C Ratio	0.27	0.22	0.35	0.79	0.76	0.76	0.13	0.12	0.12	0.07	0.05	0.05
v/c Ratio	0.01	0.14	0.45	0.92	0.07	0.00	0.62	0.20	0.72	0.02	0.09	0.01
Control Delay	18.6	42.5	11.5	24.9	6.1	0.0	79.8	68.7	33.7	43.0	58.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.6	42.5	11.5	24.9	6.1	0.0	79.8	68.7	33.7	43.0	58.9	0.0
LOS	B	D	B	C	A	A	E	E	C	D	E	A
Approach Delay		16.2			23.3			47.3			51.4	
Approach LOS		B			C			D			D	
Queue Length 50th (ft)	2	39	55	395	13	0	107	38	122	2	6	0
Queue Length 95th (ft)	8	78	136	#1052	59	0	168	79	181	9	19	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	335		170	160			150		75
Base Capacity (vph)	437	401	725	1227	1424	1234	222	243	517	192	299	272
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.14	0.44	0.92	0.07	0.00	0.55	0.18	0.69	0.01	0.05	0.01

Lanes, Volumes, Timings
 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road

Knoxville Center TIS
 2022 Background AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↕	↗	↙	↕			↕	↗
Traffic Volume (vph)	0	0	0	24	316	113	289	387	0	0	311	1053
Future Volume (vph)	0	0	0	24	316	113	289	387	0	0	311	1053
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1770	1863	1583	1770	3539	0	0	3539	1583
Flt Permitted				0.950			0.521					
Satd. Flow (perm)	0	0	0	1770	1863	1583	970	3539	0	0	3539	1583
Satd. Flow (RTOR)							119					534
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	25	333	119	304	407	0	0	327	1108
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Free
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					Free
Detector Phase				4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0			10.0	
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0			19.0	
Total Split (s)				29.0	29.0	29.0	23.0	101.0			78.0	
Total Split (%)				22.3%	22.3%	22.3%	17.7%	77.7%			60.0%	
Maximum Green (s)				23.0	23.0	23.0	18.0	95.0			72.0	
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5			4.5	
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5			1.5	
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	
Total Lost Time (s)				6.0	6.0	6.0	5.0	6.0			6.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			2.0	
Recall Mode				None	None	None	None	C-Max			C-Max	
Act Effect Green (s)				23.0	23.0	23.0	96.0	95.0			78.4	130.0
Actuated g/C Ratio				0.18	0.18	0.18	0.74	0.73			0.60	1.00
v/c Ratio				0.08	1.01	0.31	0.39	0.16			0.15	0.70
Control Delay				45.6	105.5	10.2	4.7	2.9			9.7	3.4
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				45.6	105.5	10.2	4.7	2.9			9.7	3.4
LOS				D	F	B	A	A			A	A
Approach Delay					78.6			3.6			4.8	
Approach LOS					E			A			A	
Queue Length 50th (ft)				18	-288	0	30	22			38	2
Queue Length 95th (ft)				44	#485	54	41	28			m50	m39
Internal Link Dist (ft)		569			2042			923			673	
Turn Bay Length (ft)						475	105					100
Base Capacity (vph)				313	329	378	827	2586			2133	1583
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				0.08	1.01	0.31	0.37	0.16			0.15	0.70

Lanes, Volumes, Timings
 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road

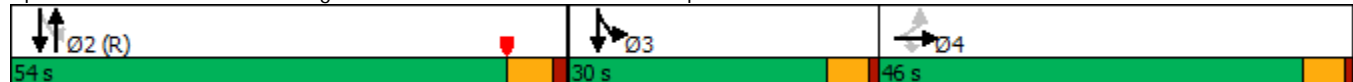
Knoxville Center TIS
 2022 Background AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	188	205	0	0	0	0	407	35	123	233	0
Future Volume (vph)	250	188	205	0	0	0	0	407	35	123	233	0
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Fr't			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	3539	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.491		
Satd. Flow (perm)	3433	3539	1583	0	0	0	0	3539	1583	915	3539	0
Satd. Flow (RTOR)			228							59		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	278	209	228	0	0	0	0	452	39	137	259	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	46.0	46.0	46.0					54.0	54.0	30.0		
Total Split (%)	35.4%	35.4%	35.4%					41.5%	41.5%	23.1%		
Maximum Green (s)	41.0	41.0	41.0					48.0	48.0	25.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	16.3	16.3	16.3					91.5	91.5	98.7	102.7	
Actuated g/C Ratio	0.13	0.13	0.13					0.70	0.70	0.76	0.79	
v/c Ratio	0.65	0.47	0.57					0.18	0.03	0.19	0.09	
Control Delay	60.8	55.6	12.1					7.2	0.9	2.6	1.7	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	60.8	55.6	12.1					7.2	0.9	2.6	1.7	
LOS	E	E	B					A	A	A	A	
Approach Delay		43.8						6.7			2.0	
Approach LOS		D						A			A	
Queue Length 50th (ft)	117	87	0					60	0	10	10	
Queue Length 95th (ft)	156	122	73					97	7	17	14	
Internal Link Dist (ft)		2101			1667			717			923	
Turn Bay Length (ft)	400		265						150	120		
Base Capacity (vph)	1082	1116	655					2490	1131	991	3307	
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	0.26	0.19	0.35					0.18	0.03	0.14	0.08	

Intersection Summary

Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 127 (98%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 22.1	Intersection LOS: C
Intersection Capacity Utilization 55.4%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road



Intersection

Int Delay, s/veh 0.8

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↑↑			↑	
Traffic Vol, veh/h	0	394	0	0	33	0
Future Vol, veh/h	0	394	0	0	33	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	469	0	0	39	0

Major/Minor Major1 Minor2

Conflicting Flow All	-	0	235	-
Stage 1	-	-	0	-
Stage 2	-	-	235	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	732	0
Stage 1	0	-	-	0
Stage 2	0	-	782	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	732	-
Mov Cap-2 Maneuver	-	-	732	-
Stage 1	-	-	-	-
Stage 2	-	-	782	-

Approach EB SB

HCM Control Delay, s	0	10.2
HCM LOS		B

Minor Lane/Major Mvmt EBT SBLn1

Capacity (veh/h)	-	732
HCM Lane V/C Ratio	-	0.054
HCM Control Delay (s)	-	10.2
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.2

Intersection												
Int Delay, s/veh	0.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗						↘				
Traffic Vol, veh/h	79	335	14	0	0	0	0	0	6	0	0	0
Future Vol, veh/h	79	335	14	0	0	0	0	0	6	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	92	390	16	0	0	0	0	0	7	0	0	0





















Major/Minor	Major1			Minor1		
Conflicting Flow All	0	0	0	-	582	203
Stage 1	-	-	-	-	582	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.14	-	-	-	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.22	-	-	-	4.02	3.32
Pot Cap-1 Maneuver	-	-	-	0	423	804
Stage 1	-	-	-	0	497	-
Stage 2	-	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	0	804
Mov Cap-2 Maneuver	-	-	-	-	0	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-

Approach	EB	NB
HCM Control Delay, s		9.5
HCM LOS		A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	804	-	-	-
HCM Lane V/C Ratio	0.009	-	-	-
HCM Control Delay (s)	9.5	-	-	-
HCM Lane LOS	A	-	-	-
HCM 95th %tile Q(veh)	0	-	-	-

Lanes, Volumes, Timings
7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

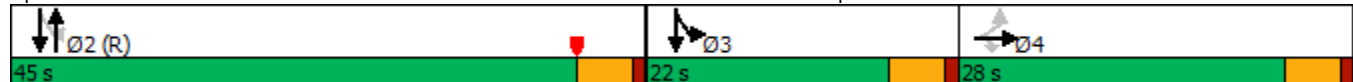
Knoxville Center TIS
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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	136	25	0	0	0	0	92	100	630	236	0
Future Volume (vph)	125	136	25	0	0	0	0	92	100	630	236	0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.996								0.950		
Satd. Flow (prot)	1681	1763	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.996								0.690		
Satd. Flow (perm)	1681	1763	1583	0	0	0	0	3539	1583	1285	3539	0
Satd. Flow (RTOR)			80							108		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)	10%											
Lane Group Flow (vph)	121	159	27	0	0	0	0	99	108	677	254	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	28.0	28.0	28.0					45.0	45.0	22.0		
Total Split (%)	29.5%	29.5%	29.5%					47.4%	47.4%	23.2%		
Maximum Green (s)	23.0	23.0	23.0					40.0	40.0	17.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	13.0	13.0	13.0					54.1	54.1	67.0	72.0	
Actuated g/C Ratio	0.14	0.14	0.14					0.57	0.57	0.71	0.76	
v/c Ratio	0.53	0.66	0.09					0.05	0.11	0.70	0.09	
Control Delay	45.7	51.6	0.6					11.2	3.1	9.5	2.4	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	45.7	51.6	0.6					11.2	3.1	9.5	2.4	
LOS	D	D	A					B	A	A	A	
Approach Delay		44.8						7.0			7.6	
Approach LOS		D						A			A	
Queue Length 50th (ft)	72	96	0					13	0	81	15	
Queue Length 95th (ft)	123	155	0					30	27	72	15	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	406	426	443					2014	947	1048	2833	
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	0.30	0.37	0.06					0.05	0.11	0.65	0.09	

Intersection Summary

Cycle Length: 95	
Actuated Cycle Length: 95	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 15.4	Intersection LOS: B
Intersection Capacity Utilization 72.1%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp



Lanes, Volumes, Timings
 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp

Knoxville Center TIS
 2022 Background AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↕			↕	↘
Traffic Volume (vph)	0	0	0	83	130	293	24	191	0	0	776	301
Future Volume (vph)	0	0	0	83	130	293	24	191	0	0	776	301
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.997		0.950					
Satd. Flow (prot)	0	0	0	1681	1764	2787	1770	3539	0	0	3539	1583
Flt Permitted				0.950	0.997		0.330					
Satd. Flow (perm)	0	0	0	1681	1764	2787	615	3539	0	0	3539	1583
Satd. Flow (RTOR)						308						317
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	0	78	146	308	25	201	0	0	817	317
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2			2	
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				30.0	30.0	30.0	65.0	65.0			65.0	65.0
Total Split (%)				31.6%	31.6%	31.6%	68.4%	68.4%			68.4%	68.4%
Maximum Green (s)				23.0	23.0	23.0	59.0	59.0			59.0	59.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)				7.0	7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)				14.6	14.6	14.6	67.4	67.4			67.4	67.4
Actuated g/C Ratio				0.15	0.15	0.15	0.71	0.71			0.71	0.71
v/c Ratio				0.30	0.54	0.45	0.06	0.08			0.33	0.26
Control Delay				37.3	43.7	6.1	1.5	1.4			3.1	0.9
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				37.3	43.7	6.1	1.5	1.4			3.1	0.9
LOS				D	D	A	A	A			A	A
Approach Delay					21.0			1.4			2.5	
Approach LOS					C			A			A	
Queue Length 50th (ft)				45	87	0	0	0			14	0
Queue Length 95th (ft)				82	138	36	m2	3			34	0
Internal Link Dist (ft)		1096			1137			650			484	
Turn Bay Length (ft)				450		800	95					
Base Capacity (vph)				406	427	908	436	2511			2511	1215
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				0.19	0.34	0.34	0.06	0.08			0.33	0.26

Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way

Knoxville Center TIS
2022 Background AM






Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	19	10	158	14	54	11	325	118	60	897	27
Future Volume (vph)	21	19	10	158	14	54	11	325	118	60	897	27
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.947				0.850			0.850			0.850
Flt Protected	0.950			0.950	0.960		0.950			0.950		
Satd. Flow (prot)	1770	1764	0	1681	1699	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950	0.960		0.280			0.950		
Satd. Flow (perm)	1770	1764	0	1681	1699	1583	522	3539	1583	1770	3539	1583
Satd. Flow (RTOR)		11				80			124			80
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	22	31	0	90	91	57	12	342	124	63	944	28
Turn Type	Split	NA		Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4		3	3	1	5	2	3	1	6	4
Permitted Phases						3	2		2			6
Detector Phase	4	4		3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0		16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	14.0	14.0		21.0	21.0	15.0	15.0	45.0	21.0	15.0	45.0	14.0
Total Split (%)	14.7%	14.7%		22.1%	22.1%	15.8%	15.8%	47.4%	22.1%	15.8%	47.4%	14.7%
Maximum Green (s)	9.0	9.0		16.0	16.0	10.0	10.0	40.0	16.0	10.0	40.0	9.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)	7.4	7.4		10.7	10.7	19.7	58.2	53.4	70.1	8.0	62.0	71.1
Actuated g/C Ratio	0.08	0.08		0.11	0.11	0.21	0.61	0.56	0.74	0.08	0.65	0.75
v/c Ratio	0.16	0.21		0.48	0.48	0.15	0.03	0.17	0.10	0.42	0.41	0.02
Control Delay	43.3	33.4		47.0	46.9	2.8	5.4	9.6	1.4	51.2	10.2	0.9
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.3	33.4		47.0	46.9	2.8	5.4	9.6	1.4	51.2	10.2	0.9
LOS	D	C		D	D	A	A	A	A	D	B	A
Approach Delay		37.5			36.4			7.3			12.5	
Approach LOS		D			D			A			B	
Queue Length 50th (ft)	13	12		54	55	0	2	37	0	41	85	0
Queue Length 95th (ft)	36	39		100	101	13	m5	79	21	m60	184	m0
Internal Link Dist (ft)		713			953			484			243	
Turn Bay Length (ft)	290			155		245	180		180	120		105
Base Capacity (vph)	167	177		283	286	426	468	1990	1254	189	2311	1175
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.18		0.32	0.32	0.13	0.03	0.17	0.10	0.33	0.41	0.02

Intersection Summary

Cycle Length: 95
 Actuated Cycle Length: 95
 Offset: 89 (94%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.48
 Intersection Signal Delay: 15.0 Intersection LOS: B
 Intersection Capacity Utilization 53.7% ICU Level of Service A
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Millertown Pike & Kinzel Way

 Ø1	 Ø2 (R)	 Ø3	 Ø4
15 s	45 s	21 s	14 s
 Ø5	 Ø6 (R)		
15 s	45 s		

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	2	5	407	994	8
Future Vol, veh/h	0	2	5	407	994	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	2	5	447	1092	9

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1331	1097	1101	0	-	0
Stage 1	1097	-	-	-	-	-
Stage 2	234	-	-	-	-	-
Critical Hdwy	6.63	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	158	258	632	-	-	-
Stage 1	319	-	-	-	-	-
Stage 2	783	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	156	258	632	-	-	-
Mov Cap-2 Maneuver	156	-	-	-	-	-
Stage 1	315	-	-	-	-	-
Stage 2	783	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	19.1	0.2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	632	-	-	258	-	-
HCM Lane V/C Ratio	0.009	-	-	0.009	-	-
HCM Control Delay (s)	10.7	0.1	0	19.1	-	-
HCM Lane LOS	B	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	-	0	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road

Knoxville Center TIS
2022 Background AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	2	30	86	12	77	20	306	44	123	886	2
Future Volume (vph)	6	2	30	86	12	77	20	306	44	123	886	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.859			0.871			0.981				
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1600	0	1770	1622	0	1770	1827	0	1770	1863	0
Flt Permitted	0.696			0.421			0.128			0.441		
Satd. Flow (perm)	1296	1600	0	784	1622	0	238	1827	0	821	1863	0
Satd. Flow (RTOR)		32			81			9				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	6	34	0	91	94	0	21	368	0	129	935	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	15.0	16.0		15.0	16.0		15.0	24.0		14.0	24.0	
Total Split (s)	22.0	16.0		22.0	16.0		14.0	43.0		14.0	43.0	
Total Split (%)	23.2%	16.8%		23.2%	16.8%		14.7%	45.3%		14.7%	45.3%	
Maximum Green (s)	17.0	11.0		17.0	11.0		9.0	38.0		9.0	38.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effect Green (s)	10.8	7.3		17.7	15.4		63.5	57.3		68.6	66.0	
Actuated g/C Ratio	0.11	0.08		0.19	0.16		0.67	0.60		0.72	0.69	
v/c Ratio	0.03	0.22		0.37	0.28		0.08	0.33		0.19	0.72	
Control Delay	26.7	19.1		34.2	12.2		4.3	6.5		6.7	20.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	26.7	19.1		34.2	12.2		4.3	6.5		6.7	20.0	
LOS	C	B		C	B		A	A		A	C	
Approach Delay		20.2			23.0			6.4			18.4	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)	3	1		45	6		2	49		25	337	
Queue Length 95th (ft)	12	30		80	50		5	70		54	#845	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)				175						65		
Base Capacity (vph)	375	213		353	353		311	1105		685	1294	
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	0.02	0.16		0.26	0.27		0.07	0.33		0.19	0.72	

Lanes, Volumes, Timings
12: Millertown Pike & Mill Road

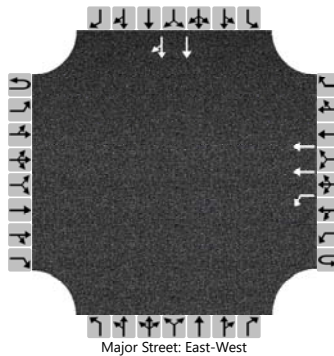
Knoxville Center TIS
2022 Background AM

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	42	551	258	119	472	95
Future Volume (vph)	42	551	258	119	472	95
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.977	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1820	0
Flt Permitted	0.950		0.151			
Satd. Flow (perm)	1770	1583	281	1863	1820	0
Satd. Flow (RTOR)		183			11	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)						
Lane Group Flow (vph)	45	592	277	128	610	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	25.5	35.5	35.5	46.0	46.0	
Total Split (%)	23.8%	33.2%	33.2%	43.0%	43.0%	
Maximum Green (s)	20.0	30.0	30.0	40.0	40.0	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	9.4	31.6	60.5	63.7	29.3	
Actuated g/C Ratio	0.13	0.43	0.82	0.86	0.40	
v/c Ratio	0.20	0.76	0.38	0.08	0.84	
Control Delay	39.8	19.4	7.0	2.3	33.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	39.8	19.4	7.0	2.3	33.2	
LOS	D	B	A	A	C	
Approach Delay	20.9			5.5	33.2	
Approach LOS	C			A	C	
Queue Length 50th (ft)	21	160	30	13	262	
Queue Length 95th (ft)	60	328	104	27	#509	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85	330			
Base Capacity (vph)	535	952	906	1682	1105	
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	0.08	0.62	0.31	0.08	0.55	

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	BJH	Intersection	N Mall Rd at East Towne W
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	City of Knoxville
Date Performed	10/22/2020	East/West Street	North Mall Road
Analysis Year	2022	North/South Street	East Towne Road (West)
Time Analyzed	AM Peak	Peak Hour Factor	0.84
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Background 2022 AM		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	0	0	0	1	2	0		0	0	0		0	2	0
Configuration						L	T								T	TR
Volume (veh/h)						8	402								32	0
Percent Heavy Vehicles (%)						2									2	2
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						5.3									6.5	6.9
Critical Headway (sec)						0.00									6.54	6.94
Base Follow-Up Headway (sec)						3.1									4.0	3.3
Follow-Up Headway (sec)						3.12									4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						10									19	19
Capacity, c (veh/h)						1154									469	469
v/c Ratio						0.01									0.04	0.04
95% Queue Length, Q ₉₅ (veh)						0.0									0.1	0.1
Control Delay (s/veh)						8.1									13.0	13.0
Level of Service (LOS)						A									B	B
Approach Delay (s/veh)						0.2									13.0	
Approach LOS															B	

Intersection	
Intersection Delay, s/veh	10.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑↑				
Traffic Vol, veh/h	0	0	0	0	397	11	2	75	0	0	0	0
Future Vol, veh/h	0	0	0	0	397	11	2	75	0	0	0	0
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	551	15	3	104	0	0	0	0
Number of Lanes	0	0	0	0	2	0	0	2	0	0	0	0

Approach	WB	NB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NB	
Conflicting Lanes Left	2	0
Conflicting Approach Right		WB
Conflicting Lanes Right	0	2
HCM Control Delay	11.1	9.2
HCM LOS	B	A

Lane	NBLn1	NBLn2	WBLn1	WBLn2
Vol Left, %	7%	0%	0%	0%
Vol Thru, %	93%	100%	100%	92%
Vol Right, %	0%	0%	0%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	27	50	265	143
LT Vol	2	0	0	0
Through Vol	25	50	265	132
RT Vol	0	0	0	11
Lane Flow Rate	38	69	368	199
Geometry Grp	7	7	7	7
Degree of Util (X)	0.061	0.113	0.495	0.265
Departure Headway (Hd)	5.87	5.833	4.843	4.789
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	611	615	746	751
Service Time	3.601	3.564	2.565	2.511
HCM Lane V/C Ratio	0.062	0.112	0.493	0.265
HCM Control Delay	9	9.3	12.2	9.2
HCM Lane LOS	A	A	B	A
HCM 95th-tile Q	0.2	0.4	2.8	1.1

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑			↑
Traffic Vol, veh/h	0	0	416	8	0	6
Future Vol, veh/h	0	0	416	8	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	501	10	0	7

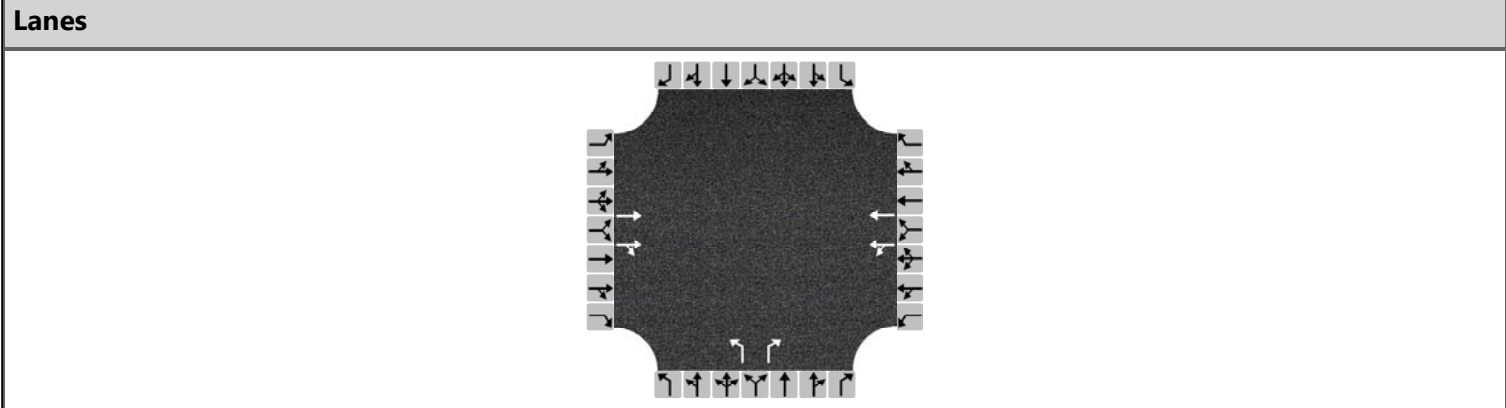
Major/Minor	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	0
Stage 1	-	0
Stage 2	-	0
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	9.9
HCM LOS		A

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	743
HCM Lane V/C Ratio	-	-	0.01
HCM Control Delay (s)	-	-	9.9
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	BJH	Intersection	Knoxville Ctr at E Towne
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	City of Knoxville
Date Performed	10/22/2020	East/West Street	Knoxville Center Drive
Analysis Year	2022	North/South Street	East Towne Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.87
Time Analyzed	AM Peak		
Project Description	Background 2022 AM		



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume		12	48	18	8		15		71			
% Thrus in Shared Lane			50	50								
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	T	TR		LT	T		L	R				
Flow Rate, v (veh/h)	7	62		25	5		17	82				
Percent Heavy Vehicles	2	2		2	2		2	2				

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20				
Initial Degree of Utilization, x	0.006	0.055		0.022	0.004		0.015	0.073				
Final Departure Headway, hd (s)	4.78	4.16		5.21	4.80		5.25	4.05				
Final Degree of Utilization, x	0.009	0.072		0.037	0.006		0.025	0.092				
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3				
Service Time, ts (s)	2.48	1.86		2.91	2.50		2.95	1.75				

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	7	62		25	5		17	82				
Capacity	753	866		691	750		686	889				
95% Queue Length, Q ₉₅ (veh)	0.0	0.2		0.1	0.0		0.1	0.3				
Control Delay (s/veh)	7.5	7.2		8.1	7.5		8.1	7.2				
Level of Service, LOS	A	A		A	A		A	A				
Approach Delay (s/veh)	7.2			8.0			7.3					
Approach LOS	A			A			A					
Intersection Delay, s/veh LOS	7.4						A					

Intersection	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	↑
Traffic Vol, veh/h	75	2	5	24	11	0
Future Vol, veh/h	75	2	5	24	11	0
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	101	3	7	32	15	0
Number of Lanes	2	0	0	2	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	7.6	7.6	8.2
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	38%	0%
Vol Thru, %	0%	100%	100%	93%	62%	100%
Vol Right, %	0%	0%	0%	7%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	11	0	50	27	13	16
LT Vol	11	0	0	0	5	0
Through Vol	0	0	50	25	8	16
RT Vol	0	0	0	2	0	0
Lane Flow Rate	15	0	68	36	18	22
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.022	0	0.086	0.046	0.023	0.028
Departure Headway (Hd)	5.374	4.874	4.579	4.527	4.803	4.61
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	670	0	782	791	743	774
Service Time	3.074	2.574	2.306	2.254	2.544	2.352
HCM Lane V/C Ratio	0.022	0	0.087	0.046	0.024	0.028
HCM Control Delay	8.2	7.6	7.7	7.5	7.7	7.5
HCM Lane LOS	A	N	A	A	A	A
HCM 95th-tile Q	0.1	0	0.3	0.1	0.1	0.1

Intersection	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	60	8	6	68	5	5
Future Vol, veh/h	60	8	6	68	5	5
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	70	9	7	79	6	6
Number of Lanes	1	1	2	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	8.3	7.2	7.8
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	100%	0%	75%	0%
Vol Thru, %	100%	3%	0%	0%	25%	100%
Vol Right, %	0%	97%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	4	70	60	8	7	3
LT Vol	0	0	60	0	5	0
Through Vol	4	2	0	0	2	3
RT Vol	0	68	0	8	0	0
Lane Flow Rate	5	81	70	9	8	4
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.006	0.09	0.101	0.01	0.011	0.005
Departure Headway (Hd)	4.677	3.996	5.197	3.997	5.091	4.715
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	756	884	687	890	694	748
Service Time	2.461	1.78	2.946	1.745	2.886	2.51
HCM Lane V/C Ratio	0.007	0.092	0.102	0.01	0.012	0.005
HCM Control Delay	7.5	7.2	8.5	6.8	7.9	7.5
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0	0.3	0.3	0	0	0

Intersection						
Int Delay, s/veh	7.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	0	74	12	4	4	2
Future Vol, veh/h	0	74	12	4	4	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	86	14	5	5	2

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	37	4	7	0	-	0
Stage 1	6	-	-	-	-	-
Stage 2	31	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	971	1078	1612	-	-	-
Stage 1	1016	-	-	-	-	-
Stage 2	987	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	962	1078	1612	-	-	-
Mov Cap-2 Maneuver	962	-	-	-	-	-
Stage 1	1007	-	-	-	-	-
Stage 2	987	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.6	5.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1612	-	1078	-	-
HCM Lane V/C Ratio	0.009	-	0.08	-	-
HCM Control Delay (s)	7.3	0	8.6	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

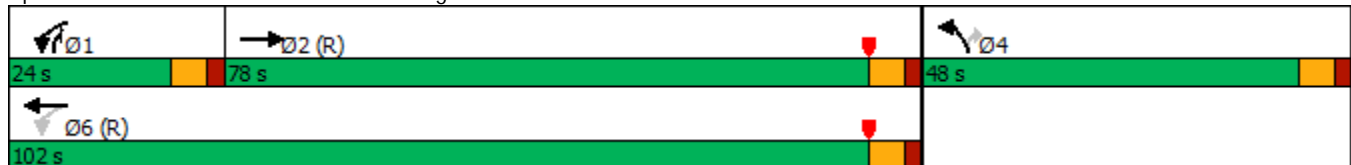
Lanes, Volumes, Timings
1: Mill Road & Washington Pike

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↖	↗	↖	↗
Traffic Volume (vph)	909	114	318	472	86	635
Future Volume (vph)	909	114	318	472	86	635
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.985					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1835	0	1770	1863	1770	1583
Flt Permitted			0.051		0.950	
Satd. Flow (perm)	1835	0	95	1863	1770	1583
Satd. Flow (RTOR)	6					76
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1077	0	335	497	91	668
Turn Type	NA		pm+pt	NA	Prot	pm+ov
Protected Phases	2		1	6	4	1
Permitted Phases			6			4
Detector Phase	2		1	6	4	1
Switch Phase						
Minimum Initial (s)	12.0		10.0	12.0	10.0	10.0
Minimum Split (s)	19.0		17.0	19.0	17.0	17.0
Total Split (s)	78.0		24.0	102.0	48.0	24.0
Total Split (%)	52.0%		16.0%	68.0%	32.0%	16.0%
Maximum Green (s)	72.0		18.0	96.0	42.0	18.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
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)	6.0		6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	C-Max		None	C-Max	None	None
Act Effect Green (s)	72.0		124.5	124.5	13.5	66.0
Actuated g/C Ratio	0.48		0.83	0.83	0.09	0.44
v/c Ratio	1.22		0.56	0.32	0.57	0.90
Control Delay	143.7		36.5	3.8	79.1	51.6
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	143.7		36.5	3.8	79.1	51.6
LOS	F		D	A	E	D
Approach Delay	143.7			17.0	54.9	
Approach LOS	F			B	D	
Queue Length 50th (ft)	~1290		215	90	87	550
Queue Length 95th (ft)	#1558		341	152	144	#806
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200		100	
Base Capacity (vph)	883		597	1546	495	739
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	1.22		0.56	0.32	0.18	0.90

Intersection Summary

Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow	
Natural Cycle: 140	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.22	
Intersection Signal Delay: 78.9	Intersection LOS: E
Intersection Capacity Utilization 104.1%	ICU Level of Service G
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: Mill Road & Washington Pike



Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

Knoxville Center TIS
2022 Background PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↖	↖	↗	↖	↖	↗	↖	↖	↗↗	↖
Traffic Volume (vph)	50	99	302	475	61	11	283	298	880	60	305	52
Future Volume (vph)	50	99	302	475	61	11	283	298	880	60	305	52
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	3539	1583
Flt Permitted	0.713			0.593			0.354			0.554		
Satd. Flow (perm)	1328	1863	1583	1105	1863	1583	659	1863	1583	1032	3539	1583
Satd. Flow (RTOR)			144			155			780			209
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	56	110	336	528	68	12	314	331	978	67	339	58
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	7	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	16.0	34.0	28.0	28.0	46.0	46.0	28.0	41.0	41.0	17.0	30.0	30.0
Total Split (%)	13.3%	28.3%	23.3%	23.3%	38.3%	38.3%	23.3%	34.2%	34.2%	14.2%	25.0%	25.0%
Maximum Green (s)	11.0	28.0	23.0	23.0	40.0	40.0	23.0	36.0	36.0	12.0	25.0	25.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	C-Max	None	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	42.4	32.9	58.3	61.9	49.7	49.7	48.1	37.9	37.9	31.1	23.7	23.7
Actuated g/C Ratio	0.35	0.27	0.49	0.52	0.41	0.41	0.40	0.32	0.32	0.26	0.20	0.20
v/c Ratio	0.11	0.22	0.40	0.76	0.09	0.02	0.71	0.56	0.95	0.21	0.48	0.12
Control Delay	19.0	37.9	13.1	30.6	26.3	0.0	30.0	32.2	24.1	23.4	44.6	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0
Total Delay	19.0	37.9	13.1	30.6	26.3	0.0	30.0	32.2	28.3	23.4	44.6	0.5
LOS	B	D	B	C	C	A	C	C	C	C	D	A
Approach Delay		19.2			29.5			29.4			36.0	
Approach LOS		B			C			C			D	
Queue Length 50th (ft)	23	70	96	298	35	0	126	137	294	30	116	0
Queue Length 95th (ft)	47	122	161	#430	70	0	220	263	#545	58	170	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	335		170	160			150		75
Base Capacity (vph)	537	510	886	702	770	745	477	598	1037	380	778	511
Starvation Cap Reductn	0	0	0	0	0	0	0	0	36	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.22	0.38	0.75	0.09	0.02	0.66	0.55	0.98	0.18	0.44	0.11

Lanes, Volumes, Timings
 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road

Knoxville Center TIS
 2022 Background PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↕	↗	↙	↕			↕	↗
Traffic Volume (vph)	0	0	0	104	343	302	241	1178	0	0	568	493
Future Volume (vph)	0	0	0	104	343	302	241	1178	0	0	568	493
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1770	1863	1583	1770	3539	0	0	3539	1583
Flt Permitted				0.950			0.347					
Satd. Flow (perm)	0	0	0	1770	1863	1583	646	3539	0	0	3539	1583
Satd. Flow (RTOR)							74					247
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	113	373	328	262	1280	0	0	617	536
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Free
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					Free
Detector Phase				4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0			10.0	
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0			19.0	
Total Split (s)				38.0	38.0	38.0	24.0	82.0			58.0	
Total Split (%)				31.7%	31.7%	31.7%	20.0%	68.3%			48.3%	
Maximum Green (s)				32.0	32.0	32.0	19.0	76.0			52.0	
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5			4.5	
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5			1.5	
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	
Total Lost Time (s)				6.0	6.0	6.0	5.0	6.0			6.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			2.0	
Recall Mode				None	None	None	None	C-Max			C-Max	
Act Effect Green (s)				28.4	28.4	28.4	80.6	79.6			62.9	120.0
Actuated g/C Ratio				0.24	0.24	0.24	0.67	0.66			0.52	1.00
v/c Ratio				0.27	0.85	0.76	0.48	0.55			0.33	0.34
Control Delay				37.9	61.3	44.3	5.4	3.4			19.9	0.5
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				37.9	61.3	44.3	5.4	3.4			19.9	0.5
LOS				D	E	D	A	A			B	A
Approach Delay					51.2			3.7			10.9	
Approach LOS					D			A			B	
Queue Length 50th (ft)				70	270	181	17	46			134	2
Queue Length 95th (ft)				120	381	286	m27	58			183	0
Internal Link Dist (ft)		569			2042			923			673	
Turn Bay Length (ft)						475	105					100
Base Capacity (vph)				472	496	476	611	2346			1855	1583
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				0.24	0.75	0.69	0.43	0.55			0.33	0.34

Lanes, Volumes, Timings
 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road

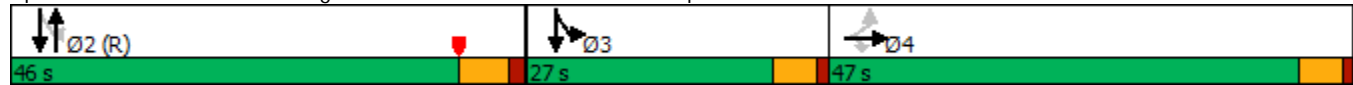
Knoxville Center TIS
 2022 Background PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	862	532	358	0	0	0	0	549	55	327	344	0
Future Volume (vph)	862	532	358	0	0	0	0	549	55	327	344	0
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	3539	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.372		
Satd. Flow (perm)	3433	3539	1583	0	0	0	0	3539	1583	693	3539	0
Satd. Flow (RTOR)			365							64		
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)	880	543	365	0	0	0	0	560	56	334	351	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	47.0	47.0	47.0					46.0	46.0	27.0		
Total Split (%)	39.2%	39.2%	39.2%					38.3%	38.3%	22.5%		
Maximum Green (s)	42.0	42.0	42.0					40.0	40.0	22.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	40.2	40.2	40.2					49.5	49.5	64.8	68.8	
Actuated g/C Ratio	0.34	0.34	0.34					0.41	0.41	0.54	0.57	
v/c Ratio	0.77	0.46	0.47					0.38	0.08	0.66	0.17	
Control Delay	40.4	32.3	4.9					27.6	6.0	23.6	5.8	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	40.4	32.3	4.9					27.6	6.0	23.6	5.8	
LOS	D	C	A					C	A	C	A	
Approach Delay		30.7						25.6			14.5	
Approach LOS		C						C			B	
Queue Length 50th (ft)	302	166	0					163	0	110	24	
Queue Length 95th (ft)	380	220	64					234	25	168	14	
Internal Link Dist (ft)		2101			1667			717			923	
Turn Bay Length (ft)	400		265						150	120		
Base Capacity (vph)	1226	1264	800					1459	690	616	2255	
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	0.72	0.43	0.46					0.38	0.08	0.54	0.16	

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 10 (8%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.77
 Intersection Signal Delay: 26.1
 Intersection LOS: C
 Intersection Capacity Utilization 69.6%
 ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road



Intersection

Int Delay, s/veh 0.7

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	986	0	0	54	0
Future Vol, veh/h	0	986	0	0	54	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1060	0	0	58	0

Major/Minor Major1 Minor2

Conflicting Flow All	-	0	530	-
Stage 1	-	-	0	-
Stage 2	-	-	530	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	479	0
Stage 1	0	-	-	0
Stage 2	0	-	555	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	479	-
Mov Cap-2 Maneuver	-	-	479	-
Stage 1	-	-	-	-
Stage 2	-	-	555	-

Approach EB SB

HCM Control Delay, s	0	13.6
HCM LOS		B

Minor Lane/Major Mvmt EBT SBLn1

Capacity (veh/h)	-	479
HCM Lane V/C Ratio	-	0.121
HCM Control Delay (s)	-	13.6
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.4

Intersection												
Int Delay, s/veh	0.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↕						↗				
Traffic Vol, veh/h	243	780	25	0	0	0	0	5	29	0	0	0
Future Vol, veh/h	243	780	25	0	0	0	0	5	29	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	273	876	28	0	0	0	0	6	33	0	0	0

Major/Minor	Major1			Minor1		
Conflicting Flow All	0	0	0	-	1436	452
Stage 1	-	-	-	-	1436	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.14	-	-	-	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.22	-	-	-	4.02	3.32
Pot Cap-1 Maneuver	-	-	-	0	132	555
Stage 1	-	-	-	0	197	-
Stage 2	-	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	0	555
Mov Cap-2 Maneuver	-	-	-	-	0	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-

Approach	EB	NB
HCM Control Delay, s		12
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	555	-	-	-
HCM Lane V/C Ratio	0.069	-	-	-
HCM Control Delay (s)	12	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.2	-	-	-

Lanes, Volumes, Timings
 7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

Knoxville Center TIS
 2022 Background PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	464	269	54	0	0	0	0	298	127	431	435	0
Future Volume (vph)	464	269	54	0	0	0	0	298	127	431	435	0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.986								0.950		
Satd. Flow (prot)	1681	1745	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.986								0.557		
Satd. Flow (perm)	1681	1745	1583	0	0	0	0	3539	1583	1038	3539	0
Satd. Flow (RTOR)			64							131		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)	22%											
Lane Group Flow (vph)	373	382	56	0	0	0	0	307	131	444	448	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	38.0	38.0	38.0					50.0	50.0	32.0		
Total Split (%)	31.7%	31.7%	31.7%					41.7%	41.7%	26.7%		
Maximum Green (s)	33.0	33.0	33.0					45.0	45.0	27.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	31.5	31.5	31.5					60.6	60.6	73.5	78.5	
Actuated g/C Ratio	0.26	0.26	0.26					0.50	0.50	0.61	0.65	
v/c Ratio	0.85	0.84	0.12					0.17	0.15	0.62	0.19	
Control Delay	56.9	55.2	7.1					18.7	4.4	17.9	6.8	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	56.9	55.2	7.1					18.7	4.4	17.9	6.8	
LOS	E	E	A					B	A	B	A	
Approach Delay		52.6						14.4			12.3	
Approach LOS		D						B			B	
Queue Length 50th (ft)	304	311	6					63	0	71	36	
Queue Length 95th (ft)	m406	m410	m34					120	40	m269	m120	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	485	503	502					1787	864	922	2731	
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	0.77	0.76	0.11					0.17	0.15	0.48	0.16	

Lanes, Volumes, Timings
 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp

Knoxville Center TIS
 2022 Background PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↑			↑	↗
Traffic Volume (vph)	0	0	0	154	367	594	77	669	0	0	707	314
Future Volume (vph)	0	0	0	154	367	594	77	669	0	0	707	314
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.998		0.950					
Satd. Flow (prot)	0	0	0	1681	1766	2787	1770	3539	0	0	3539	1583
Flt Permitted				0.950	0.998		0.352					
Satd. Flow (perm)	0	0	0	1681	1766	2787	656	3539	0	0	3539	1583
Satd. Flow (RTOR)						461						186
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	0	140	387	600	78	676	0	0	714	317
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2			2	
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				40.0	40.0	40.0	80.0	80.0			80.0	80.0
Total Split (%)				33.3%	33.3%	33.3%	66.7%	66.7%			66.7%	66.7%
Maximum Green (s)				33.0	33.0	33.0	74.0	74.0			74.0	74.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)				7.0	7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)				31.0	31.0	31.0	76.0	76.0			76.0	76.0
Actuated g/C Ratio				0.26	0.26	0.26	0.63	0.63			0.63	0.63
v/c Ratio				0.32	0.85	0.57	0.19	0.30			0.32	0.30
Control Delay				37.7	60.1	10.7	5.3	6.5			14.5	9.2
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				37.7	60.1	10.7	5.3	6.5			14.5	9.2
LOS				D	E	B	A	A			B	A
Approach Delay					31.0			6.4			12.9	
Approach LOS					C			A			B	
Queue Length 50th (ft)				90	293	46	32	181			123	67
Queue Length 95th (ft)				151	#449	106	m7	30			150	95
Internal Link Dist (ft)		1096			1137			650			484	
Turn Bay Length (ft)				450		800	95					
Base Capacity (vph)				462	485	1100	415	2242			2242	1071
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				0.30	0.80	0.55	0.19	0.30			0.32	0.30

Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way

Knoxville Center TIS
2022 Background PM









Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	163	52	68	336	43	144	55	798	397	101	587	81
Future Volume (vph)	163	52	68	336	43	144	55	798	397	101	587	81
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.915				0.850			0.850			0.850
Flt Protected	0.950			0.950	0.963		0.950			0.950		
Satd. Flow (prot)	1770	1704	0	1681	1704	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950	0.963		0.396			0.950		
Satd. Flow (perm)	1770	1704	0	1681	1704	1583	738	3539	1583	1770	3539	1583
Satd. Flow (RTOR)		47				137			409			84
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)				44%								
Lane Group Flow (vph)	168	124	0	194	196	148	57	823	409	104	605	84
Turn Type	Split	NA		Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4		3	3	1	5	2	3	1	6	4
Permitted Phases						3	2		2			6
Detector Phase	4	4		3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0		16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	25.0	25.0		26.0	26.0	16.0	17.0	53.0	26.0	16.0	52.0	25.0
Total Split (%)	20.8%	20.8%		21.7%	21.7%	13.3%	14.2%	44.2%	21.7%	13.3%	43.3%	20.8%
Maximum Green (s)	20.0	20.0		21.0	21.0	11.0	12.0	48.0	21.0	11.0	47.0	20.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)	16.3	16.3		18.6	18.6	28.7	61.8	55.1	78.7	10.0	60.6	77.9
Actuated g/C Ratio	0.14	0.14		0.16	0.16	0.24	0.52	0.46	0.66	0.08	0.50	0.65
v/c Ratio	0.70	0.46		0.74	0.74	0.31	0.13	0.51	0.35	0.70	0.34	0.08
Control Delay	64.9	34.1		65.6	65.2	5.5	9.8	18.9	2.4	75.8	18.2	1.6
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Total Delay	64.9	34.1		65.6	65.2	5.5	9.8	18.9	2.6	75.8	18.2	1.6
LOS	E	C		E	E	A	A	B	A	E	B	A
Approach Delay		51.8			48.9			13.3			24.0	
Approach LOS		D			D			B			C	
Queue Length 50th (ft)	126	55		149	150	4	13	263	0	81	121	0
Queue Length 95th (ft)	196	113		235	237	37	m31	306	37	#153	193	20
Internal Link Dist (ft)		713			953			484			243	
Turn Bay Length (ft)	290			155		245	180		180	120		105
Base Capacity (vph)	295	323		294	298	495	515	1623	1201	164	1787	1079
Starvation Cap Reductn	0	0		0	0	0	0	0	244	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.57	0.38		0.66	0.66	0.30	0.11	0.51	0.43	0.63	0.34	0.08

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 103 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.74
 Intersection Signal Delay: 26.7
 Intersection LOS: C
 Intersection Capacity Utilization 57.3%
 ICU Level of Service B
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Millertown Pike & Kinzel Way

 Ø1 16 s	 Ø2 (R) 53 s	 Ø3 26 s	 Ø4 25 s
 Ø5 17 s	 Ø6 (R) 52 s		

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	37	44	11	1131	759	36
Future Vol, veh/h	37	44	11	1131	759	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	45	11	1166	782	37

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1406	801	819	0	-	0
Stage 1	801	-	-	-	-	-
Stage 2	605	-	-	-	-	-
Critical Hdwy	6.63	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	141	384	807	-	-	-
Stage 1	441	-	-	-	-	-
Stage 2	509	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	136	384	807	-	-	-
Mov Cap-2 Maneuver	136	-	-	-	-	-
Stage 1	424	-	-	-	-	-
Stage 2	509	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	27.4	0.3	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	807	-	136	384	-	-
HCM Lane V/C Ratio	0.014	-	0.28	0.118	-	-
HCM Control Delay (s)	9.5	0.2	41.5	15.6	-	-
HCM Lane LOS	A	A	E	C	-	-
HCM 95th %tile Q(veh)	0	-	1.1	0.4	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road

Knoxville Center TIS
2022 Background PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	82	38	89	143	44	181	94	944	75	76	560	15
Future Volume (vph)	82	38	89	143	44	181	94	944	75	76	560	15
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.895			0.879			0.989				0.996
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1667	0	1770	1637	0	1770	1842	0	1770	1855	0
Flt Permitted	0.345			0.331			0.300			0.060		
Satd. Flow (perm)	643	1667	0	617	1637	0	559	1842	0	112	1855	0
Satd. Flow (RTOR)		79			138			5			2	
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)	84	130	0	146	230	0	96	1040	0	78	586	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	15.0	16.0		15.0	16.0		15.0	24.0		14.0	24.0	
Total Split (s)	24.0	18.0		24.0	18.0		14.0	64.0		14.0	64.0	
Total Split (%)	20.0%	15.0%		20.0%	15.0%		11.7%	53.3%		11.7%	53.3%	
Maximum Green (s)	19.0	13.0		19.0	13.0		9.0	59.0		9.0	59.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effect Green (s)	20.4	10.5		28.3	16.6		77.6	71.2		75.1	68.2	
Actuated g/C Ratio	0.17	0.09		0.24	0.14		0.65	0.59		0.63	0.57	
v/c Ratio	0.42	0.60		0.53	0.67		0.22	0.95		0.47	0.56	
Control Delay	40.9	33.8		43.2	30.1		3.9	32.4		22.8	20.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	40.9	33.8		43.2	30.1		3.9	32.4		22.8	20.4	
LOS	D	C		D	C		A	C		C	C	
Approach Delay		36.6			35.2			30.0			20.6	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)	52	38		94	68		8	305		19	273	
Queue Length 95th (ft)	88	100		141	152		25	#1225		63	452	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)				175						65		
Base Capacity (vph)	328	255		332	350		456	1094		196	1055	
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	0.26	0.51		0.44	0.66		0.21	0.95		0.40	0.56	

Lanes, Volumes, Timings
12: Millertown Pike & Mill Road

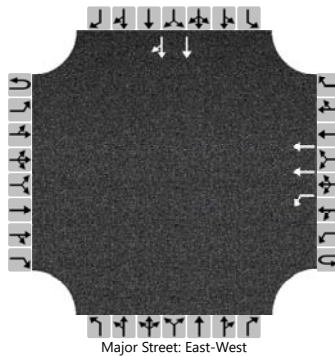


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	82	379	686	581	299	76
Future Volume (vph)	82	379	686	581	299	76
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.973	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1812	0
Flt Permitted	0.950		0.260			
Satd. Flow (perm)	1770	1583	484	1863	1812	0
Satd. Flow (RTOR)		372			14	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Shared Lane Traffic (%)						
Lane Group Flow (vph)	85	395	715	605	390	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	25.5	35.5	35.5	46.0	46.0	
Total Split (%)	23.8%	33.2%	33.2%	43.0%	43.0%	
Maximum Green (s)	20.0	30.0	30.0	40.0	40.0	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	10.0	41.8	59.3	60.5	23.0	
Actuated g/C Ratio	0.13	0.54	0.77	0.79	0.30	
v/c Ratio	0.37	0.38	0.82	0.41	0.71	
Control Delay	39.2	2.8	21.4	5.0	31.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	39.2	2.8	21.4	5.0	31.7	
LOS	D	A	C	A	C	
Approach Delay	9.3			13.9	31.7	
Approach LOS	A			B	C	
Queue Length 50th (ft)	39	5	194	92	166	
Queue Length 95th (ft)	92	50	#502	174	277	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85	330			
Base Capacity (vph)	479	1049	896	1734	988	
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	0.18	0.38	0.80	0.35	0.39	

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	BJH			Intersection	N Mall Rd at East Towne W		
Agency/Co.	Cannon & Cannon, Inc.			Jurisdiction	City of Knoxville		
Date Performed	10/22/2020			East/West Street	North Mall Road		
Analysis Year	2022			North/South Street	East Towne Road (West)		
Time Analyzed	PM Peak			Peak Hour Factor	0.93		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Background 2022 PM						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	0	0	0	1	2	0		0	0	0		0	2	0
Configuration						L	T								T	TR
Volume (veh/h)						21	663								18	0
Percent Heavy Vehicles (%)						2									2	2
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						5.3									6.5	6.9
Critical Headway (sec)						0.00									6.54	6.94
Base Follow-Up Headway (sec)						3.1									4.0	3.3
Follow-Up Headway (sec)						3.12									4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						23									10	10
Capacity, c (veh/h)						1154									328	328
v/c Ratio						0.02									0.03	0.03
95% Queue Length, Q ₉₅ (veh)						0.1									0.1	0.1
Control Delay (s/veh)						8.2									16.3	16.3
Level of Service (LOS)						A									C	C
Approach Delay (s/veh)					0.3								16.3			
Approach LOS													C			

Intersection	
Intersection Delay, s/veh	14.7
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑↑				
Traffic Vol, veh/h	0	0	0	0	663	23	1	241	0	0	0	0
Future Vol, veh/h	0	0	0	0	663	23	1	241	0	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	698	24	1	254	0	0	0	0
Number of Lanes	0	0	0	0	2	0	0	2	0	0	0	0

Approach	WB	NB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NB	
Conflicting Lanes Left	2	0
Conflicting Approach Right		WB
Conflicting Lanes Right	0	2
HCM Control Delay	16	11.1
HCM LOS	C	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2
Vol Left, %	1%	0%	0%	0%
Vol Thru, %	99%	100%	100%	91%
Vol Right, %	0%	0%	0%	9%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	81	161	442	244
LT Vol	1	0	0	0
Through Vol	80	161	442	221
RT Vol	0	0	0	23
Lane Flow Rate	86	169	465	257
Geometry Grp	7	7	7	7
Degree of Util (X)	0.148	0.292	0.682	0.372
Departure Headway (Hd)	6.212	6.205	5.276	5.209
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	573	575	679	686
Service Time	4.002	3.996	3.041	2.975
HCM Lane V/C Ratio	0.15	0.294	0.685	0.375
HCM Control Delay	10.1	11.6	18.7	11.1
HCM Lane LOS	B	B	C	B
HCM 95th-tile Q	0.5	1.2	5.4	1.7

Intersection

Int Delay, s/veh 0.4

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations			↑↑			↑
Traffic Vol, veh/h	0	0	695	35	0	27
Future Vol, veh/h	0	0	695	35	0	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	724	36	0	28

Major/Minor Major2 Minor2

Conflicting Flow All	-	0	-	380
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	618
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	618
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach WB SB

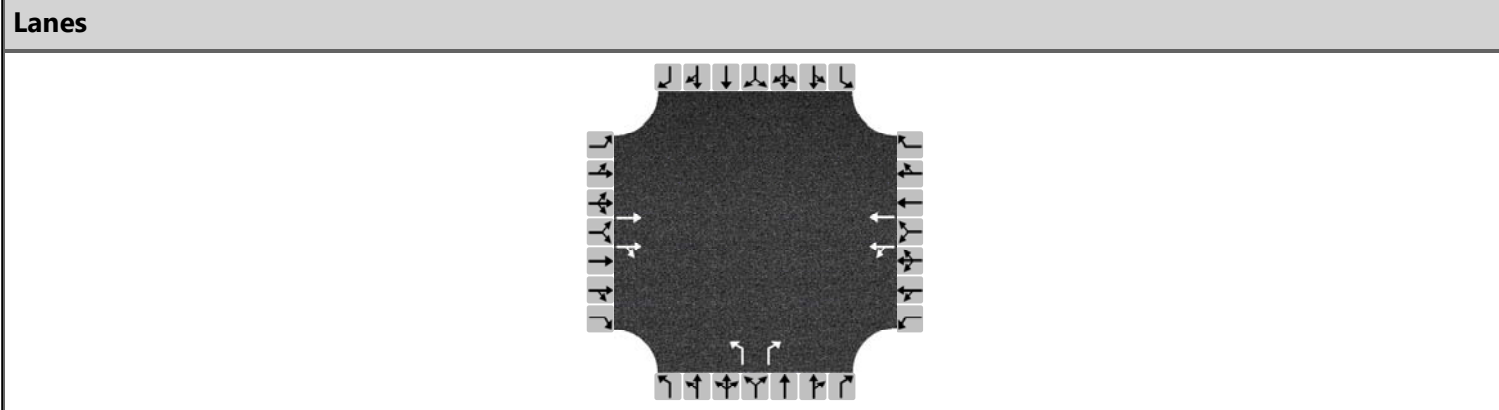
HCM Control Delay, s	0	11.1
HCM LOS		B

Minor Lane/Major Mvmt WBT WBR SBLn1

Capacity (veh/h)	-	-	618
HCM Lane V/C Ratio	-	-	0.046
HCM Control Delay (s)	-	-	11.1
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.1

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	BJH	Intersection	Knoxville Ctr at E Towne
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	City of Knoxville
Date Performed	10/22/2020	East/West Street	Knoxville Center Drive
Analysis Year	2022	North/South Street	East Towne Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.91
Time Analyzed	PM Peak		
Project Description	Background 2022 PM		



Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume		11	42	89	29		49		224			
% Thrus in Shared Lane			50	50								
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	T	TR		LT	T		L	R				
Flow Rate, v (veh/h)	6	52		114	16		54	246				
Percent Heavy Vehicles	2	2		2	2		2	2				

Departure Headway and Service Time												
Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20				
Initial Degree of Utilization, x	0.005	0.046		0.101	0.014		0.048	0.219				
Final Departure Headway, hd (s)	5.39	4.77		5.73	5.30		5.52	4.33				
Final Degree of Utilization, x	0.009	0.069		0.181	0.023		0.083	0.296				
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3				
Service Time, ts (s)	3.09	2.47		3.43	3.00		3.22	2.03				

Capacity, Delay and Level of Service												
Flow Rate, v (veh/h)	6	52		114	16		54	246				
Capacity	668	755		628	680		652	832				
95% Queue Length, Q ₉₅ (veh)	0.0	0.2		0.7	0.1		0.3	1.2				
Control Delay (s/veh)	8.1	7.8		9.7	8.1		8.7	8.8				
Level of Service, LOS	A	A		A	A		A	A				
Approach Delay (s/veh)	7.9			9.5			8.8					
Approach LOS	A			A			A					
Intersection Delay, s/veh LOS	8.9						A					

Intersection	
Intersection Delay, s/veh	8.4
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↗	↖
Traffic Vol, veh/h	225	5	19	98	35	7
Future Vol, veh/h	225	5	19	98	35	7
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	242	5	20	105	38	8
Number of Lanes	2	0	0	2	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	8.5	8.1	8.8
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	37%	0%
Vol Thru, %	0%	0%	100%	94%	63%	100%
Vol Right, %	0%	100%	0%	6%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	35	7	150	80	52	65
LT Vol	35	0	0	0	19	0
Through Vol	0	0	150	75	33	65
RT Vol	0	7	0	5	0	0
Lane Flow Rate	38	8	161	86	56	70
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.062	0.01	0.214	0.113	0.078	0.095
Departure Headway (Hd)	5.901	4.697	4.779	4.735	5.049	4.864
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	609	763	756	761	712	739
Service Time	3.621	2.416	2.479	2.435	2.762	2.577
HCM Lane V/C Ratio	0.062	0.01	0.213	0.113	0.079	0.095
HCM Control Delay	9	7.5	8.8	8	8.2	8.1
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0.2	0	0.8	0.4	0.3	0.3

Intersection	
Intersection Delay, s/veh	9.7
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	129	71	29	230	56	26
Future Vol, veh/h	129	71	29	230	56	26
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	150	83	34	267	65	30
Number of Lanes	1	1	2	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	9.8	9.8	9.3
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	100%	0%	87%	0%
Vol Thru, %	100%	4%	0%	0%	13%	100%
Vol Right, %	0%	96%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	19	240	129	71	65	17
LT Vol	0	0	129	0	56	0
Through Vol	19	10	0	0	9	17
RT Vol	0	230	0	71	0	0
Lane Flow Rate	22	279	150	83	75	20
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.033	0.357	0.248	0.109	0.123	0.031
Departure Headway (Hd)	5.285	4.609	5.962	4.757	5.889	5.452
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	676	778	600	749	607	654
Service Time	3.024	2.347	3.721	2.515	3.642	3.205
HCM Lane V/C Ratio	0.033	0.359	0.25	0.111	0.124	0.031
HCM Control Delay	8.2	9.9	10.7	8.1	9.5	8.4
HCM Lane LOS	A	A	B	A	A	A
HCM 95th-tile Q	0.1	1.6	1	0.4	0.4	0.1

Intersection						
Int Delay, s/veh	6.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	5	61	74	2	5	15
Future Vol, veh/h	5	61	74	2	5	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
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	5	66	80	2	5	16

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	174	11	21	0	0
Stage 1	13	-	-	-	-
Stage 2	161	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-
Pot Cap-1 Maneuver	799	1067	1593	-	-
Stage 1	1008	-	-	-	-
Stage 2	851	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	759	1067	1593	-	-
Mov Cap-2 Maneuver	759	-	-	-	-
Stage 1	958	-	-	-	-
Stage 2	851	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.7	7.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1593	-	1035	-	-
HCM Lane V/C Ratio	0.05	-	0.069	-	-
HCM Control Delay (s)	7.4	0	8.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	-	-

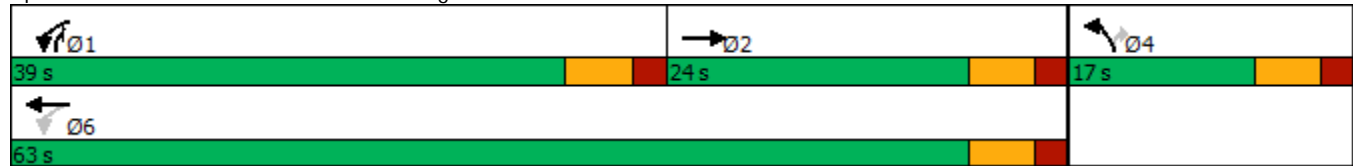
Lanes, Volumes, Timings
1: Mill Road & Washington Pike

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↖	↗↗
Traffic Volume (vph)	322	64	564	1152	54	322
Future Volume (vph)	322	64	564	1152	54	322
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	0.88
Frt	0.975					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3451	0	1770	3539	1770	2787
Flt Permitted			0.436		0.950	
Satd. Flow (perm)	3451	0	812	3539	1770	2787
Satd. Flow (RTOR)	26					264
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	406	0	594	1213	57	339
Turn Type	NA		pm+pt	NA	Prot	pm+ov
Protected Phases	2		1	6	4	1
Permitted Phases			6			4
Detector Phase	2		1	6	4	1
Switch Phase						
Minimum Initial (s)	12.0		10.0	12.0	10.0	10.0
Minimum Split (s)	19.0		17.0	19.0	17.0	17.0
Total Split (s)	24.0		39.0	63.0	17.0	39.0
Total Split (%)	30.0%		48.8%	78.8%	21.3%	48.8%
Maximum Green (s)	18.0		33.0	57.0	11.0	33.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
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)	6.0		6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	Max		None	Max	None	None
Act Effect Green (s)	33.6		57.7	60.5	10.2	26.9
Actuated g/C Ratio	0.46		0.79	0.83	0.14	0.37
v/c Ratio	0.25		0.67	0.41	0.23	0.28
Control Delay	16.2		7.9	3.9	33.0	3.0
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	16.2		7.9	3.9	33.0	3.0
LOS	B		A	A	C	A
Approach Delay	16.2			5.2	7.3	
Approach LOS	B			A	A	
Queue Length 50th (ft)	61		100	107	26	11
Queue Length 95th (ft)	129		161	147	59	23
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200		100	100
Base Capacity (vph)	1609		1084	2943	271	1733
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	0.25		0.55	0.41	0.21	0.20

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 72.7	
Natural Cycle: 60	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 7.2	Intersection LOS: A
Intersection Capacity Utilization 65.5%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Mill Road & Washington Pike



Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

Knoxville Center TIS
2027 Background AM

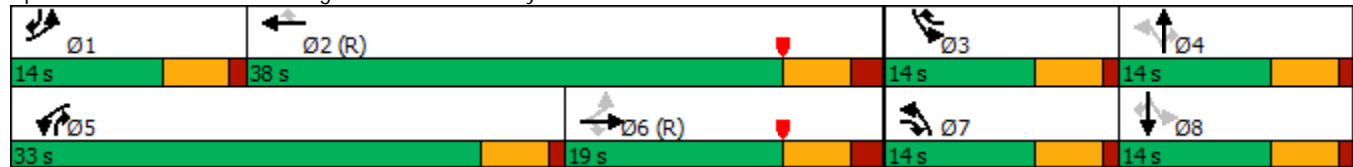


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	57	325	1151	101	5	123	44	363	2	16	2
Future Volume (vph)	6	57	325	1151	101	5	123	44	363	2	16	2
Lane Util. Factor	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	3433	1863	1583	1770	1863	2787	1770	3539	1583
Flt Permitted	0.686			0.950			0.645					
Satd. Flow (perm)	1278	3539	1583	3433	1863	1583	1201	1863	2787	1863	3539	1583
Satd. Flow (RTOR)			259			95			395			177
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	62	353	1251	110	5	134	48	395	2	17	2
Turn Type	pm+pt	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	1	6	7	5	2	3	7	4	5	3	8	1
Permitted Phases	6		6			2	4		4	8		8
Detector Phase	1	6	7	5	2	3	7	4	5	3	8	1
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	14.0	19.0	14.0	33.0	38.0	14.0	14.0	14.0	33.0	14.0	14.0	14.0
Total Split (%)	17.5%	23.8%	17.5%	41.3%	47.5%	17.5%	17.5%	17.5%	41.3%	17.5%	17.5%	17.5%
Maximum Green (s)	9.0	13.0	9.0	28.0	32.0	9.0	9.0	9.0	28.0	9.0	9.0	9.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	4.0	2.0	2.0	4.0
Recall Mode	None	C-Max	None	None	C-Max	None	None	None	None	None	None	None
Act Effect Green (s)	21.6	14.0	28.3	39.5	56.1	69.1	10.1	8.3	52.8	7.2	6.0	8.8
Actuated g/C Ratio	0.27	0.18	0.35	0.49	0.70	0.86	0.13	0.10	0.66	0.09	0.08	0.11
v/c Ratio	0.02	0.10	0.49	0.74	0.08	0.00	0.64	0.25	0.20	0.01	0.06	0.01
Control Delay	11.8	29.1	8.3	20.9	6.5	0.0	41.5	32.6	3.0	27.5	35.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.8	29.1	8.3	20.9	6.5	0.0	41.5	32.6	3.0	27.5	35.1	0.0
LOS	B	C	A	C	A	A	D	C	A	C	D	A
Approach Delay		11.4			19.6			14.4			31.0	
Approach LOS		B			B			B			C	
Queue Length 50th (ft)	2	14	32	225	11	0	71	25	0	1	4	0
Queue Length 95th (ft)	5	31	99	#442	59	0	118	57	26	6	14	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	300		170	160		160	150		75
Base Capacity (vph)	437	617	738	1696	1306	1454	226	209	1974	227	398	374
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.10	0.48	0.74	0.08	0.00	0.59	0.23	0.20	0.01	0.04	0.01

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 24 (30%), Referenced to phase 2:WBT and 6:EBTL, Start of Yellow
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.74
 Intersection Signal Delay: 17.0 Intersection LOS: B
 Intersection Capacity Utilization 70.5% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 2: Washington Pike & Greenway Drive



Lanes, Volumes, Timings
 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road

Knoxville Center TIS
 2027 Background AM

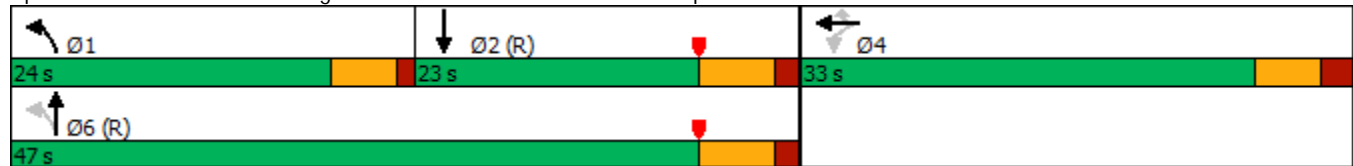


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↖	↗	↖	↖	↗			↗	↖
Traffic Volume (vph)	0	0	0	26	349	125	319	427	0	0	343	1162
Future Volume (vph)	0	0	0	26	349	125	319	427	0	0	343	1162
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1770	1863	1583	1770	3539	0	0	3539	1583
Flt Permitted				0.950			0.459					
Satd. Flow (perm)	0	0	0	1770	1863	1583	855	3539	0	0	3539	1583
Satd. Flow (RTOR)							132					386
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	27	367	132	336	449	0	0	361	1223
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Free
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					Free
Detector Phase				4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0			10.0	
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0			19.0	
Total Split (s)				33.0	33.0	33.0	24.0	47.0			23.0	
Total Split (%)				41.3%	41.3%	41.3%	30.0%	58.8%			28.8%	
Maximum Green (s)				27.0	27.0	27.0	19.0	41.0			17.0	
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5			4.5	
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5			1.5	
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	
Total Lost Time (s)				6.0	6.0	6.0	5.0	6.0			6.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			2.0	
Recall Mode				None	None	None	None	C-Max			C-Max	
Act Effect Green (s)				20.9	20.9	20.9	48.1	47.1			29.6	80.0
Actuated g/C Ratio				0.26	0.26	0.26	0.60	0.59			0.37	1.00
v/c Ratio				0.06	0.75	0.26	0.51	0.22			0.28	0.77
Control Delay				20.0	36.8	5.2	10.0	4.6			10.6	13.4
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				20.0	36.8	5.2	10.0	4.6			10.6	13.4
LOS				B	D	A	B	A			B	B
Approach Delay					28.0			6.9			12.8	
Approach LOS					C			A			B	
Queue Length 50th (ft)				10	168	0	35	25			47	626
Queue Length 95th (ft)				26	236	35	82	34			m87	673
Internal Link Dist (ft)		569			2042			923			673	
Turn Bay Length (ft)						475	105					100
Base Capacity (vph)				597	628	621	731	2082			1307	1583
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	0.58	0.21	0.46	0.22			0.28	0.77

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 20 (25%), Referenced to phase 2:SBT and 6:NBTL, Start of Yellow
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.77
 Intersection Signal Delay: 14.0
 Intersection LOS: B
 Intersection Capacity Utilization 59.7%
 ICU Level of Service B
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road



Lanes, Volumes, Timings
 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road

Knoxville Center TIS
 2027 Background AM



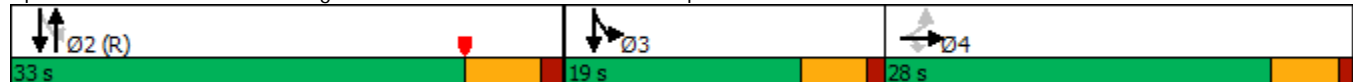
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↕↕	↕↕	↕					↕↕	↕	↕	↕↕	
Traffic Volume (vph)	276	208	226	0	0	0	0	449	39	136	257	0
Future Volume (vph)	276	208	226	0	0	0	0	449	39	136	257	0
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	3539	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.469		
Satd. Flow (perm)	3433	3539	1583	0	0	0	0	3539	1583	874	3539	0
Satd. Flow (RTOR)			251							95		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	307	231	251	0	0	0	0	499	43	151	286	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	28.0	28.0	28.0					33.0	33.0	19.0		
Total Split (%)	35.0%	35.0%	35.0%					41.3%	41.3%	23.8%		
Maximum Green (s)	23.0	23.0	23.0					27.0	27.0	14.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	12.9	12.9	12.9					44.6	44.6	52.1	56.1	
Actuated g/C Ratio	0.16	0.16	0.16					0.56	0.56	0.65	0.70	
v/c Ratio	0.56	0.41	0.54					0.25	0.05	0.24	0.12	
Control Delay	34.1	31.4	8.5					10.3	0.3	4.6	1.6	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	34.1	31.4	8.5					10.3	0.3	4.6	1.6	
LOS	C	C	A					B	A	A	A	
Approach Delay		25.2						9.5			2.7	
Approach LOS		C						A			A	
Queue Length 50th (ft)	74	55	0					60	0	7	6	
Queue Length 95th (ft)	103	81	56					107	2	57	11	
Internal Link Dist (ft)		2101			1667			717			923	
Turn Bay Length (ft)	400		265						150	120		
Base Capacity (vph)	986	1017	633					1973	925	808	2814	
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	0.31	0.23	0.40					0.25	0.05	0.19	0.10	

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 28 (35%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.56
 Intersection Signal Delay: 14.8
 Intersection Capacity Utilization 59.7%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service B

Splits and Phases: 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road



Intersection

Int Delay, s/veh 0.8

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↑↑			↑	
Traffic Vol, veh/h	0	435	0	0	37	0
Future Vol, veh/h	0	435	0	0	37	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	518	0	0	44	0

Major/Minor Major1 Minor2

Conflicting Flow All	-	0	259	-
Stage 1	-	-	0	-
Stage 2	-	-	259	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	708	0
Stage 1	0	-	-	0
Stage 2	0	-	761	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	708	-
Mov Cap-2 Maneuver	-	-	708	-
Stage 1	-	-	-	-
Stage 2	-	-	761	-

Approach EB SB

HCM Control Delay, s	0	10.4
HCM LOS		B

Minor Lane/Major Mvmt EBT SBLn1

Capacity (veh/h)	-	708
HCM Lane V/C Ratio	-	0.062
HCM Control Delay (s)	-	10.4
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.2

Intersection												
Int Delay, s/veh	0.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗						↖				
Traffic Vol, veh/h	87	370	15	0	0	0	0	0	7	0	0	0
Future Vol, veh/h	87	370	15	0	0	0	0	0	7	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	101	430	17	0	0	0	0	0	8	0	0	0

Major/Minor	Major1			Minor1		
Conflicting Flow All	0	0	0	-	641	224
Stage 1	-	-	-	-	641	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.14	-	-	-	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.22	-	-	-	4.02	3.32
Pot Cap-1 Maneuver	-	-	-	0	391	779
Stage 1	-	-	-	0	468	-
Stage 2	-	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	0	779
Mov Cap-2 Maneuver	-	-	-	-	0	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-

Approach	EB	NB
HCM Control Delay, s		9.7
HCM LOS		A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	779	-	-	-
HCM Lane V/C Ratio	0.01	-	-	-
HCM Control Delay (s)	9.7	-	-	-
HCM Lane LOS	A	-	-	-
HCM 95th %tile Q(veh)	0	-	-	-

Lanes, Volumes, Timings
7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

Knoxville Center TIS
2027 Background AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖	↖					↑↑	↖	↖	↑↑	
Traffic Volume (vph)	138	150	28	0	0	0	0	101	110	696	261	0
Future Volume (vph)	138	150	28	0	0	0	0	101	110	696	261	0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.996								0.950		
Satd. Flow (prot)	1681	1763	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.996								0.683		
Satd. Flow (perm)	1681	1763	1583	0	0	0	0	3539	1583	1272	3539	0
Satd. Flow (RTOR)			95							118		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)	10%											
Lane Group Flow (vph)	133	176	30	0	0	0	0	109	118	748	281	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	17.0	17.0	17.0					35.0	35.0	28.0		
Total Split (%)	21.3%	21.3%	21.3%					43.8%	43.8%	35.0%		
Maximum Green (s)	12.0	12.0	12.0					30.0	30.0	23.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	11.0	11.0	11.0					36.3	36.3	54.0	59.0	
Actuated g/C Ratio	0.14	0.14	0.14					0.45	0.45	0.68	0.74	
v/c Ratio	0.57	0.72	0.10					0.07	0.15	0.77	0.11	
Control Delay	32.6	41.9	0.8					15.0	4.1	11.8	1.7	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	32.6	41.9	0.8					15.0	4.1	11.8	1.7	
LOS	C	D	A					B	A	B	A	
Approach Delay		34.6						9.3			9.0	
Approach LOS		C						A			A	
Queue Length 50th (ft)	43	56	0					17	0	42	7	
Queue Length 95th (ft)	108	#178	0					34	31	252	10	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	255	267	320					1604	782	1085	2842	
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	0.52	0.66	0.09					0.07	0.15	0.69	0.10	

Lanes, Volumes, Timings
 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp

Knoxville Center TIS
 2027 Background AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↕			↕	↘
Traffic Volume (vph)	0	0	0	92	144	324	26	211	0	0	857	332
Future Volume (vph)	0	0	0	92	144	324	26	211	0	0	857	332
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.997		0.950					
Satd. Flow (prot)	0	0	0	1681	1764	2787	1770	3539	0	0	3539	1583
Flt Permitted				0.950	0.997		0.293					
Satd. Flow (perm)	0	0	0	1681	1764	2787	546	3539	0	0	3539	1583
Satd. Flow (RTOR)						341						349
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	0	87	162	341	27	222	0	0	902	349
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2			2	
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				30.0	30.0	30.0	50.0	50.0			50.0	50.0
Total Split (%)				37.5%	37.5%	37.5%	62.5%	62.5%			62.5%	62.5%
Maximum Green (s)				23.0	23.0	23.0	44.0	44.0			44.0	44.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)				7.0	7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)				14.2	14.2	14.2	52.8	52.8			52.8	52.8
Actuated g/C Ratio				0.18	0.18	0.18	0.66	0.66			0.66	0.66
v/c Ratio				0.29	0.52	0.44	0.07	0.10			0.39	0.30
Control Delay				29.5	34.8	5.0	0.5	0.5			2.8	1.1
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				29.5	34.8	5.0	0.5	0.5			2.8	1.1
LOS				C	C	A	A	A			A	A
Approach Delay					16.8			0.5			2.3	
Approach LOS					B			A			A	
Queue Length 50th (ft)				41	78	0	0	0			3	0
Queue Length 95th (ft)				74	125	33	m0	m0			20	0
Internal Link Dist (ft)		1096			1137			650			484	
Turn Bay Length (ft)				450		800	95					
Base Capacity (vph)				483	507	1044	360	2333			2333	1162
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				0.18	0.32	0.33	0.07	0.10			0.39	0.30

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 18 (23%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.52	
Intersection Signal Delay: 6.2	Intersection LOS: A
Intersection Capacity Utilization 74.4%	ICU Level of Service D
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp



Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way

Knoxville Center TIS
2027 Background AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗	↖	↕	↗	↖	↕↕	↗	↖	↕↕	↗
Traffic Volume (vph)	23	21	11	175	15	60	13	358	130	67	990	30
Future Volume (vph)	23	21	11	175	15	60	13	358	130	67	990	30
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.975		0.950	0.960		0.950			0.950		
Satd. Flow (prot)	0	1816	1583	1681	1699	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.975		0.950	0.960		0.232			0.950		
Satd. Flow (perm)	0	1816	1583	1681	1699	1583	432	3539	1583	1770	3539	1583
Satd. Flow (RTOR)			164			95			137			95
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	0	46	12	99	101	63	14	377	137	71	1042	32
Turn Type	Split	NA	Perm	Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4		3	3	1	5	2	3	1	6	4
Permitted Phases			4			3	2		2			6
Detector Phase	4	4	4	3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	16.0	16.0	16.0	16.0	16.0	14.0	14.0	34.0	16.0	14.0	34.0	16.0
Total Split (%)	20.0%	20.0%	20.0%	20.0%	20.0%	17.5%	17.5%	42.5%	20.0%	17.5%	42.5%	20.0%
Maximum Green (s)	11.0	11.0	11.0	11.0	11.0	9.0	9.0	29.0	11.0	9.0	29.0	11.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)		7.9	7.9	9.5	9.5	18.3	44.2	39.4	54.9	7.8	47.8	57.3
Actuated g/C Ratio		0.10	0.10	0.12	0.12	0.23	0.55	0.49	0.69	0.10	0.60	0.72
v/c Ratio		0.26	0.04	0.50	0.50	0.15	0.04	0.22	0.12	0.41	0.49	0.03
Control Delay		36.5	0.3	41.5	41.7	2.1	6.1	11.0	1.1	51.5	6.4	0.1
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		36.5	0.3	41.5	41.7	2.1	6.1	11.0	1.1	51.5	6.4	0.1
LOS		D	A	D	D	A	A	B	A	D	A	A
Approach Delay		29.0			32.1			8.3				9.0
Approach LOS		C			C			A				A
Queue Length 50th (ft)		22	0	49	50	0	2	41	0	35	40	0
Queue Length 95th (ft)		52	0	97	98	10	m6	83	20	m51	m73	m0
Internal Link Dist (ft)		713			953			484				243
Turn Bay Length (ft)				155		245	180		180	120		105
Base Capacity (vph)		249	359	231	233	461	402	1742	1138	204	2113	1147
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio		0.18	0.03	0.43	0.43	0.14	0.03	0.22	0.12	0.35	0.49	0.03

Intersection

Int Delay, s/veh 0.1

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations						
Traffic Vol, veh/h	0	2	6	449	1097	9
Future Vol, veh/h	0	2	6	449	1097	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	2	7	493	1205	10

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	1471	1210	1215	0	-	0
Stage 1	1210	-	-	-	-	-
Stage 2	261	-	-	-	-	-
Critical Hdwy	6.63	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	128	222	572	-	-	-
Stage 1	281	-	-	-	-	-
Stage 2	760	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	126	222	572	-	-	-
Mov Cap-2 Maneuver	126	-	-	-	-	-
Stage 1	276	-	-	-	-	-
Stage 2	760	-	-	-	-	-

Approach EB NB SB

HCM Control Delay, s 21.4 0.2 0
 HCM LOS C

Minor Lane/Major Mvmt NBL NBT EBLn1 EBLn2 SBT SBR

Capacity (veh/h)	572	-	-	222	-	-
HCM Lane V/C Ratio	0.012	-	-	0.01	-	-
HCM Control Delay (s)	11.4	0.1	0	21.4	-	-
HCM Lane LOS	B	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	-	0	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road

Knoxville Center TIS
2027 Background AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗	↖	↘		↖	↘		↖	↘	
Traffic Volume (vph)	7	2	33	95	14	85	22	338	48	136	979	2
Future Volume (vph)	7	2	33	95	14	85	22	338	48	136	979	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.872			0.981				
Flt Protected		0.963		0.950			0.950			0.950		
Satd. Flow (prot)	0	1794	1583	1770	1624	0	1770	1827	0	1770	1863	0
Flt Permitted		0.808		0.426			0.099			0.393		
Satd. Flow (perm)	0	1505	1583	794	1624	0	184	1827	0	732	1863	0
Satd. Flow (RTOR)			164		89			10				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	9	35	100	104	0	23	407	0	143	1033	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4			2			6		
Detector Phase	3	8	8	7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	15.0	16.0	16.0	15.0	16.0		15.0	24.0		14.0	24.0	
Total Split (s)	15.0	16.0	16.0	15.0	16.0		15.0	35.0		14.0	34.0	
Total Split (%)	18.8%	20.0%	20.0%	18.8%	20.0%		18.8%	43.8%		17.5%	42.5%	
Maximum Green (s)	10.0	11.0	11.0	10.0	11.0		10.0	30.0		9.0	29.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0	4.0	3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Act Effect Green (s)		7.0	7.0	16.2	16.3		49.7	43.5		55.0	52.4	
Actuated g/C Ratio		0.09	0.09	0.20	0.20		0.62	0.54		0.69	0.66	
v/c Ratio		0.07	0.12	0.37	0.26		0.10	0.41		0.24	0.85	
Control Delay		34.3	0.9	28.3	8.6		15.5	24.6		5.8	22.1	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		34.3	0.9	28.3	8.6		15.5	24.6		5.8	22.1	
LOS		C	A	C	A		B	C		A	C	
Approach Delay		7.7			18.3			24.1			20.1	
Approach LOS		A			B			C			C	
Queue Length 50th (ft)		4	0	39	6		6	116		27	289	
Queue Length 95th (ft)		18	0	75	40		29	281		m31	m#826	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)			170	175						65		
Base Capacity (vph)		206	359	294	429		321	998		623	1220	
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		0.04	0.10	0.34	0.24		0.07	0.41		0.23	0.85	

Lanes, Volumes, Timings
12: Millertown Pike & Mill Road

Knoxville Center TIS
2027 Background AM

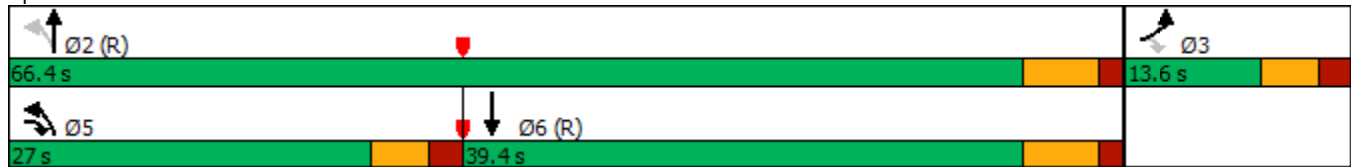


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	46	609	285	131	522	105
Future Volume (vph)	46	609	285	131	522	105
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.977	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1820	0
Flt Permitted	0.950		0.152			
Satd. Flow (perm)	1770	1583	283	1863	1820	0
Satd. Flow (RTOR)		187			16	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)						
Lane Group Flow (vph)	49	655	306	141	674	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	13.6	27.0	27.0	66.4	39.4	
Total Split (%)	17.0%	33.8%	33.8%	83.0%	49.3%	
Maximum Green (s)	8.1	21.5	21.5	60.4	33.4	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	C-Min	C-Min	
Act Effect Green (s)	8.0	30.6	66.4	68.3	37.9	
Actuated g/C Ratio	0.10	0.38	0.83	0.85	0.47	
v/c Ratio	0.28	0.91	0.47	0.09	0.77	
Control Delay	37.7	34.3	13.1	5.3	26.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	37.7	34.3	13.1	5.3	26.8	
LOS	D	C	B	A	C	
Approach Delay	34.5			10.7	26.8	
Approach LOS	C			B	C	
Queue Length 50th (ft)	23	203	78	14	294	
Queue Length 95th (ft)	55	#411	196	86	#504	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85	330			
Base Capacity (vph)	179	724	656	1589	871	
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	0.27	0.90	0.47	0.09	0.77	

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 20 (25%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.91	
Intersection Signal Delay: 25.8	Intersection LOS: C
Intersection Capacity Utilization 81.1%	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: 12: Millertown Pike & Mill Road



Intersection	
Intersection Delay, s/veh	11.7
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑↑				
Traffic Vol, veh/h	0	0	0	0	439	13	2	83	0	0	0	0
Future Vol, veh/h	0	0	0	0	439	13	2	83	0	0	0	0
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	610	18	3	115	0	0	0	0
Number of Lanes	0	0	0	0	2	0	0	2	0	0	0	0

Approach	WB	NB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NB	
Conflicting Lanes Left	2	0
Conflicting Approach Right		WB
Conflicting Lanes Right	0	2
HCM Control Delay	12.1	9.5
HCM LOS	B	A

Lane	NBLn1	NBLn2	WBLn1	WBLn2
Vol Left, %	7%	0%	0%	0%
Vol Thru, %	93%	100%	100%	92%
Vol Right, %	0%	0%	0%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	30	55	293	159
LT Vol	2	0	0	0
Through Vol	28	55	293	146
RT Vol	0	0	0	13
Lane Flow Rate	41	77	406	221
Geometry Grp	7	7	7	7
Degree of Util (X)	0.069	0.127	0.551	0.296
Departure Headway (Hd)	5.994	5.96	4.88	4.823
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	597	602	740	746
Service Time	3.73	3.696	2.606	2.548
HCM Lane V/C Ratio	0.069	0.128	0.549	0.296
HCM Control Delay	9.2	9.6	13.5	9.6
HCM Lane LOS	A	A	B	A
HCM 95th-tile Q	0.2	0.4	3.4	1.2

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑			↑
Traffic Vol, veh/h	0	0	459	9	0	7
Future Vol, veh/h	0	0	459	9	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	553	11	0	8

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	0
Stage 1	-	0
Stage 2	-	0
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	10.1
HCM LOS		B

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	715
HCM Lane V/C Ratio	-	-	0.012
HCM Control Delay (s)	-	-	10.1
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0

Intersection	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↘	↗
Traffic Vol, veh/h	83	2	6	26	13	0
Future Vol, veh/h	83	2	6	26	13	0
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	112	3	8	35	18	0
Number of Lanes	2	0	0	2	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	7.7	7.6	8.3
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	41%	0%
Vol Thru, %	0%	100%	100%	93%	59%	100%
Vol Right, %	0%	0%	0%	7%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	13	0	55	30	15	17
LT Vol	13	0	0	0	6	0
Through Vol	0	0	55	28	9	17
RT Vol	0	0	0	2	0	0
Lane Flow Rate	18	0	75	40	20	23
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.026	0	0.095	0.051	0.027	0.03
Departure Headway (Hd)	5.41	4.91	4.587	4.54	4.827	4.622
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	666	0	781	788	739	772
Service Time	3.11	2.61	2.317	2.27	2.573	2.368
HCM Lane V/C Ratio	0.027	0	0.096	0.051	0.027	0.03
HCM Control Delay	8.3	7.6	7.8	7.5	7.7	7.5
HCM Lane LOS	A	N	A	A	A	A
HCM 95th-tile Q	0.1	0	0.3	0.2	0.1	0.1

Intersection	
Intersection Delay, s/veh	7.8
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	67	9	7	75	6	6
Future Vol, veh/h	67	9	7	75	6	6
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	78	10	8	87	7	7
Number of Lanes	1	1	2	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	8.4	7.3	7.9
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	100%	0%	75%	0%
Vol Thru, %	100%	3%	0%	0%	25%	100%
Vol Right, %	0%	97%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	5	77	67	9	8	4
LT Vol	0	0	67	0	6	0
Through Vol	5	2	0	0	2	4
RT Vol	0	75	0	9	0	0
Lane Flow Rate	5	90	78	10	9	5
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.007	0.1	0.113	0.012	0.013	0.006
Departure Headway (Hd)	4.694	4.014	5.218	4.017	5.221	4.845
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	751	878	684	885	690	743
Service Time	2.491	1.81	2.972	1.771	2.921	2.545
HCM Lane V/C Ratio	0.007	0.103	0.114	0.011	0.013	0.007
HCM Control Delay	7.5	7.3	8.6	6.8	8	7.6
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0	0.3	0.4	0	0	0

Intersection						
Int Delay, s/veh	7.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	0	82	14	5	5	2
Future Vol, veh/h	0	82	14	5	5	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	95	16	6	6	2

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	42	4	8	0	-	0
Stage 1	7	-	-	-	-	-
Stage 2	35	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	964	1078	1611	-	-	-
Stage 1	1015	-	-	-	-	-
Stage 2	983	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	954	1078	1611	-	-	-
Mov Cap-2 Maneuver	954	-	-	-	-	-
Stage 1	1005	-	-	-	-	-
Stage 2	983	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.7	5.3	0
HCM LOS	A		

























Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1611	-	1078	-	-
HCM Lane V/C Ratio	0.01	-	0.088	-	-
HCM Control Delay (s)	7.3	0	8.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Lanes, Volumes, Timings
1: Mill Road & Washington Pike

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↖	↗↗
Traffic Volume (vph)	1004	126	351	522	95	701
Future Volume (vph)	1004	126	351	522	95	701
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	0.88
Frt	0.983					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3479	0	1770	3539	1770	2787
Flt Permitted			0.103		0.950	
Satd. Flow (perm)	3479	0	192	3539	1770	2787
Satd. Flow (RTOR)	20					54
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1190	0	369	549	100	738
Turn Type	NA		pm+pt	NA	Prot	pm+ov
Protected Phases	2		1	6	4	1
Permitted Phases			6			4
Detector Phase	2		1	6	4	1
Switch Phase						
Minimum Initial (s)	12.0		10.0	12.0	10.0	10.0
Minimum Split (s)	19.0		17.0	19.0	17.0	17.0
Total Split (s)	38.0		25.0	63.0	17.0	25.0
Total Split (%)	47.5%		31.3%	78.8%	21.3%	31.3%
Maximum Green (s)	32.0		19.0	57.0	11.0	19.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
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)	6.0		6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	C-Max		None	C-Max	None	None
Act Effect Green (s)	36.9		60.8	62.0	10.4	31.1
Actuated g/C Ratio	0.46		0.76	0.78	0.13	0.39
v/c Ratio	0.74		0.74	0.20	0.43	0.66
Control Delay	23.8		26.0	3.5	38.4	20.9
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	23.8		26.0	3.5	38.4	20.9
LOS	C		C	A	D	C
Approach Delay	23.8			12.6	23.0	
Approach LOS	C			B	C	
Queue Length 50th (ft)	234		113	37	47	142
Queue Length 95th (ft)	#385		#221	56	93	196
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200		100	100
Base Capacity (vph)	1615		520	2742	243	1153
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	0.74		0.71	0.20	0.41	0.64

Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

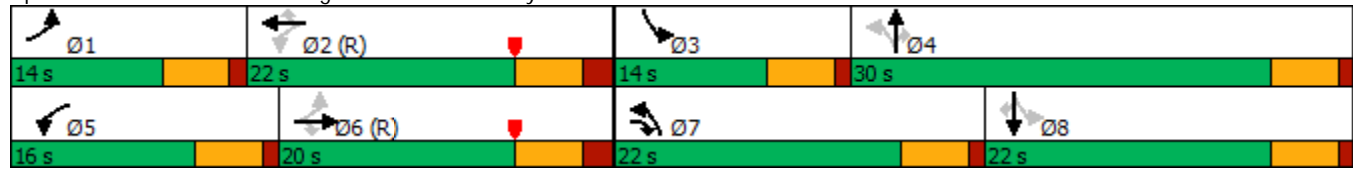
Knoxville Center TIS
2027 Background PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	109	333	525	68	13	312	329	972	67	337	57
Future Volume (vph)	55	109	333	525	68	13	312	329	972	67	337	57
Lane Util. Factor	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	3433	1863	1583	1770	1863	2787	1770	3539	1583
Flt Permitted	0.708			0.520			0.315			0.543		
Satd. Flow (perm)	1319	3539	1583	1879	1863	1583	587	1863	2787	1011	3539	1583
Satd. Flow (RTOR)			95			232			1080			245
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	121	370	583	76	14	347	366	1080	74	374	63
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	7	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	14.0	20.0	22.0	16.0	22.0	22.0	22.0	30.0	30.0	14.0	22.0	22.0
Total Split (%)	17.5%	25.0%	27.5%	20.0%	27.5%	27.5%	27.5%	37.5%	37.5%	17.5%	27.5%	27.5%
Maximum Green (s)	9.0	14.0	17.0	11.0	16.0	16.0	17.0	25.0	25.0	9.0	17.0	17.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	C-Max	None	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	26.7	17.7	38.8	34.9	26.9	26.9	33.9	24.4	24.4	20.6	13.8	13.8
Actuated g/C Ratio	0.33	0.22	0.48	0.44	0.34	0.34	0.42	0.30	0.30	0.26	0.17	0.17
v/c Ratio	0.13	0.15	0.45	0.55	0.12	0.02	0.74	0.65	0.68	0.23	0.61	0.13
Control Delay	15.9	27.8	12.6	23.3	29.2	0.1	29.0	35.7	13.1	15.3	34.6	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.9	27.8	12.6	23.3	29.2	0.1	29.0	35.7	13.1	15.3	34.6	0.6
LOS	B	C	B	C	C	A	C	D	B	B	C	A
Approach Delay		16.3			23.5			20.8				27.6
Approach LOS		B			C			C				C
Queue Length 50th (ft)	17	27	91	119	33	0	162	189	152	21	91	0
Queue Length 95th (ft)	43	51	159	177	75	m0	m226	m271	178	40	129	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	300		170	160		160	150		75
Base Capacity (vph)	507	784	852	1058	625	685	500	601	1631	374	753	529
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.15	0.43	0.55	0.12	0.02	0.69	0.61	0.66	0.20	0.50	0.12

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.74
 Intersection Signal Delay: 21.6
 Intersection LOS: C
 Intersection Capacity Utilization 61.6%
 ICU Level of Service B
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Washington Pike & Greenway Drive



Lanes, Volumes, Timings
 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road

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 2027 Background PM

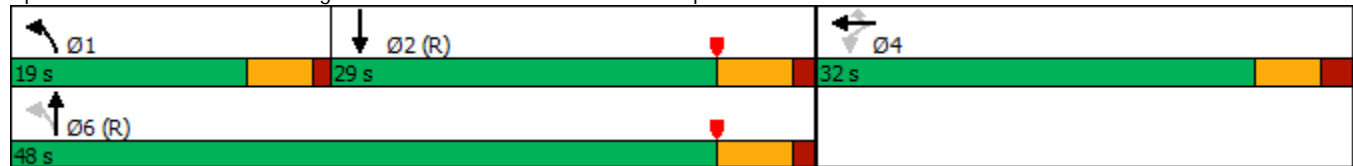


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↕	↗	↙	↕			↕	↗
Traffic Volume (vph)	0	0	0	115	379	333	266	1300	0	0	627	544
Future Volume (vph)	0	0	0	115	379	333	266	1300	0	0	627	544
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1770	1863	1583	1770	3539	0	0	3539	1583
Flt Permitted				0.950			0.259					
Satd. Flow (perm)	0	0	0	1770	1863	1583	482	3539	0	0	3539	1583
Satd. Flow (RTOR)							109					370
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	125	412	362	289	1413	0	0	682	591
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Free
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					Free
Detector Phase				4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0			10.0	
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0			19.0	
Total Split (s)				32.0	32.0	32.0	19.0	48.0			29.0	
Total Split (%)				40.0%	40.0%	40.0%	23.8%	60.0%			36.3%	
Maximum Green (s)				26.0	26.0	26.0	14.0	42.0			23.0	
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5			4.5	
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5			1.5	
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	
Total Lost Time (s)				6.0	6.0	6.0	5.0	6.0			6.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			2.0	
Recall Mode				None	None	None	None	C-Max			C-Max	
Act Effect Green (s)				22.8	22.8	22.8	46.2	45.2			29.2	80.0
Actuated g/C Ratio				0.28	0.28	0.28	0.58	0.56			0.36	1.00
v/c Ratio				0.25	0.78	0.69	0.64	0.71			0.53	0.37
Control Delay				22.2	36.8	24.1	17.1	12.4			19.0	0.6
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				22.2	36.8	24.1	17.1	12.4			19.0	0.6
LOS				C	D	C	B	B			B	A
Approach Delay					29.7			13.2			10.5	
Approach LOS					C			B			B	
Queue Length 50th (ft)				46	180	106	50	133			112	1
Queue Length 95th (ft)				85	275	194	m83	165			190	0
Internal Link Dist (ft)		569			2042			923			673	
Turn Bay Length (ft)						475	105					100
Base Capacity (vph)				575	605	588	504	2001			1292	1583
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				0.22	0.68	0.62	0.57	0.71			0.53	0.37

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBTL, Start of Yellow
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.78
 Intersection Signal Delay: 16.1
 Intersection LOS: B
 Intersection Capacity Utilization 75.4%
 ICU Level of Service D
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road



Lanes, Volumes, Timings
 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road

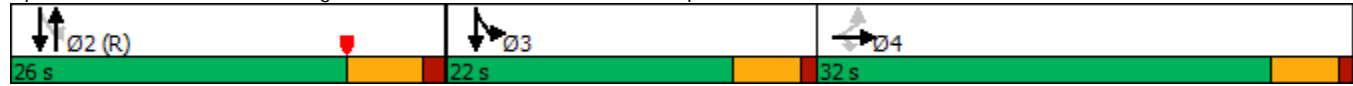
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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	952	587	395	0	0	0	0	607	61	361	380	0
Future Volume (vph)	952	587	395	0	0	0	0	607	61	361	380	0
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	3539	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.288		
Satd. Flow (perm)	3433	3539	1583	0	0	0	0	3539	1583	536	3539	0
Satd. Flow (RTOR)			403							95		
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)	971	599	403	0	0	0	0	619	62	368	388	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	32.0	32.0	32.0					26.0	26.0	22.0		
Total Split (%)	40.0%	40.0%	40.0%					32.5%	32.5%	27.5%		
Maximum Green (s)	27.0	27.0	27.0					20.0	20.0	17.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	27.2	27.2	27.2					22.0	22.0	37.8	41.8	
Actuated g/C Ratio	0.34	0.34	0.34					0.28	0.28	0.47	0.52	
v/c Ratio	0.83	0.50	0.50					0.64	0.12	0.77	0.21	
Control Delay	32.0	22.7	4.7					29.8	3.0	23.1	5.2	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	32.0	22.7	4.7					29.8	3.0	23.1	5.2	
LOS	C	C	A					C	A	C	A	
Approach Delay		23.6						27.3			13.9	
Approach LOS		C						C			B	
Queue Length 50th (ft)	228	123	0					147	0	124	17	
Queue Length 95th (ft)	#314	172	58					205	15	#223	24	
Internal Link Dist (ft)		2101			1667			717			923	
Turn Bay Length (ft)	400		265						150	120		
Base Capacity (vph)	1185	1221	810					973	504	530	1946	
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	0.82	0.49	0.50					0.64	0.12	0.69	0.20	

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.83	
Intersection Signal Delay: 22.2	Intersection LOS: C
Intersection Capacity Utilization 75.4%	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: 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road



Intersection

Int Delay, s/veh 0.8

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1089	0	0	60	0
Future Vol, veh/h	0	1089	0	0	60	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1171	0	0	65	0

Major/Minor Major1 Minor2

Conflicting Flow All	-	0	586	-
Stage 1	-	-	0	-
Stage 2	-	-	586	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	441	0
Stage 1	0	-	-	0
Stage 2	0	-	519	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	441	-
Mov Cap-2 Maneuver	-	-	441	-
Stage 1	-	-	-	-
Stage 2	-	-	519	-

Approach EB SB

HCM Control Delay, s	0	14.6
HCM LOS		B

Minor Lane/Major Mvmt EBT SBLn1

Capacity (veh/h)	-	441
HCM Lane V/C Ratio	-	0.146
HCM Control Delay (s)	-	14.6
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.5

Intersection												
Int Delay, s/veh	0.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗						↖				
Traffic Vol, veh/h	269	862	28	0	0	0	0	6	32	0	0	0
Future Vol, veh/h	269	862	28	0	0	0	0	6	32	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	302	969	31	0	0	0	0	7	36	0	0	0

Major/Minor	Major1			Minor1		
Conflicting Flow All	0	0	0	-	1589	500
Stage 1	-	-	-	-	1589	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.14	-	-	-	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.22	-	-	-	4.02	3.32
Pot Cap-1 Maneuver	-	-	-	0	107	516
Stage 1	-	-	-	0	166	-
Stage 2	-	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	0	516
Mov Cap-2 Maneuver	-	-	-	-	0	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-

Approach	EB	NB
HCM Control Delay, s		12.6
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	516	-	-	-
HCM Lane V/C Ratio	0.083	-	-	-
HCM Control Delay (s)	12.6	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.3	-	-	-

Lanes, Volumes, Timings
7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	512	298	60	0	0	0	0	329	140	476	480	0
Future Volume (vph)	512	298	60	0	0	0	0	329	140	476	480	0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.986								0.950		
Satd. Flow (prot)	1681	1745	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.986								0.534		
Satd. Flow (perm)	1681	1745	1583	0	0	0	0	3539	1583	995	3539	0
Satd. Flow (RTOR)			85							144		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)	22%											
Lane Group Flow (vph)	412	423	62	0	0	0	0	339	144	491	495	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	33.0	33.0	33.0					35.0	35.0	22.0		
Total Split (%)	36.7%	36.7%	36.7%					38.9%	38.9%	24.4%		
Maximum Green (s)	28.0	28.0	28.0					30.0	30.0	17.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	25.3	25.3	25.3					36.4	36.4	49.7	54.7	
Actuated g/C Ratio	0.28	0.28	0.28					0.40	0.40	0.55	0.61	
v/c Ratio	0.87	0.87	0.12					0.24	0.20	0.74	0.23	
Control Delay	51.1	49.3	3.7					20.0	4.6	16.9	4.3	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	51.1	49.3	3.7					20.0	4.6	16.9	4.3	
LOS	D	D	A					B	A	B	A	
Approach Delay		47.0						15.4			10.6	
Approach LOS		D						B			B	
Queue Length 50th (ft)	226	231	0					70	0	49	26	
Queue Length 95th (ft)	#377	#381	m19					108	39	181	30	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	522	542	551					1429	725	736	2294	
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	0.79	0.78	0.11					0.24	0.20	0.67	0.22	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.87	
Intersection Signal Delay: 25.4	Intersection LOS: C
Intersection Capacity Utilization 81.7%	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.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp



Lanes, Volumes, Timings
 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp

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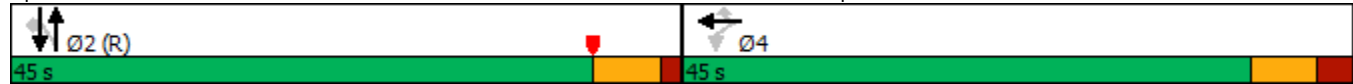


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↕			↕	↘
Traffic Volume (vph)	0	0	0	170	405	656	85	739	0	0	781	347
Future Volume (vph)	0	0	0	170	405	656	85	739	0	0	781	347
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.998		0.950					
Satd. Flow (prot)	0	0	0	1681	1766	2787	1770	3539	0	0	3539	1583
Flt Permitted				0.950	0.998		0.297					
Satd. Flow (perm)	0	0	0	1681	1766	2787	553	3539	0	0	3539	1583
Satd. Flow (RTOR)						197						310
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	0	155	426	663	86	746	0	0	789	351
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2			2	
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				45.0	45.0	45.0	45.0	45.0			45.0	45.0
Total Split (%)				50.0%	50.0%	50.0%	50.0%	50.0%			50.0%	50.0%
Maximum Green (s)				38.0	38.0	38.0	39.0	39.0			39.0	39.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)				7.0	7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)				31.4	31.4	31.4	45.6	45.6			45.6	45.6
Actuated g/C Ratio				0.35	0.35	0.35	0.51	0.51			0.51	0.51
v/c Ratio				0.26	0.69	0.60	0.31	0.42			0.44	0.37
Control Delay				20.6	30.5	18.1	7.9	5.9			16.6	6.4
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				20.6	30.5	18.1	7.9	5.9			16.6	6.4
LOS				C	C	B	A	A			B	A
Approach Delay					22.6			6.1			13.5	
Approach LOS					C			A			B	
Queue Length 50th (ft)				63	208	116	12	73			124	35
Queue Length 95th (ft)				102	288	160	m27	111			167	86
Internal Link Dist (ft)		1096			1137			650			484	
Turn Bay Length (ft)				450		800	95					
Base Capacity (vph)				709	745	1290	279	1792			1792	954
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				0.22	0.57	0.51	0.31	0.42			0.44	0.37

Intersection Summary
























Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.69	
Intersection Signal Delay: 15.1	Intersection LOS: B
Intersection Capacity Utilization 81.7%	ICU Level of Service D
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp



Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way







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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	57	75	371	47	159	61	881	439	111	648	90
Future Volume (vph)	180	57	75	371	47	159	61	881	439	111	648	90
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.963		0.950	0.963		0.950			0.950		
Satd. Flow (prot)	0	1794	1583	1681	1704	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.963		0.950	0.963		0.328			0.950		
Satd. Flow (perm)	0	1794	1583	1681	1704	1583	611	3539	1583	1770	3539	1583
Satd. Flow (RTOR)			145			145			453			93
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)				44%								
Lane Group Flow (vph)	0	245	77	214	216	164	63	908	453	114	668	93
Turn Type	Split	NA	Perm	Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4		3	3	1	5	2	3	1	6	4
Permitted Phases			4			3	2		2			6
Detector Phase	4	4	4	3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	23.0	23.0	23.0	22.0	22.0	16.0	15.0	29.0	22.0	16.0	30.0	23.0
Total Split (%)	25.6%	25.6%	25.6%	24.4%	24.4%	17.8%	16.7%	32.2%	24.4%	17.8%	33.3%	25.6%
Maximum Green (s)	18.0	18.0	18.0	17.0	17.0	11.0	10.0	24.0	17.0	11.0	25.0	18.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)		16.0	16.0	15.7	15.7	25.0	35.7	29.0	49.7	9.3	33.8	50.7
Actuated g/C Ratio		0.18	0.18	0.17	0.17	0.28	0.40	0.32	0.55	0.10	0.38	0.56
v/c Ratio		0.77	0.19	0.73	0.73	0.30	0.19	0.80	0.42	0.62	0.50	0.10
Control Delay		51.8	1.3	50.3	49.9	4.3	13.4	31.8	3.2	63.6	20.7	1.8
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		51.8	1.3	50.3	49.9	4.3	13.4	31.8	3.2	63.6	20.7	1.8
LOS		D	A	D	D	A	B	C	A	E	C	A
Approach Delay		39.7			37.5			21.9			24.3	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)		131	0	120	121	4	16	246	29	70	90	0
Queue Length 95th (ft)		#218	3	#213	#214	26	m35	#388	27	m111	192	m10
Internal Link Dist (ft)		713			953			484			243	
Turn Bay Length (ft)				155		245	180		180	120		105
Base Capacity (vph)		358	432	317	321	572	393	1140	1093	216	1327	944
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio		0.68	0.18	0.68	0.67	0.29	0.16	0.80	0.41	0.53	0.50	0.10

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 27.2	Intersection LOS: C
Intersection Capacity Utilization 62.6%	ICU Level of Service B
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 9: Millertown Pike & Kinzel Way

 Ø1 16 s	 Ø2 (R) 29 s	 Ø3 22 s	 Ø4 23 s
 Ø5 15 s	 Ø6 (R) 30 s		

Intersection

Int Delay, s/veh 1.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	41	48	13	1249	839	40
Future Vol, veh/h	41	48	13	1249	839	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	42	49	13	1288	865	41

Major/Minor

	Minor2	Major1	Major2			
Conflicting Flow All	1556	886	906	0	-	0
Stage 1	886	-	-	-	-	-
Stage 2	670	-	-	-	-	-
Critical Hdwy	6.63	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	113	343	749	-	-	-
Stage 1	402	-	-	-	-	-
Stage 2	471	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	106	343	749	-	-	-
Mov Cap-2 Maneuver	106	-	-	-	-	-
Stage 1	377	-	-	-	-	-
Stage 2	471	-	-	-	-	-

Approach

	EB	NB	SB
HCM Control Delay, s	36.9	0.4	0
HCM LOS	E		

Minor Lane/Major Mvmt

	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	749	-	106	343	-	-
HCM Lane V/C Ratio	0.018	-	0.399	0.144	-	-
HCM Control Delay (s)	9.9	0.3	59.9	17.3	-	-
HCM Lane LOS	A	A	F	C	-	-
HCM 95th %tile Q(veh)	0.1	-	1.6	0.5	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road

Knoxville Center TIS
2027 Background PM











Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	91	43	99	157	48	200	103	1042	83	84	618	16
Future Volume (vph)	91	43	99	157	48	200	103	1042	83	84	618	16
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.896			0.879			0.989				0.996
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1669	0	1770	1637	0	1770	1842	0	1770	1855	0
Flt Permitted	0.412			0.443			0.228			0.088		
Satd. Flow (perm)	767	1669	0	825	1637	0	425	1842	0	164	1855	0
Satd. Flow (RTOR)		101			187			6			2	
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)	93	145	0	160	253	0	105	1148	0	86	647	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	14.0	15.0		15.0	15.0		15.0	24.0		14.0	24.0	
Total Split (s)	14.0	15.0		14.0	15.0		14.0	47.0		14.0	47.0	
Total Split (%)	15.6%	16.7%		15.6%	16.7%		15.6%	52.2%		15.6%	52.2%	
Maximum Green (s)	9.0	10.0		9.0	10.0		9.0	42.0		9.0	42.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effect Green (s)	16.8	8.6		18.7	11.5		54.4	48.0		52.7	47.2	
Actuated g/C Ratio	0.19	0.10		0.21	0.13		0.60	0.53		0.59	0.52	
v/c Ratio	0.40	0.58		0.61	0.68		0.28	1.16		0.40	0.66	
Control Delay	31.6	23.8		38.4	22.3		14.0	112.3		14.3	21.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	31.6	23.8		38.4	22.3		14.0	112.3		14.3	21.5	
LOS	C	C		D	C		B	F		B	C	
Approach Delay		26.8			28.6			104.1			20.6	
Approach LOS		C			C			F			C	
Queue Length 50th (ft)	41	23		73	35		30	~772		18	279	
Queue Length 95th (ft)	80	81		129	#138		m46	#1042		42	429	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)				175						65		
Base Capacity (vph)	250	275		265	379		395	986		259	973	
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	0.37	0.53		0.60	0.67		0.27	1.16		0.33	0.66	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.16	
Intersection Signal Delay: 62.1	Intersection LOS: E
Intersection Capacity Utilization 101.4%	ICU Level of Service G
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.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 11: Millertown Pike & Loves Creek Road

 Ø1	 Ø2 (R)	 Ø3	 Ø4
14 s	47 s	14 s	15 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
14 s	47 s	14 s	15 s

Lanes, Volumes, Timings
12: Millertown Pike & Mill Road



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	91	418	757	641	330	84
Future Volume (vph)	91	418	757	641	330	84
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.972	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1811	0
Flt Permitted	0.950		0.183			
Satd. Flow (perm)	1770	1583	341	1863	1811	0
Satd. Flow (RTOR)		219			14	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Shared Lane Traffic (%)						
Lane Group Flow (vph)	95	435	789	668	432	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	13.8	45.0	45.0	76.2	31.2	
Total Split (%)	15.3%	50.0%	50.0%	84.7%	34.7%	
Maximum Green (s)	8.3	39.5	39.5	70.2	25.2	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	8.6	46.8	65.8	67.2	22.8	
Actuated g/C Ratio	0.11	0.57	0.81	0.82	0.28	
v/c Ratio	0.51	0.44	0.86	0.44	0.84	
Control Delay	49.8	6.0	26.1	4.1	44.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	49.8	6.0	26.1	4.1	44.8	
LOS	D	A	C	A	D	
Approach Delay	13.8			16.0	44.8	
Approach LOS	B			B	D	
Queue Length 50th (ft)	53	54	307	100	224	
Queue Length 95th (ft)	#113	110	#556	148	#383	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85	330			
Base Capacity (vph)	189	1080	1001	1543	597	
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	0.50	0.40	0.79	0.43	0.72	

Intersection	
Intersection Delay, s/veh	17.4
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑↑				
Traffic Vol, veh/h	0	0	0	0	732	25	1	266	0	0	0	0
Future Vol, veh/h	0	0	0	0	732	25	1	266	0	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	771	26	1	280	0	0	0	0
Number of Lanes	0	0	0	0	2	0	0	2	0	0	0	0

Approach	WB	NB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NB	
Conflicting Lanes Left	2	0
Conflicting Approach Right		WB
Conflicting Lanes Right	0	2
HCM Control Delay	19.4	11.8
HCM LOS	C	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2
Vol Left, %	1%	0%	0%	0%
Vol Thru, %	99%	100%	100%	91%
Vol Right, %	0%	0%	0%	9%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	90	177	488	269
LT Vol	1	0	0	0
Through Vol	89	177	488	244
RT Vol	0	0	0	25
Lane Flow Rate	94	187	514	283
Geometry Grp	7	7	7	7
Degree of Util (X)	0.17	0.335	0.765	0.417
Departure Headway (Hd)	6.476	6.47	5.362	5.297
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	557	560	668	674
Service Time	4.176	4.17	3.152	3.087
HCM Lane V/C Ratio	0.169	0.334	0.769	0.42
HCM Control Delay	10.5	12.4	23.6	11.9
HCM Lane LOS	B	B	C	B
HCM 95th-tile Q	0.6	1.5	7.1	2.1

Intersection

Int Delay, s/veh 0.4

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations			↑↓			↑
Traffic Vol, veh/h	0	0	767	39	0	30
Future Vol, veh/h	0	0	767	39	0	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	799	41	0	31

Major/Minor Major2 Minor2

Conflicting Flow All	-	0	-	420
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	582
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	582
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach WB SB

HCM Control Delay, s	0	11.5
HCM LOS		B

Minor Lane/Major Mvmt WBT WBR SBLn1

Capacity (veh/h)	-	-	582
HCM Lane V/C Ratio	-	-	0.054
HCM Control Delay (s)	-	-	11.5
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.2

Intersection	
Intersection Delay, s/veh	8.6
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↘	↗
Traffic Vol, veh/h	248	6	21	108	39	8
Future Vol, veh/h	248	6	21	108	39	8
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	267	6	23	116	42	9
Number of Lanes	2	0	0	2	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	8.7	8.2	8.9
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	37%	0%
Vol Thru, %	0%	0%	100%	93%	63%	100%
Vol Right, %	0%	100%	0%	7%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	39	8	165	89	57	72
LT Vol	39	0	0	0	21	0
Through Vol	0	0	165	83	36	72
RT Vol	0	8	0	6	0	0
Lane Flow Rate	42	9	178	95	61	77
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.07	0.011	0.237	0.126	0.087	0.106
Departure Headway (Hd)	5.988	4.783	4.798	4.75	5.091	4.907
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	599	749	750	757	706	732
Service Time	3.712	2.507	2.51	2.463	2.806	2.621
HCM Lane V/C Ratio	0.07	0.012	0.237	0.125	0.086	0.105
HCM Control Delay	9.2	7.6	9	8.1	8.3	8.2
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0.2	0	0.9	0.4	0.3	0.4

Intersection	
Intersection Delay, s/veh	10.2
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	142	78	32	254	62	29
Future Vol, veh/h	142	78	32	254	62	29
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	165	91	37	295	72	34
Number of Lanes	1	1	2	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	10.2	10.4	9.4
HCM LOS	B	B	A

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	100%	0%	87%	0%
Vol Thru, %	100%	4%	0%	0%	13%	100%
Vol Right, %	0%	96%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	21	265	142	78	72	19
LT Vol	0	0	142	0	62	0
Through Vol	21	11	0	0	10	19
RT Vol	0	254	0	78	0	0
Lane Flow Rate	25	308	165	91	83	22
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.037	0.401	0.278	0.122	0.139	0.035
Departure Headway (Hd)	5.371	4.694	6.065	4.859	6	5.563
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	665	763	589	732	595	640
Service Time	3.12	2.442	3.837	2.63	3.765	3.328
HCM Lane V/C Ratio	0.038	0.404	0.28	0.124	0.139	0.034
HCM Control Delay	8.3	10.6	11.2	8.3	9.7	8.5
HCM Lane LOS	A	B	B	A	A	A
HCM 95th-tile Q	0.1	1.9	1.1	0.4	0.5	0.1

Intersection

Int Delay, s/veh 7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	68	82	2	6	16
Future Vol, veh/h	6	68	82	2	6	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
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	7	74	89	2	7	17

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	195	12	24	0	-	0
Stage 1	16	-	-	-	-	-
Stage 2	179	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	776	1065	1589	-	-	-
Stage 1	1004	-	-	-	-	-
Stage 2	834	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	733	1065	1589	-	-	-
Mov Cap-2 Maneuver	733	-	-	-	-	-
Stage 1	948	-	-	-	-	-
Stage 2	834	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.8	7.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1589	-	1027	-	-
HCM Lane V/C Ratio	0.056	-	0.078	-	-
HCM Control Delay (s)	7.4	0	8.8	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.3	-	-

APPENDIX C | TRIP GENERATION & INFORMATION

USER PROVIDED TRIP GENERATION DATA

Time	Associates			Trucks			DSP Drivers			DSP Vans			Flex			Total		
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
00:00	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	1	1	2
00:30	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	1	1	2
01:00	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	1	1	2
01:30	144	0	144	1	1	2	0	0	0	0	0	0	0	0	0	145	1	146
02:00	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	1	1	2
02:30	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	1	1	2
03:00	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	1	1	2
03:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	1	1	2
04:30	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	1	1	2
05:00	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	1	1	2
05:30	51	0	51	1	1	2	0	0	0	0	0	0	0	0	52	1	53	
06:00	0	0	0	1	1	2	0	0	0	0	0	0	0	0	1	1	2	
06:30	0	0	0	1	1	2	0	0	0	0	0	0	0	0	1	1	2	
07:00	0	0	0	1	1	2	0	0	0	0	0	0	0	0	1	1	2	
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	1	1
09:00	0	0	0	1	1	2	37	0	37	0	0	37	0	0	38	1	39	39
09:30	0	0	0	1	1	2	149	0	149	0	0	149	0	0	150	1	151	151
10:00	0	0	0	1	1	2	162	0	162	0	0	162	0	0	162	113	275	275
10:30	0	0	0	0	0	0	23	0	23	0	0	23	0	0	23	224	247	247
11:00	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	35	36	36
11:30	8	0	8	0	1	1	0	0	0	0	0	0	0	0	8	1	9	9
12:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30	0	144	144	0	0	0	0	0	0	0	0	0	0	0	0	144	144	144
13:00	51	0	51	0	0	0	0	0	0	0	0	0	0	0	51	0	51	51
13:30	38	0	38	0	0	0	0	0	0	0	0	0	0	0	38	0	38	38
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30	0	51	51	0	0	0	0	0	0	0	0	0	0	0	0	51	51	51
15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	0	90	90
16:30	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	45	46	46
17:00	0	0	0	1	1	2	0	0	0	0	0	0	0	0	1	46	47	47
17:30	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1	1
18:00	0	38	38	1	0	1	0	0	0	0	0	0	0	0	1	38	39	39
18:30	0	0	0	1	1	2	0	0	0	0	0	0	0	0	1	1	2	2
19:00	0	0	0	1	1	2	28	28	28	0	0	28	0	0	29	29	58	58
19:30	0	0	0	1	1	2	56	56	56	0	0	140	0	0	141	57	198	198
20:00	0	0	0	1	1	2	177	177	177	0	0	93	0	0	94	178	272	272
20:30	0	0	0	1	1	2	65	65	65	102	102	102	0	0	103	66	169	169
21:00	0	0	0	1	1	2	45	45	45	8	8	8	0	0	9	46	55	55
21:30	0	0	0	1	1	2	0	0	0	0	0	0	0	0	1	1	2	2
22:00	0	51	51	1	1	2	0	0	0	0	0	0	0	0	1	52	53	53
22:30	0	8	8	1	1	2	0	0	0	0	0	0	0	0	1	9	10	10
23:00	0	0	0	1	1	2	0	0	0	0	0	0	0	0	1	1	2	2
23:30	0	0	0	1	1	2	0	0	0	0	0	0	0	0	1	1	2	2
Total	292	292	584	32	32	64	371	371	742	371	371	742	90	90	180	1,156	1,156	2,312

APPENDIX D | TRIP DISTRIBUTION AND ASSIGNMENT FIGURES

- FIGURE D-1A / D-1B – Trip Distribution for Employees
- FIGURE D-1C / D-1D – Trip Distribution for Service Vehicles

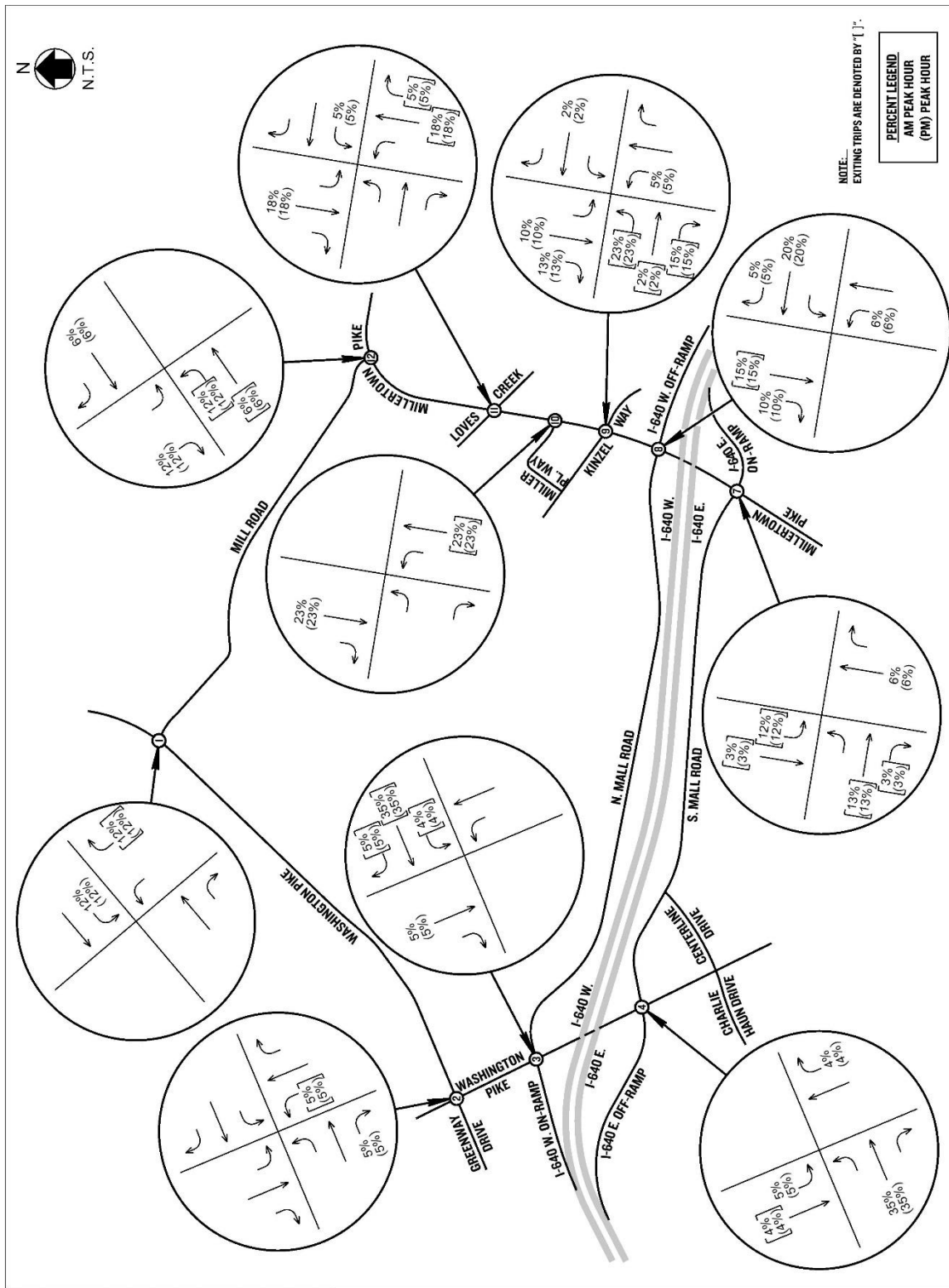


FIGURE D-1A
TRIP DISTRIBUTION FOR EMPLOYEES (STUDY AREA)

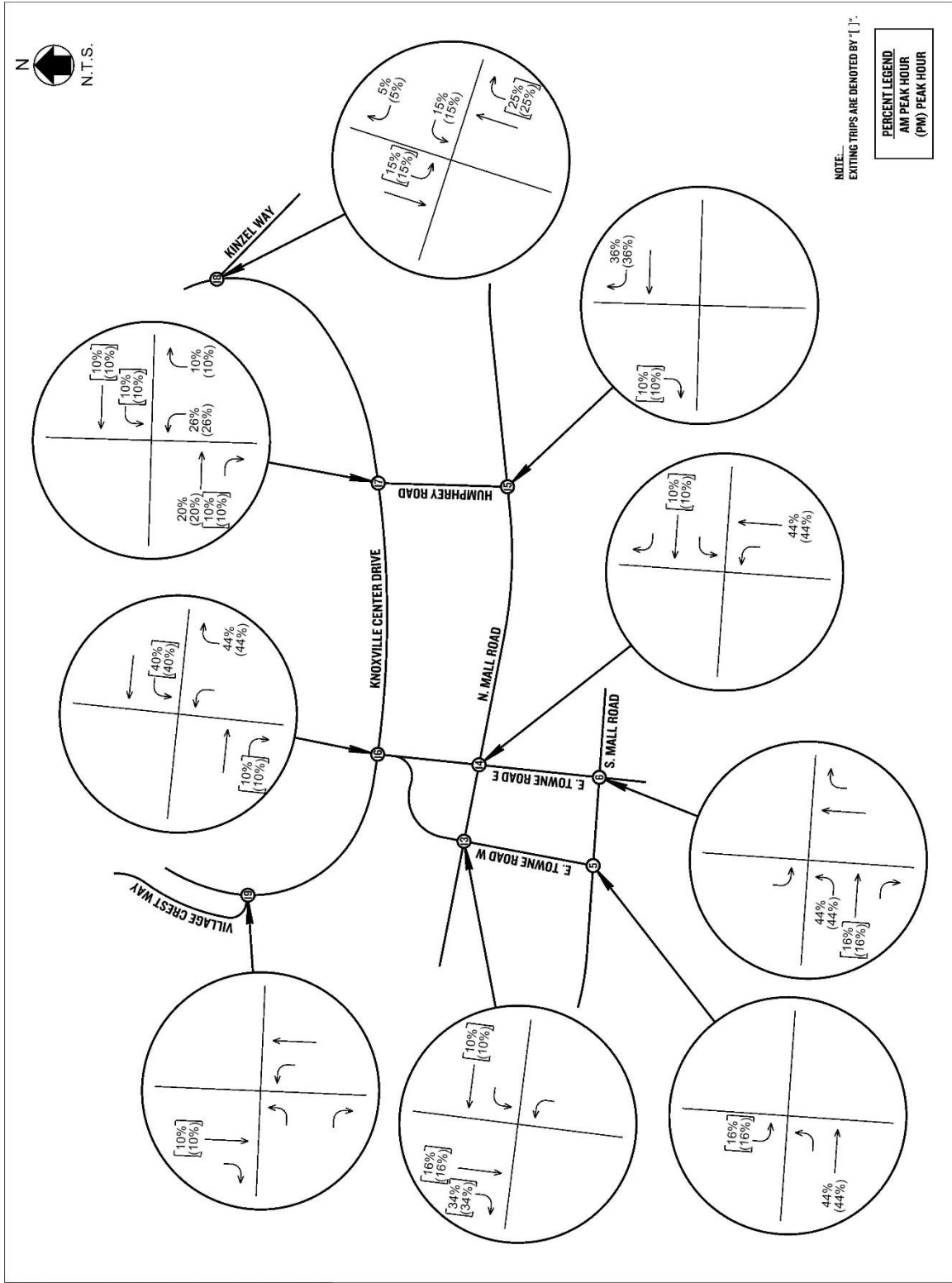


FIGURE D-1B
 TRIP DISTRIBUTION FOR EMPLOYEES (SITE VICINITY)

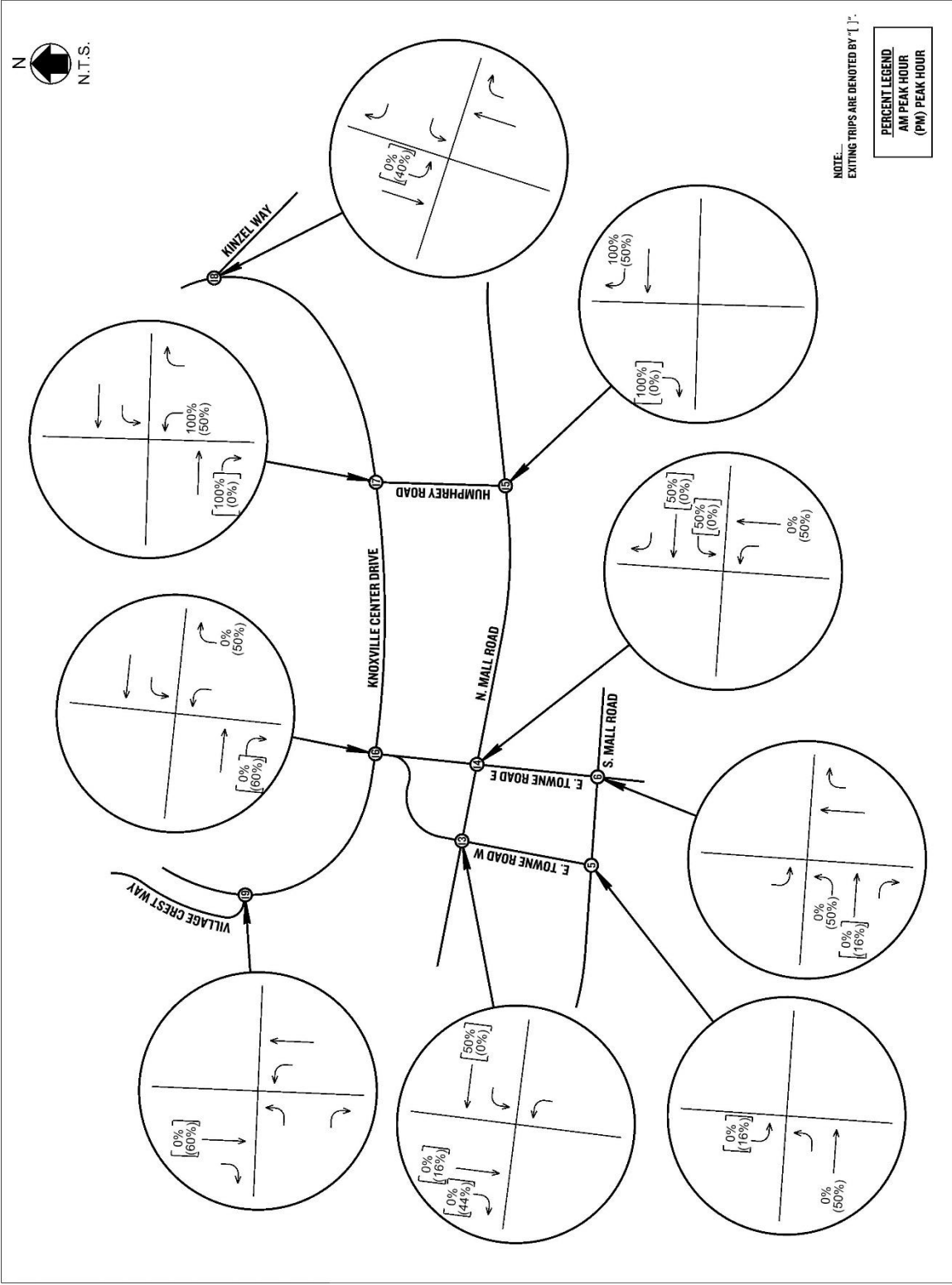


FIGURE D-1D
TRIP DISTRIBUTION FOR SERVICE VEHICLES (SITE VICINITY)

APPENDIX E | ANALYSES FOR COMBINED TRAFFIC

Lanes, Volumes, Timings
1: Mill Road & Washington Pike

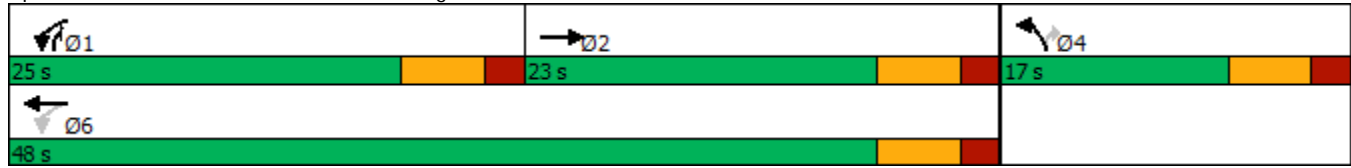
Knoxville Center TIS
2022 Combined AM

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↖	↗	↖	↗
Traffic Volume (vph)	291	58	511	1044	49	291
Future Volume (vph)	291	58	511	1044	49	291
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.978					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1822	0	1770	1863	1770	1583
Flt Permitted			0.324		0.950	
Satd. Flow (perm)	1822	0	604	1863	1770	1583
Satd. Flow (RTOR)	15					212
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Shared Lane Traffic (%)						
Lane Group Flow (vph)	392	0	574	1173	55	327
Turn Type	NA		pm+pt	NA	Prot	pm+ov
Protected Phases	2		1	6	4	1
Permitted Phases			6			4
Detector Phase	2		1	6	4	1
Switch Phase						
Minimum Initial (s)	12.0		10.0	12.0	10.0	10.0
Minimum Split (s)	19.0		17.0	19.0	17.0	17.0
Total Split (s)	23.0		25.0	48.0	17.0	25.0
Total Split (%)	35.4%		38.5%	73.8%	26.2%	38.5%
Maximum Green (s)	17.0		19.0	42.0	11.0	19.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
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)	6.0		6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	Max		None	Max	None	None
Act Effect Green (s)	21.5		42.8	45.7	10.2	23.8
Actuated g/C Ratio	0.37		0.74	0.79	0.18	0.41
v/c Ratio	0.57		0.76	0.79	0.18	0.42
Control Delay	23.1		14.1	15.0	24.7	4.9
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	23.1		14.1	15.0	24.7	4.9
LOS	C		B	B	C	A
Approach Delay	23.1			14.7	7.7	
Approach LOS	C			B	A	
Queue Length 50th (ft)	136		95	353	19	20
Queue Length 95th (ft)	#263		#240	#675	47	54
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200		100	
Base Capacity (vph)	690		841	1478	344	878
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	0.57		0.68	0.79	0.16	0.37

Intersection Summary

Cycle Length: 65	
Actuated Cycle Length: 57.6	
Natural Cycle: 75	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 14.9	Intersection LOS: B
Intersection Capacity Utilization 73.3%	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: Mill Road & Washington Pike



Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

Knoxville Center TIS
2022 Combined AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	52	294	1042	92	4	111	40	329	2	15	2
Future Volume (vph)	5	52	294	1042	92	4	111	40	329	2	15	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	3539	1583
Flt Permitted	0.692			0.463			0.444					
Satd. Flow (perm)	1289	1863	1583	862	1863	1583	827	1863	1583	1863	3539	1583
Satd. Flow (RTOR)			202			119			358			179
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	57	320	1133	100	4	121	43	358	2	16	2
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	7	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	14.0	19.0	15.0	62.0	67.0	67.0	15.0	15.0	15.0	14.0	14.0	14.0
Total Split (%)	12.7%	17.3%	13.6%	56.4%	60.9%	60.9%	13.6%	13.6%	13.6%	12.7%	12.7%	12.7%
Maximum Green (s)	9.0	13.0	10.0	57.0	61.0	61.0	10.0	10.0	10.0	9.0	9.0	9.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	C-Max	None	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	20.6	13.0	28.4	85.6	82.3	82.3	14.2	12.2	12.2	9.0	6.6	6.6
Actuated g/C Ratio	0.19	0.12	0.26	0.78	0.75	0.75	0.13	0.11	0.11	0.08	0.06	0.06
v/c Ratio	0.02	0.26	0.57	0.93	0.07	0.00	0.65	0.21	0.73	0.01	0.08	0.01
Control Delay	20.2	47.6	17.2	27.3	6.0	0.0	50.1	37.1	22.4	36.5	48.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.2	47.6	17.2	27.3	6.0	0.0	50.1	37.1	22.4	36.5	48.9	0.0
LOS	C	D	B	C	A	A	D	D	C	D	D	A
Approach Delay		21.8			25.5			30.1			42.8	
Approach LOS		C			C			C			D	
Queue Length 50th (ft)	2	37	67	407	11	0	74	26	83	1	5	0
Queue Length 95th (ft)	8	77	159	#1030	55	0	115	57	184	8	17	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	335		170	160			150		75
Base Capacity (vph)	308	220	566	1221	1393	1213	196	216	500	195	289	293
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.26	0.57	0.93	0.07	0.00	0.62	0.20	0.72	0.01	0.06	0.01

Lanes, Volumes, Timings
 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road

Knoxville Center TIS
 2022 Combined AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↑	↗	↙	↑↑			↑↑	↗
Traffic Volume (vph)	0	0	0	24	317	113	289	387	0	0	311	1053
Future Volume (vph)	0	0	0	24	317	113	289	387	0	0	311	1053
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1770	1863	1583	1770	3539	0	0	3539	1583
Flt Permitted				0.950			0.508					
Satd. Flow (perm)	0	0	0	1770	1863	1583	946	3539	0	0	3539	1583
Satd. Flow (RTOR)							119					443
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	25	334	119	304	407	0	0	327	1108
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Free
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					Free
Detector Phase				4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0			10.0	
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0			19.0	
Total Split (s)				46.0	46.0	46.0	33.0	64.0			31.0	
Total Split (%)				41.8%	41.8%	41.8%	30.0%	58.2%			28.2%	
Maximum Green (s)				40.0	40.0	40.0	28.0	58.0			25.0	
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5			4.5	
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5			1.5	
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	
Total Lost Time (s)				6.0	6.0	6.0	5.0	6.0			6.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			2.0	
Recall Mode				None	None	None	None	C-Max			C-Max	
Act Effect Green (s)				25.7	25.7	25.7	73.3	72.3			54.6	110.0
Actuated g/C Ratio				0.23	0.23	0.23	0.67	0.66			0.50	1.00
v/c Ratio				0.06	0.77	0.26	0.42	0.18			0.19	0.70
Control Delay				29.8	50.6	6.7	8.3	5.6			11.9	3.0
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				29.8	50.6	6.7	8.3	5.6			11.9	3.0
LOS				C	D	A	A	A			B	A
Approach Delay					38.6			6.7			5.1	
Approach LOS					D			A			A	
Queue Length 50th (ft)				14	222	0	94	50			64	0
Queue Length 95th (ft)				33	291	41	156	100			m84	m35
Internal Link Dist (ft)		569			2042			923			673	
Turn Bay Length (ft)						475	105					100
Base Capacity (vph)				643	677	651	839	2324			1757	1583
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	0.49	0.18	0.36	0.18			0.19	0.70

Lanes, Volumes, Timings

Knoxville Center TIS

4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road

2022 Combined AM

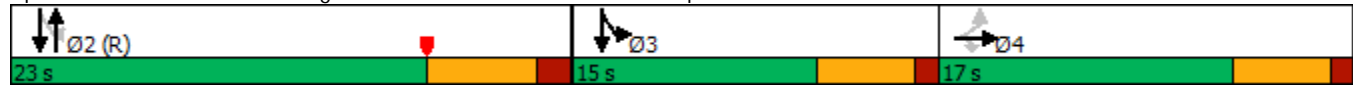
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	188	205	0	0	0	0	407	35	123	233	0
Future Volume (vph)	250	188	205	0	0	0	0	407	35	123	233	0
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	3539	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.491		
Satd. Flow (perm)	3433	3539	1583	0	0	0	0	3539	1583	915	3539	0
Satd. Flow (RTOR)			228							139		
Peak Hour Factor	0.90	0.78	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	278	241	228	0	0	0	0	452	39	137	259	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	17.0	17.0	17.0					23.0	23.0	15.0		
Total Split (%)	30.9%	30.9%	30.9%					41.8%	41.8%	27.3%		
Maximum Green (s)	12.0	12.0	12.0					17.0	17.0	10.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	10.4	10.4	10.4					22.3	22.3	29.6	33.6	
Actuated g/C Ratio	0.19	0.19	0.19					0.41	0.41	0.54	0.61	
v/c Ratio	0.43	0.36	0.47					0.31	0.05	0.23	0.12	
Control Delay	21.1	20.3	6.6					12.8	0.1	5.7	3.5	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	21.1	20.3	6.6					12.8	0.1	5.7	3.5	
LOS	C	C	A					B	A	A	A	
Approach Delay		16.4						11.8			4.3	
Approach LOS		B						B			A	
Queue Length 50th (ft)	42	37	0					48	0	16	16	
Queue Length 95th (ft)	63	48	42					95	0	51	30	
Internal Link Dist (ft)		2101			1667			717			923	
Turn Bay Length (ft)	400		265						150	120		
Base Capacity (vph)	783	807	536					1436	725	709	2401	
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	0.36	0.30	0.43					0.31	0.05	0.19	0.11	

Intersection Summary

Cycle Length: 55
 Actuated Cycle Length: 55
 Offset: 48 (87%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.47
 Intersection Signal Delay: 12.1
 Intersection Capacity Utilization 55.5%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service B

Splits and Phases: 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road



Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↑	
Traffic Vol, veh/h	0	394	0	0	33	0
Future Vol, veh/h	0	394	0	0	33	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	469	0	0	39	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	235	-
Stage 1	-	-	0	-
Stage 2	-	-	235	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	732	0
Stage 1	0	-	-	0
Stage 2	0	-	782	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	732	-
Mov Cap-2 Maneuver	-	-	732	-
Stage 1	-	-	-	-
Stage 2	-	-	782	-

Approach	EB	SB
HCM Control Delay, s	0	10.2
HCM LOS		B

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	732
HCM Lane V/C Ratio	-	0.054
HCM Control Delay (s)	-	10.2
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.2

Intersection												
Int Delay, s/veh	0.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗						↘				
Traffic Vol, veh/h	79	335	14	0	0	0	0	0	6	0	0	0
Future Vol, veh/h	79	335	14	0	0	0	0	0	6	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	116	390	16	0	0	0	0	0	7	0	0	0

Major/Minor	Major1			Minor1		
Conflicting Flow All	0	0	0	-	630	203
Stage 1	-	-	-	-	630	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.14	-	-	-	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.22	-	-	-	4.02	3.32
Pot Cap-1 Maneuver	-	-	-	0	397	804
Stage 1	-	-	-	0	473	-
Stage 2	-	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	0	804
Mov Cap-2 Maneuver	-	-	-	-	0	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-

Approach	EB	NB
HCM Control Delay, s		9.5
HCM LOS		A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	804	-	-	-
HCM Lane V/C Ratio	0.009	-	-	-
HCM Control Delay (s)	9.5	-	-	-
HCM Lane LOS	A	-	-	-
HCM 95th %tile Q(veh)	0	-	-	-

Lanes, Volumes, Timings
7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

Knoxville Center TIS
2022 Combined AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	137	25	0	0	0	0	92	100	630	236	0
Future Volume (vph)	125	137	25	0	0	0	0	92	100	630	236	0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.996								0.950		
Satd. Flow (prot)	1681	1763	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.996								0.690		
Satd. Flow (perm)	1681	1763	1583	0	0	0	0	3539	1583	1285	3539	0
Satd. Flow (RTOR)			85							108		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)	10%											
Lane Group Flow (vph)	121	160	27	0	0	0	0	99	108	677	254	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	20.0	20.0	20.0					35.0	35.0	35.0		
Total Split (%)	22.2%	22.2%	22.2%					38.9%	38.9%	38.9%		
Maximum Green (s)	15.0	15.0	15.0					30.0	30.0	30.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	12.1	12.1	12.1					42.5	42.5	62.9	67.9	
Actuated g/C Ratio	0.13	0.13	0.13					0.47	0.47	0.70	0.75	
v/c Ratio	0.54	0.68	0.09					0.06	0.13	0.67	0.10	
Control Delay	44.8	51.3	0.6					16.8	4.8	7.4	1.7	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	44.8	51.3	0.6					16.8	4.8	7.4	1.7	
LOS	D	D	A					B	A	A	A	
Approach Delay		44.3						10.5			5.8	
Approach LOS		D						B			A	
Queue Length 50th (ft)	68	91	0					16	0	61	10	
Queue Length 95th (ft)	122	155	0					37	34	95	10	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	280	293	334					1672	805	1185	3017	
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	0.43	0.55	0.08					0.06	0.13	0.57	0.08	

Intersection Summary




















Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 74 (82%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.68	
Intersection Signal Delay: 14.7	Intersection LOS: B
Intersection Capacity Utilization 72.1%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp



Lanes, Volumes, Timings
 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp

Knoxville Center TIS
 2022 Combined AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	83	131	293	24	191	0	0	776	301
Future Volume (vph)	0	0	0	83	131	293	24	191	0	0	776	301
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.997		0.950					
Satd. Flow (prot)	0	0	0	1681	1764	2787	1770	3539	0	0	3539	1583
Flt Permitted				0.950	0.997		0.311					
Satd. Flow (perm)	0	0	0	1681	1764	2787	579	3539	0	0	3539	1583
Satd. Flow (RTOR)						326						334
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	0	83	155	326	27	212	0	0	862	334
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2				2
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2				2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				34.0	34.0	34.0	56.0	56.0			56.0	56.0
Total Split (%)				37.8%	37.8%	37.8%	62.2%	62.2%			62.2%	62.2%
Maximum Green (s)				27.0	27.0	27.0	50.0	50.0			50.0	50.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)				7.0	7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)				14.6	14.6	14.6	62.4	62.4			62.4	62.4
Actuated g/C Ratio				0.16	0.16	0.16	0.69	0.69			0.69	0.69
v/c Ratio				0.30	0.54	0.45	0.07	0.09			0.35	0.28
Control Delay				34.6	40.8	5.6	1.9	2.6			4.2	1.2
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				34.6	40.8	5.6	1.9	2.6			4.2	1.2
LOS				C	D	A	A	A			A	A
Approach Delay					19.6			2.5			3.4	
Approach LOS					B			A			A	
Queue Length 50th (ft)				44	87	0	0	0			45	0
Queue Length 95th (ft)				82	138	35	m0	1			56	9
Internal Link Dist (ft)		1096			1137			650			484	
Turn Bay Length (ft)				450		800	95					
Base Capacity (vph)				504	529	1064	401	2452			2452	1199
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				0.16	0.29	0.31	0.07	0.09			0.35	0.28

Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way

Knoxville Center TIS
2022 Combined AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	19	10	158	14	54	11	325	118	60	916	51
Future Volume (vph)	21	19	10	158	14	54	11	325	118	60	916	51
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.941				0.850			0.850			0.850
Flt Protected	0.950			0.950	0.960		0.950			0.950		
Satd. Flow (prot)	1770	1753	0	1681	1699	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950	0.960		0.272			0.950		
Satd. Flow (perm)	1770	1753	0	1681	1699	1583	507	3539	1583	1770	3539	1583
Satd. Flow (RTOR)		13				85			124			85
Peak Hour Factor	0.79	0.95	0.78	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	27	33	0	90	91	57	12	342	124	63	964	54
Turn Type	Split	NA		Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4		3	3	1	5	2	3	1	6	4
Permitted Phases						3	2		2			6
Detector Phase	4	4		3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0		16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	16.0	16.0		16.0	16.0	14.0	14.0	44.0	16.0	14.0	44.0	16.0
Total Split (%)	17.8%	17.8%		17.8%	17.8%	15.6%	15.6%	48.9%	17.8%	15.6%	48.9%	17.8%
Maximum Green (s)	11.0	11.0		11.0	11.0	9.0	9.0	39.0	11.0	9.0	39.0	11.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)	7.5	7.5		9.5	9.5	18.4	54.5	49.7	65.2	7.9	58.2	67.3
Actuated g/C Ratio	0.08	0.08		0.11	0.11	0.20	0.61	0.55	0.72	0.09	0.65	0.75
v/c Ratio	0.18	0.21		0.51	0.51	0.15	0.03	0.18	0.10	0.41	0.42	0.04
Control Delay	41.1	30.2		48.0	47.8	2.6	4.9	9.1	1.7	55.9	5.4	0.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.1	30.2		48.0	47.8	2.6	4.9	9.1	1.7	55.9	5.4	0.2
LOS	D	C		D	D	A	A	A	A	E	A	A
Approach Delay		35.1			37.1			7.0			8.1	
Approach LOS		D			D			A			A	
Queue Length 50th (ft)	15	11		51	51	0	1	33	0	36	44	0
Queue Length 95th (ft)	35	39		101	101	11	m7	69	20	m58	73	m0
Internal Link Dist (ft)		713			953			484			243	
Turn Bay Length (ft)	290			155		245	180		180	120		105
Base Capacity (vph)	216	225		205	207	415	446	1953	1188	184	2288	1200
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.15		0.44	0.44	0.14	0.03	0.18	0.10	0.34	0.42	0.04

Timing Plan: AM Peak
Cannon & Cannon, Inc.

Synchro 10 Report
Page 15

Intersection

Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	2	5	407	994	8
Future Vol, veh/h	0	2	5	407	994	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	2	5	447	1092	9

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1331	1097	1101	0	-	0
Stage 1	1097	-	-	-	-	-
Stage 2	234	-	-	-	-	-
Critical Hdwy	6.63	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	158	258	632	-	-	-
Stage 1	319	-	-	-	-	-
Stage 2	783	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	156	258	632	-	-	-
Mov Cap-2 Maneuver	156	-	-	-	-	-
Stage 1	315	-	-	-	-	-
Stage 2	783	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	19.1	0.2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	632	-	-	258	-	-
HCM Lane V/C Ratio	0.009	-	-	0.009	-	-
HCM Control Delay (s)	10.7	0.1	0	19.1	-	-
HCM Lane LOS	B	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	-	0	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road













Knoxville Center TIS
2022 Combined AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	2	30	86	12	77	20	306	44	123	886	2
Future Volume (vph)	6	2	30	86	12	77	20	306	44	123	886	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.859			0.871			0.981				
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1600	0	1770	1622	0	1770	1827	0	1770	1863	0
Flt Permitted	0.696			0.421			0.122			0.437		
Satd. Flow (perm)	1296	1600	0	784	1622	0	227	1827	0	814	1863	0
Satd. Flow (RTOR)		32			81			10				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	6	34	0	91	94	0	21	368	0	129	935	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	15.0	16.0		15.0	16.0		15.0	24.0		14.0	24.0	
Total Split (s)	15.0	16.0		15.0	16.0		15.0	45.0		14.0	44.0	
Total Split (%)	16.7%	17.8%		16.7%	17.8%		16.7%	50.0%		15.6%	48.9%	
Maximum Green (s)	10.0	11.0		10.0	11.0		10.0	40.0		9.0	39.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effect Green (s)	10.7	7.3		16.2	14.3		59.6	53.5		64.6	62.2	
Actuated g/C Ratio	0.12	0.08		0.18	0.16		0.66	0.59		0.72	0.69	
v/c Ratio	0.03	0.22		0.38	0.29		0.08	0.34		0.20	0.73	
Control Delay	25.7	18.0		33.5	12.3		7.4	11.6		6.4	19.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	25.7	18.0		33.5	12.3		7.4	11.6		6.4	19.8	
LOS	C	B		C	B		A	B		A	B	
Approach Delay		19.1			22.7			11.4			18.2	
Approach LOS		B			C			B			B	
Queue Length 50th (ft)	3	1		42	6		3	58		25	333	
Queue Length 95th (ft)	12	29		79	50		14	147		50	#800	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)				175						65		
Base Capacity (vph)	263	223		260	350		331	1089		682	1286	
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	0.02	0.15		0.35	0.27		0.06	0.34		0.19	0.73	

Lanes, Volumes, Timings
12: Millertown Pike & Mill Road

Knoxville Center TIS
2022 Combined AM

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	42	551	258	119	472	95
Future Volume (vph)	42	551	258	119	472	95
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.977	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1820	0
Flt Permitted	0.950		0.167			
Satd. Flow (perm)	1770	1583	311	1863	1820	0
Satd. Flow (RTOR)		213			17	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)						
Lane Group Flow (vph)	45	592	277	128	610	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	13.5	22.0	22.0	56.5	34.5	
Total Split (%)	19.3%	31.4%	31.4%	80.7%	49.3%	
Maximum Green (s)	8.0	16.5	16.5	50.5	28.5	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	8.6	22.4	45.9	48.8	23.8	
Actuated g/C Ratio	0.15	0.38	0.78	0.83	0.41	
v/c Ratio	0.17	0.80	0.44	0.08	0.81	
Control Delay	29.5	19.8	7.2	2.7	27.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	29.5	19.8	7.2	2.7	27.3	
LOS	C	B	A	A	C	
Approach Delay	20.5			5.8	27.3	
Approach LOS	C			A	C	
Queue Length 50th (ft)	18	129	30	13	219	
Queue Length 95th (ft)	46	255	87	25	#396	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85	330			
Base Capacity (vph)	260	787	685	1552	961	
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	0.17	0.75	0.40	0.08	0.63	

Intersection Summary

Cycle Length: 70	
Actuated Cycle Length: 58.6	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 19.4	Intersection LOS: B
Intersection Capacity Utilization 74.3%	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.	

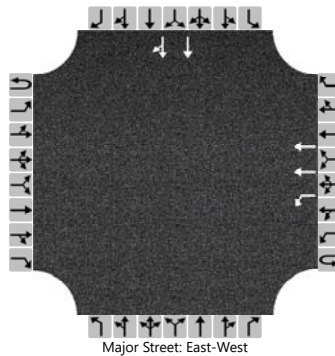
Splits and Phases: 12: Millertown Pike & Mill Road



HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	BJH			Intersection	N Mall Rd at East Towne W		
Agency/Co.	Cannon & Cannon, Inc.			Jurisdiction	City of Knoxville		
Date Performed	12/15/2020			East/West Street	North Mall Road		
Analysis Year	2022			North/South Street	East Towne Road (West)		
Time Analyzed	AM Peak			Peak Hour Factor	0.84		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Combined 2022 AM						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	0	0	0	1	2	0		0	0	0		0	2	0
Configuration						L	T								T	TR
Volume (veh/h)						8	403								32	0
Percent Heavy Vehicles (%)						2									2	2
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						5.3									6.5	6.9
Critical Headway (sec)						0.00									6.54	6.94
Base Follow-Up Headway (sec)						3.1									4.0	3.3
Follow-Up Headway (sec)						3.12									4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						10									19	19
Capacity, c (veh/h)						1154									468	468
v/c Ratio						0.01									0.04	0.04
95% Queue Length, Q ₉₅ (veh)						0.0									0.1	0.1
Control Delay (s/veh)						8.1									13.0	13.0
Level of Service (LOS)						A									B	B
Approach Delay (s/veh)						0.2									13.0	
Approach LOS															B	

Intersection	
Intersection Delay, s/veh	10.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑↑				
Traffic Vol, veh/h	0	0	0	0	398	11	2	75	0	0	0	0
Future Vol, veh/h	0	0	0	0	398	11	2	75	0	0	0	0
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.63	0.72	0.72	0.72	0.72
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	553	15	3	119	0	0	0	0
Number of Lanes	0	0	0	0	2	0	0	2	0	0	0	0

Approach	WB	NB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NB	
Conflicting Lanes Left	2	0
Conflicting Approach Right		WB
Conflicting Lanes Right	0	2
HCM Control Delay	11.3	9.3
HCM LOS	B	A

Lane	NBLn1	NBLn2	WBLn1	WBLn2
Vol Left, %	7%	0%	0%	0%
Vol Thru, %	93%	100%	100%	92%
Vol Right, %	0%	0%	0%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	27	50	265	144
LT Vol	2	0	0	0
Through Vol	25	50	265	133
RT Vol	0	0	0	11
Lane Flow Rate	42	79	369	200
Geometry Grp	7	7	7	7
Degree of Util (X)	0.069	0.129	0.5	0.268
Departure Headway (Hd)	5.879	5.842	4.885	4.832
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	609	613	737	744
Service Time	3.613	3.576	2.609	2.556
HCM Lane V/C Ratio	0.069	0.129	0.501	0.269
HCM Control Delay	9.1	9.4	12.4	9.3
HCM Lane LOS	A	A	B	A
HCM 95th-tile Q	0.2	0.4	2.8	1.1

Intersection

Int Delay, s/veh 0.1

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations			↑↑			↑
Traffic Vol, veh/h	0	0	416	75	0	6
Future Vol, veh/h	0	0	416	75	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	83	83	83	60	83	83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	501	125	0	7

Major/Minor Major2 Minor2

Conflicting Flow All	-	0	-	313
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	683
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	683
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach WB SB

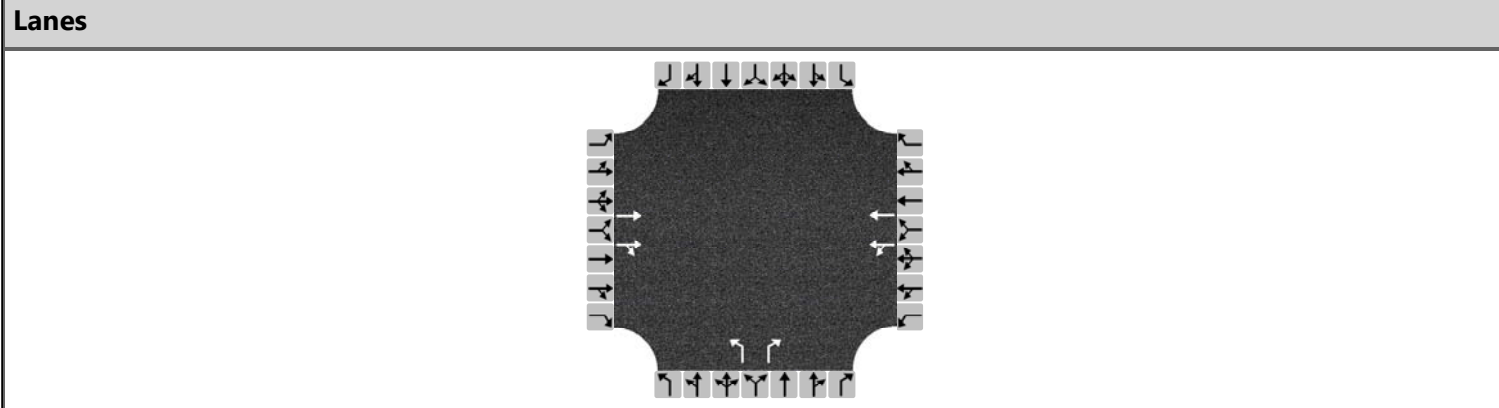
HCM Control Delay, s	0	10.3
HCM LOS		B

Minor Lane/Major Mvmt WBT WBR SBLn1

Capacity (veh/h)	-	-	683
HCM Lane V/C Ratio	-	-	0.011
HCM Control Delay (s)	-	-	10.3
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	BJH	Intersection	Knoxville Ctr at E Towne
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	City of Knoxville
Date Performed	12/15/2020	East/West Street	Knoxville Center Drive
Analysis Year	2022	North/South Street	East Towne Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.75
Time Analyzed	AM Peak		
Project Description	Combined 2022 AM		



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume		12	250	18	8		15		152			
% Thrus in Shared Lane			50	50								
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	T	TR		LT	T		L	R				
Flow Rate, v (veh/h)	8	341		29	5		20	203				
Percent Heavy Vehicles	2	2		2	2		2	2				

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20				
Initial Degree of Utilization, x	0.007	0.303		0.026	0.005		0.018	0.180				
Final Departure Headway, hd (s)	5.14	4.45		5.82	5.40		5.89	4.69				
Final Degree of Utilization, x	0.011	0.422		0.047	0.008		0.033	0.264				
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3				
Service Time, ts (s)	2.84	2.15		3.52	3.10		3.59	2.39				

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	8	341		29	5		20	203				
Capacity	701	809		619	666		612	768				
95% Queue Length, Q ₉₅ (veh)	0.0	2.1		0.1	0.0		0.1	1.1				
Control Delay (s/veh)	7.9	10.4		8.8	8.1		8.8	9.1				
Level of Service, LOS	A	B		A	A		A	A				
Approach Delay (s/veh)	10.3			8.7			9.0					
Approach LOS	B			A			A					
Intersection Delay, s/veh LOS	9.7						A					

Intersection	
Intersection Delay, s/veh	8.5
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↖	↗
Traffic Vol, veh/h	112	2	5	24	59	19
Future Vol, veh/h	112	2	5	24	59	19
Peak Hour Factor	0.68	0.74	0.74	0.74	0.59	0.59
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	165	3	7	32	100	32
Number of Lanes	2	0	0	2	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	8.3	8	8.8
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	38%	0%
Vol Thru, %	0%	0%	100%	95%	62%	100%
Vol Right, %	0%	100%	0%	5%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	59	19	75	39	13	16
LT Vol	59	0	0	0	5	0
Through Vol	0	0	75	37	8	16
RT Vol	0	19	0	2	0	0
Lane Flow Rate	100	32	110	58	18	22
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.154	0.039	0.15	0.078	0.026	0.03
Departure Headway (Hd)	5.541	4.338	4.93	4.894	5.238	5.044
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	650	828	730	734	685	711
Service Time	3.255	2.052	2.645	2.609	2.956	2.763
HCM Lane V/C Ratio	0.154	0.039	0.151	0.079	0.026	0.031
HCM Control Delay	9.3	7.2	8.5	8	8.1	7.9
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0.5	0.1	0.5	0.3	0.1	0.1

Intersection	
Intersection Delay, s/veh	9.2
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	88	17	6	68	140	5
Future Vol, veh/h	88	17	6	68	140	5
Peak Hour Factor	0.76	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	116	20	7	79	163	6
Number of Lanes	1	1	2	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	9.4	7.6	9.9
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	100%	0%	99%	0%
Vol Thru, %	100%	3%	0%	0%	1%	100%
Vol Right, %	0%	97%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	4	70	88	17	142	3
LT Vol	0	0	88	0	140	0
Through Vol	4	2	0	0	2	3
RT Vol	0	68	0	17	0	0
Lane Flow Rate	5	81	116	20	165	4
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.007	0.1	0.183	0.025	0.251	0.005
Departure Headway (Hd)	5.086	4.402	5.684	4.48	5.484	4.987
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	704	814	632	799	656	718
Service Time	2.812	2.128	3.409	2.205	3.208	2.711
HCM Lane V/C Ratio	0.007	0.1	0.184	0.025	0.252	0.006
HCM Control Delay	7.8	7.6	9.7	7.3	10	7.7
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0	0.3	0.7	0.1	1	0

Intersection						
Int Delay, s/veh	2.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	0	74	12	4	206	2
Future Vol, veh/h	0	74	12	4	206	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	86	14	5	240	2

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	272	121	242	0	-	0
Stage 1	241	-	-	-	-	-
Stage 2	31	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	695	908	1322	-	-	-
Stage 1	776	-	-	-	-	-
Stage 2	987	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	687	908	1322	-	-	-
Mov Cap-2 Maneuver	687	-	-	-	-	-
Stage 1	767	-	-	-	-	-
Stage 2	987	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.4	5.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1322	-	908	-	-
HCM Lane V/C Ratio	0.011	-	0.095	-	-
HCM Control Delay (s)	7.8	0	9.4	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Lanes, Volumes, Timings
1: Mill Road & Washington Pike

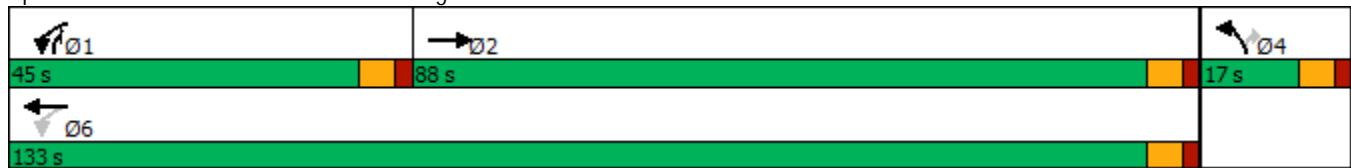
Knoxville Center TIS
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	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↖	↗	↖	↗
Traffic Volume (vph)	909	114	318	472	86	646
Future Volume (vph)	909	114	318	472	86	646
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.985					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1835	0	1770	1863	1770	1583
Flt Permitted			0.045		0.950	
Satd. Flow (perm)	1835	0	84	1863	1770	1583
Satd. Flow (RTOR)	7					107
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1077	0	335	497	91	680
Turn Type	NA		pm+pt	NA	Prot	pm+ov
Protected Phases	2		1	6	4	1
Permitted Phases			6			4
Detector Phase	2		1	6	4	1
Switch Phase						
Minimum Initial (s)	12.0		10.0	12.0	10.0	10.0
Minimum Split (s)	19.0		17.0	19.0	17.0	17.0
Total Split (s)	88.0		45.0	133.0	17.0	45.0
Total Split (%)	58.7%		30.0%	88.7%	11.3%	30.0%
Maximum Green (s)	82.0		39.0	127.0	11.0	39.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
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)	6.0		6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	Max		None	Max	None	None
Act Effect Green (s)	82.0		127.0	127.0	10.8	55.8
Actuated g/C Ratio	0.55		0.85	0.85	0.07	0.37
v/c Ratio	1.07		0.66	0.31	0.72	1.04
Control Delay	81.7		44.6	2.9	97.2	83.0
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	81.7		44.6	2.9	97.2	83.0
LOS	F		D	A	F	F
Approach Delay	81.7			19.7	84.6	
Approach LOS	F			B	F	
Queue Length 50th (ft)	~1163		238	80	89	~643
Queue Length 95th (ft)	#1430		353	107	#175	#892
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200		100	
Base Capacity (vph)	1007		510	1579	129	657
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	1.07		0.66	0.31	0.71	1.04

Intersection Summary

Cycle Length: 150	
Actuated Cycle Length: 149.8	
Natural Cycle: 140	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 1.07	
Intersection Signal Delay: 63.3	Intersection LOS: E
Intersection Capacity Utilization 104.8%	ICU Level of Service G
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: Mill Road & Washington Pike



Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

Knoxville Center TIS
2022 Combined PM

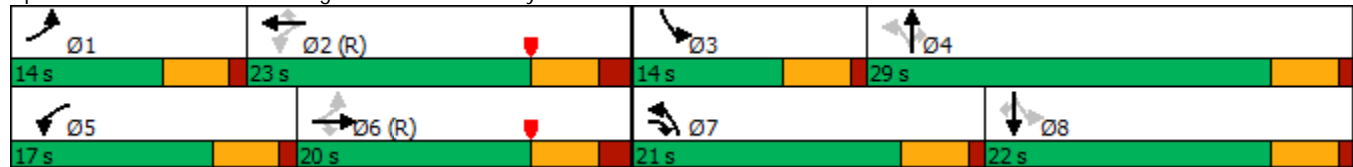


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	99	302	475	61	11	288	298	880	60	305	52
Future Volume (vph)	50	99	302	475	61	11	288	298	880	60	305	52
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	3539	1583
Flt Permitted	0.713			0.496			0.388			0.561		
Satd. Flow (perm)	1328	1863	1583	924	1863	1583	723	1863	1583	1045	3539	1583
Satd. Flow (RTOR)			114			232			734			245
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	56	110	336	528	68	12	320	331	978	67	339	58
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	7	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	14.0	20.0	21.0	17.0	23.0	23.0	21.0	29.0	29.0	14.0	22.0	22.0
Total Split (%)	17.5%	25.0%	26.3%	21.3%	28.8%	28.8%	26.3%	36.3%	36.3%	17.5%	27.5%	27.5%
Maximum Green (s)	9.0	14.0	16.0	12.0	17.0	17.0	16.0	24.0	24.0	9.0	17.0	17.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	C-Max	None	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	22.9	14.0	33.5	33.3	25.1	25.1	35.8	26.4	26.4	23.9	17.3	17.3
Actuated g/C Ratio	0.29	0.18	0.42	0.42	0.31	0.31	0.45	0.33	0.33	0.30	0.22	0.22
v/c Ratio	0.13	0.34	0.46	0.99	0.12	0.02	0.64	0.54	0.97	0.18	0.44	0.11
Control Delay	16.3	32.3	12.6	62.2	25.3	0.1	11.8	16.5	30.4	13.9	29.1	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.3	32.3	12.6	62.2	25.3	0.1	11.8	16.5	30.4	13.9	29.1	0.4
LOS	B	C	B	E	C	A	B	B	C	B	C	A
Approach Delay		17.3			56.8			23.9			23.3	
Approach LOS		B			E			C			C	
Queue Length 50th (ft)	17	49	73	~250	28	0	32	123	376	17	75	0
Queue Length 95th (ft)	39	95	134	#377	61	0	52	192	#442	38	117	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	335		170	160			150		75
Base Capacity (vph)	448	326	775	534	583	655	532	613	1013	425	811	551
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.34	0.43	0.99	0.12	0.02	0.60	0.54	0.97	0.16	0.42	0.11

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 68 (85%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.99	
Intersection Signal Delay: 29.0	Intersection LOS: C
Intersection Capacity Utilization 81.2%	ICU Level of Service D
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: 2: Washington Pike & Greenway Drive



Lanes, Volumes, Timings
 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road

Knoxville Center TIS
 2022 Combined PM

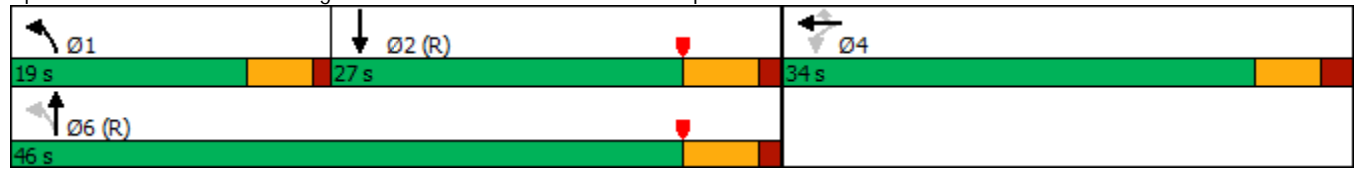


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↶	↷	↷	↶	↷			↷	↷
Traffic Volume (vph)	0	0	0	108	375	307	241	1178	0	0	568	493
Future Volume (vph)	0	0	0	108	375	307	241	1178	0	0	568	493
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1770	1863	1583	1770	3539	0	0	3539	1583
Flt Permitted				0.950			0.288					
Satd. Flow (perm)	0	0	0	1770	1863	1583	536	3539	0	0	3539	1583
Satd. Flow (RTOR)							109					371
Peak Hour Factor	0.92	0.92	0.92	0.92	0.86	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	117	436	334	262	1280	0	0	617	536
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Free
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					Free
Detector Phase				4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0			10.0	
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0			19.0	
Total Split (s)				34.0	34.0	34.0	19.0	46.0			27.0	
Total Split (%)				42.5%	42.5%	42.5%	23.8%	57.5%			33.8%	
Maximum Green (s)				28.0	28.0	28.0	14.0	40.0			21.0	
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5			4.5	
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5			1.5	
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	
Total Lost Time (s)				6.0	6.0	6.0	5.0	6.0			6.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			2.0	
Recall Mode				None	None	None	None	C-Max			C-Max	
Act Effect Green (s)				24.0	24.0	24.0	45.0	44.0			28.4	80.0
Actuated g/C Ratio				0.30	0.30	0.30	0.56	0.55			0.36	1.00
v/c Ratio				0.22	0.78	0.61	0.56	0.66			0.49	0.34
Control Delay				20.7	35.6	20.0	8.3	6.3			26.9	0.5
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				20.7	35.6	20.0	8.3	6.3			26.9	0.5
LOS				C	D	C	A	A			C	A
Approach Delay					27.8			6.7			14.6	
Approach LOS					C			A			B	
Queue Length 50th (ft)				42	190	89	7	38			166	0
Queue Length 95th (ft)				77	264	165	m39	172			m204	m0
Internal Link Dist (ft)		569			2042			923			673	
Turn Bay Length (ft)						475	105					100
Base Capacity (vph)				619	652	624	517	1947			1256	1583
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				0.19	0.67	0.54	0.51	0.66			0.49	0.34

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 20 (25%), Referenced to phase 2:SBT and 6:NBTL, Start of Yellow
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.78
 Intersection Signal Delay: 14.4
 Intersection LOS: B
 Intersection Capacity Utilization 69.6%
 ICU Level of Service C
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road



Lanes, Volumes, Timings
 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road

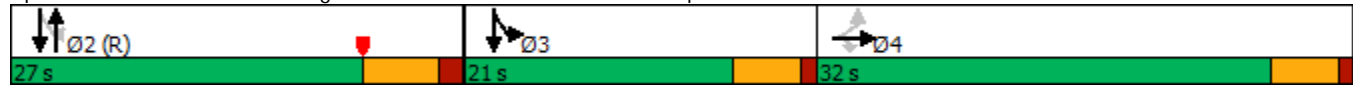
Knoxville Center TIS
 2022 Combined PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	862	533	358	0	0	0	0	549	55	327	348	0
Future Volume (vph)	862	533	358	0	0	0	0	549	55	327	348	0
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	3539	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.340		
Satd. Flow (perm)	3433	3539	1583	0	0	0	0	3539	1583	633	3539	0
Satd. Flow (RTOR)			377							95		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	907	561	377	0	0	0	0	578	58	344	366	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	32.0	32.0	32.0					27.0	27.0	21.0		
Total Split (%)	40.0%	40.0%	40.0%					33.8%	33.8%	26.3%		
Maximum Green (s)	27.0	27.0	27.0					21.0	21.0	16.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	26.8	26.8	26.8					24.4	24.4	38.2	42.2	
Actuated g/C Ratio	0.34	0.34	0.34					0.30	0.30	0.48	0.53	
v/c Ratio	0.79	0.47	0.48					0.54	0.11	0.71	0.20	
Control Delay	29.8	22.4	4.6					26.6	2.5	16.9	5.4	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	29.8	22.4	4.6					26.6	2.5	16.9	5.4	
LOS	C	C	A					C	A	B	A	
Approach Delay		22.4						24.4			11.0	
Approach LOS		C						C			B	
Queue Length 50th (ft)	199	110	0					133	0	33	18	
Queue Length 95th (ft)	277	161	56					187	12	78	42	
Internal Link Dist (ft)		2101			1667			717			923	
Turn Bay Length (ft)	400		265						150	120		
Base Capacity (vph)	1188	1225	794					1078	548	555	2007	
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	0.76	0.46	0.47					0.54	0.11	0.62	0.18	

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 11 (14%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 20.2	Intersection LOS: C
Intersection Capacity Utilization 69.6%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road



Intersection

Int Delay, s/veh 1.1

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	987	0	0	69	0
Future Vol, veh/h	0	987	0	0	69	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	81	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1061	0	0	85	0

Major/Minor Major1 Minor2

Conflicting Flow All	-	0	531	-
Stage 1	-	-	0	-
Stage 2	-	-	531	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	478	0
Stage 1	0	-	-	0
Stage 2	0	-	554	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	478	-
Mov Cap-2 Maneuver	-	-	478	-
Stage 1	-	-	-	-
Stage 2	-	-	554	-

Approach EB SB

HCM Control Delay, s	0	14.2
HCM LOS		B

Minor Lane/Major Mvmt EBT SBLn1

Capacity (veh/h)	-	478
HCM Lane V/C Ratio	-	0.178
HCM Control Delay (s)	-	14.2
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.6

Intersection												
Int Delay, s/veh	0.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↕						↗				
Traffic Vol, veh/h	244	795	25	0	0	0	0	5	29	0	0	0
Future Vol, veh/h	244	795	25	0	0	0	0	5	29	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	274	893	28	0	0	0	0	6	33	0	0	0

Major/Minor	Major1			Minor1		
Conflicting Flow All	0	0	0	-	1455	461
Stage 1	-	-	-	-	1455	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.14	-	-	-	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.22	-	-	-	4.02	3.32
Pot Cap-1 Maneuver	-	-	-	0	129	547
Stage 1	-	-	-	0	193	-
Stage 2	-	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	0	547
Mov Cap-2 Maneuver	-	-	-	-	0	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-

Approach	EB	NB
HCM Control Delay, s		12.1
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	547	-	-	-
HCM Lane V/C Ratio	0.07	-	-	-
HCM Control Delay (s)	12.1	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.2	-	-	-

Lanes, Volumes, Timings
7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

Knoxville Center TIS
2022 Combined PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	464	281	57	0	0	0	0	298	127	442	438	0
Future Volume (vph)	464	281	57	0	0	0	0	298	127	442	438	0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.987								0.950		
Satd. Flow (prot)	1681	1747	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.987								0.530		
Satd. Flow (perm)	1681	1747	1583	0	0	0	0	3539	1583	987	3539	0
Satd. Flow (RTOR)			69							140		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Shared Lane Traffic (%)	21%											
Lane Group Flow (vph)	403	416	63	0	0	0	0	327	140	486	481	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	42.0	42.0	42.0					35.0	35.0	33.0		
Total Split (%)	38.2%	38.2%	38.2%					31.8%	31.8%	30.0%		
Maximum Green (s)	37.0	37.0	37.0					30.0	30.0	28.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	30.8	30.8	30.8					44.3	44.3	64.2	69.2	
Actuated g/C Ratio	0.28	0.28	0.28					0.40	0.40	0.58	0.63	
v/c Ratio	0.86	0.85	0.13					0.23	0.19	0.68	0.22	
Control Delay	54.9	53.7	6.1					25.3	5.8	13.2	5.4	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	54.9	53.7	6.1					25.3	5.8	13.2	5.4	
LOS	D	D	A					C	A	B	A	
Approach Delay		50.9						19.4			9.4	
Approach LOS		D						B			A	
Queue Length 50th (ft)	278	287	0					81	0	48	24	
Queue Length 95th (ft)	383	390	m27					138	47	178	55	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	565	587	578					1425	721	848	2487	
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	0.71	0.71	0.11					0.23	0.19	0.57	0.19	

Intersection Summary




















Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 109 (99%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 27.2 Intersection LOS: C
 Intersection Capacity Utilization 78.1% ICU Level of Service D
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp



Lanes, Volumes, Timings
 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp

Knoxville Center TIS
 2022 Combined PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	154	368	594	77	669	0	0	721	314
Future Volume (vph)	0	0	0	154	368	594	77	669	0	0	721	314
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.998		0.950					
Satd. Flow (prot)	0	0	0	1681	1766	2787	1770	3539	0	0	3539	1583
Flt Permitted				0.950	0.998		0.335					
Satd. Flow (perm)	0	0	0	1681	1766	2787	624	3539	0	0	3539	1583
Satd. Flow (RTOR)						184						308
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	0	140	388	600	78	676	0	0	728	317
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2			2	
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				28.0	28.0	28.0	27.0	27.0			27.0	27.0
Total Split (%)				50.9%	50.9%	50.9%	49.1%	49.1%			49.1%	49.1%
Maximum Green (s)				21.0	21.0	21.0	21.0	21.0			21.0	21.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)				7.0	7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)				18.4	18.4	18.4	23.6	23.6			23.6	23.6
Actuated g/C Ratio				0.33	0.33	0.33	0.43	0.43			0.43	0.43
v/c Ratio				0.25	0.66	0.57	0.29	0.45			0.48	0.37
Control Delay				13.4	20.9	11.9	12.7	11.0			10.7	3.8
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				13.4	20.9	11.9	12.7	11.0			10.7	3.8
LOS				B	C	B	B	B			B	A
Approach Delay					15.2			11.2			8.6	
Approach LOS					B			B			A	
Queue Length 50th (ft)				31	102	53	20	95			84	13
Queue Length 95th (ft)				65	178	96	m53	188			171	66
Internal Link Dist (ft)		1096			1137			650			484	
Turn Bay Length (ft)				450		800	95					
Base Capacity (vph)				641	674	1177	267	1518			1518	854
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				0.22	0.58	0.51	0.29	0.45			0.48	0.37

Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way

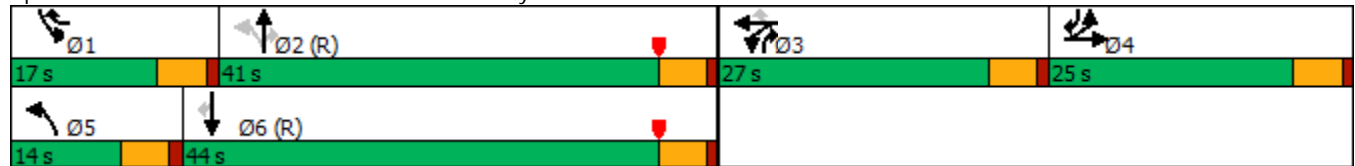
Knoxville Center TIS
2022 Combined PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	184	54	82	336	43	144	55	798	397	101	587	81
Future Volume (vph)	184	54	82	336	43	144	55	798	397	101	587	81
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.906				0.850			0.850			0.850
Flt Protected	0.950			0.950	0.963		0.950			0.950		
Satd. Flow (prot)	1770	1688	0	1681	1704	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950	0.963		0.379			0.950		
Satd. Flow (perm)	1770	1688	0	1681	1704	1583	706	3539	1583	1770	3539	1583
Satd. Flow (RTOR)		67				110			418			85
Peak Hour Factor	0.89	0.95	0.86	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				44%								
Lane Group Flow (vph)	207	152	0	198	201	152	58	840	418	106	618	85
Turn Type	Split	NA		Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4		3	3	1	5	2	3	1	6	4
Permitted Phases						3	2		2			6
Detector Phase	4	4		3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0		16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	25.0	25.0		27.0	27.0	17.0	14.0	41.0	27.0	17.0	44.0	25.0
Total Split (%)	22.7%	22.7%		24.5%	24.5%	15.5%	12.7%	37.3%	24.5%	15.5%	40.0%	22.7%
Maximum Green (s)	20.0	20.0		22.0	22.0	12.0	9.0	36.0	22.0	12.0	39.0	20.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)	17.0	17.0		18.7	18.7	28.7	51.0	44.3	68.0	10.0	49.7	67.7
Actuated g/C Ratio	0.15	0.15		0.17	0.17	0.26	0.46	0.40	0.62	0.09	0.45	0.62
v/c Ratio	0.76	0.48		0.69	0.70	0.31	0.15	0.59	0.37	0.66	0.39	0.08
Control Delay	62.1	28.2		55.5	55.5	6.7	14.4	25.4	3.2	63.8	21.3	2.4
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.1	28.2		55.5	55.5	6.7	14.4	25.4	3.2	63.8	21.3	2.4
LOS	E	C		E	E	A	B	C	A	E	C	A
Approach Delay		47.7			42.0			17.9			24.9	
Approach LOS		D			D			B			C	
Queue Length 50th (ft)	140	53		136	138	13	15	194	2	75	128	1
Queue Length 95th (ft)	214	115		215	218	40	m48	356	68	m126	201	m19
Internal Link Dist (ft)		713			953			484			243	
Turn Bay Length (ft)	290			155		245	180		180	120		105
Base Capacity (vph)	321	361		336	340	521	428	1424	1172	193	1599	1025
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.64	0.42		0.59	0.59	0.29	0.14	0.59	0.36	0.55	0.39	0.08

Intersection Summary

Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 96 (87%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.76
 Intersection Signal Delay: 27.7
 Intersection LOS: C
 Intersection Capacity Utilization 65.0%
 ICU Level of Service C
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Millertown Pike & Kinzel Way



Intersection

Int Delay, s/veh 1.3

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations						
Traffic Vol, veh/h	37	44	11	1152	759	36
Future Vol, veh/h	37	44	11	1152	759	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	39	46	12	1213	799	38

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	1449	818	837	0	-	0
Stage 1	818	-	-	-	-	-
Stage 2	631	-	-	-	-	-
Critical Hdwy	6.63	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	133	375	795	-	-	-
Stage 1	433	-	-	-	-	-
Stage 2	493	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	127	375	795	-	-	-
Mov Cap-2 Maneuver	127	-	-	-	-	-
Stage 1	413	-	-	-	-	-
Stage 2	493	-	-	-	-	-

Approach EB NB SB

HCM Control Delay, s	29.4	0.3	0
HCM LOS	D		

Minor Lane/Major Mvmt NBL NBT EBLn1 EBLn2 SBT SBR

Capacity (veh/h)	795	-	127	375	-	-
HCM Lane V/C Ratio	0.015	-	0.307	0.124	-	-
HCM Control Delay (s)	9.6	0.2	45.4	15.9	-	-
HCM Lane LOS	A	A	E	C	-	-
HCM 95th %tile Q(veh)	0	-	1.2	0.4	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road

Knoxville Center TIS
2022 Combined PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	82	38	89	143	44	181	94	960	80	76	560	15
Future Volume (vph)	82	38	89	143	44	181	94	960	80	76	560	15
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.895			0.879			0.988				0.996
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1667	0	1770	1637	0	1770	1840	0	1770	1855	0
Flt Permitted	0.377			0.399			0.291			0.065		
Satd. Flow (perm)	702	1667	0	743	1637	0	542	1840	0	121	1855	0
Satd. Flow (RTOR)		85			151			6			2	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	86	134	0	151	237	0	99	1095	0	80	605	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	15.0	16.0		15.0	16.0		15.0	24.0		14.0	24.0	
Total Split (s)	15.0	16.0		15.0	16.0		15.0	65.0		14.0	64.0	
Total Split (%)	13.6%	14.5%		13.6%	14.5%		13.6%	59.1%		12.7%	58.2%	
Maximum Green (s)	10.0	11.0		10.0	11.0		10.0	60.0		9.0	59.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effect Green (s)	18.5	9.6		20.8	12.8		72.4	66.0		69.8	63.0	
Actuated g/C Ratio	0.17	0.09		0.19	0.12		0.66	0.60		0.63	0.57	
v/c Ratio	0.42	0.60		0.65	0.73		0.22	0.99		0.45	0.57	
Control Delay	41.1	31.4		50.4	32.9		3.2	38.7		18.8	18.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	41.1	31.4		50.4	32.9		3.2	38.7		18.8	18.2	
LOS	D	C		D	C		A	D		B	B	
Approach Delay		35.2			39.7			35.8			18.2	
Approach LOS		D			D			D			B	
Queue Length 50th (ft)	49	33		89	58		10	~853		17	265	
Queue Length 95th (ft)	93	96		#154	#184		m14	#1150		52	389	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)				175						65		
Base Capacity (vph)	222	243		234	326		476	1105		214	1062	
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	0.39	0.55		0.65	0.73		0.21	0.99		0.37	0.57	

Lanes, Volumes, Timings
12: Millertown Pike & Mill Road

Knoxville Center TIS
2022 Combined PM

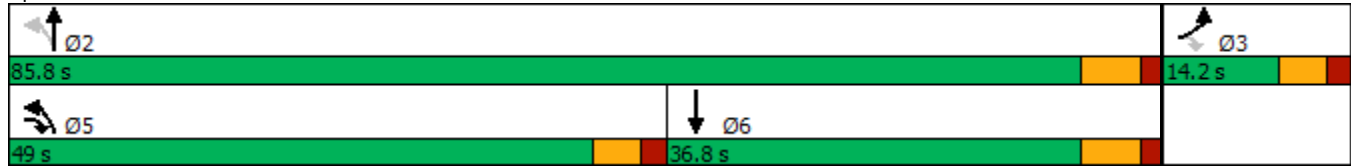


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	82	379	697	586	299	76
Future Volume (vph)	82	379	697	586	299	76
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.973	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1812	0
Flt Permitted	0.950		0.233			
Satd. Flow (perm)	1770	1583	434	1863	1812	0
Satd. Flow (RTOR)		289			13	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	86	399	734	617	395	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	14.2	49.0	49.0	85.8	36.8	
Total Split (%)	14.2%	49.0%	49.0%	85.8%	36.8%	
Maximum Green (s)	8.7	43.5	43.5	79.8	30.8	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	9.1	47.1	67.0	68.6	23.4	
Actuated g/C Ratio	0.11	0.57	0.81	0.83	0.28	
v/c Ratio	0.45	0.39	0.78	0.40	0.76	
Control Delay	49.7	4.1	18.0	3.8	39.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	49.7	4.1	18.0	3.8	39.5	
LOS	D	A	B	A	D	
Approach Delay	12.2			11.5	39.5	
Approach LOS	B			B	D	
Queue Length 50th (ft)	48	23	221	91	214	
Queue Length 95th (ft)	#111	76	418	132	322	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85	330			
Base Capacity (vph)	202	1186	1119	1667	740	
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	0.43	0.34	0.66	0.37	0.53	

Intersection Summary

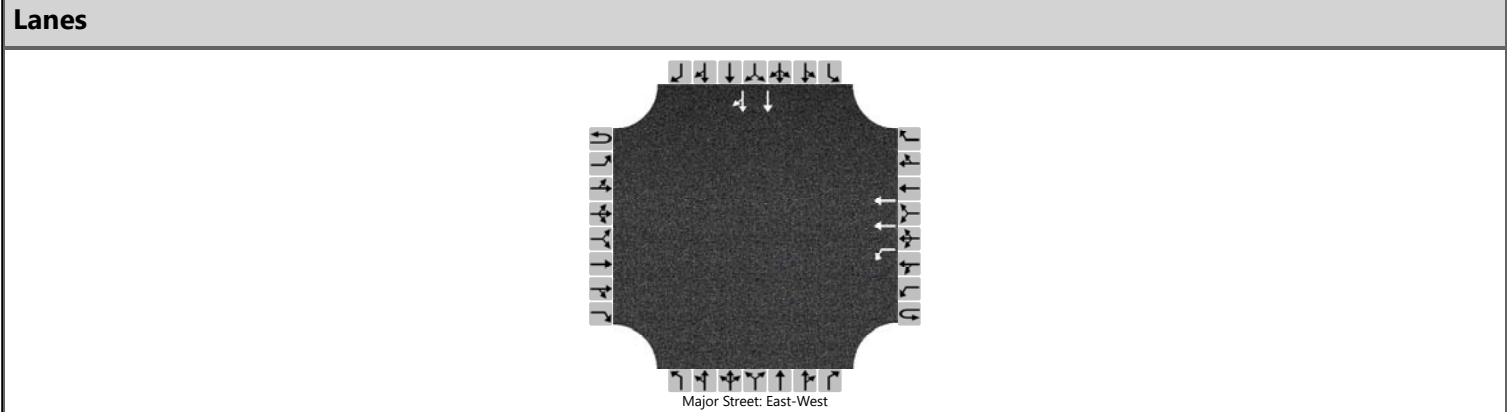
Cycle Length: 100	
Actuated Cycle Length: 83.1	
Natural Cycle: 75	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.78	
Intersection Signal Delay: 16.6	Intersection LOS: B
Intersection Capacity Utilization 79.8%	ICU Level of Service D
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 12: Millertown Pike & Mill Road



HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	BJH			Intersection	N Mall Rd at East Towne W		
Agency/Co.	Cannon & Cannon, Inc.			Jurisdiction	City of Knoxville		
Date Performed	12/15/2020			East/West Street	North Mall Road		
Analysis Year	2022			North/South Street	East Towne Road (West)		
Time Analyzed	PM Peak			Peak Hour Factor	0.87		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Combined 2022 PM						



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	0	0	0	1	2	0		0	0	0		0	2	0
Configuration						L	T								T	TR
Volume (veh/h)						21	663								33	0
Percent Heavy Vehicles (%)						2									2	2
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						5.3									6.5	6.9
Critical Headway (sec)						0.00									6.54	6.94
Base Follow-Up Headway (sec)						3.1									4.0	3.3
Follow-Up Headway (sec)						3.12									4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						24									19	19
Capacity, c (veh/h)						1154									306	306
v/c Ratio						0.02									0.06	0.06
95% Queue Length, Q ₉₅ (veh)						0.1									0.2	0.2
Control Delay (s/veh)						8.2									17.6	17.6
Level of Service (LOS)						A									C	C
Approach Delay (s/veh)						0.3									17.6	
Approach LOS															C	

Intersection	
Intersection Delay, s/veh	14.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑↑				
Traffic Vol, veh/h	0	0	0	0	663	23	1	242	0	0	0	0
Future Vol, veh/h	0	0	0	0	663	23	1	242	0	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.91	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	698	24	1	266	0	0	0	0
Number of Lanes	0	0	0	0	2	0	0	2	0	0	0	0

Approach	WB	NB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NB	
Conflicting Lanes Left	2	0
Conflicting Approach Right		WB
Conflicting Lanes Right	0	2
HCM Control Delay	16.2	11.3
HCM LOS	C	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2
Vol Left, %	1%	0%	0%	0%
Vol Thru, %	99%	100%	100%	91%
Vol Right, %	0%	0%	0%	9%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	82	161	442	244
LT Vol	1	0	0	0
Through Vol	81	161	442	221
RT Vol	0	0	0	23
Lane Flow Rate	90	177	465	257
Geometry Grp	7	7	7	7
Degree of Util (X)	0.155	0.306	0.686	0.374
Departure Headway (Hd)	6.219	6.212	5.31	5.244
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	572	574	675	681
Service Time	4.01	4.004	3.077	3.011
HCM Lane V/C Ratio	0.157	0.308	0.689	0.377
HCM Control Delay	10.2	11.8	19	11.1
HCM Lane LOS	B	B	C	B
HCM 95th-tile Q	0.5	1.3	5.4	1.7

Intersection

Int Delay, s/veh 0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑			↑
Traffic Vol, veh/h	0	0	695	131	0	52
Future Vol, veh/h	0	0	695	131	0	52
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	86	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	724	152	0	54

Major/Minor

	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	0
Stage 1	-	0
Stage 2	-	0
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach

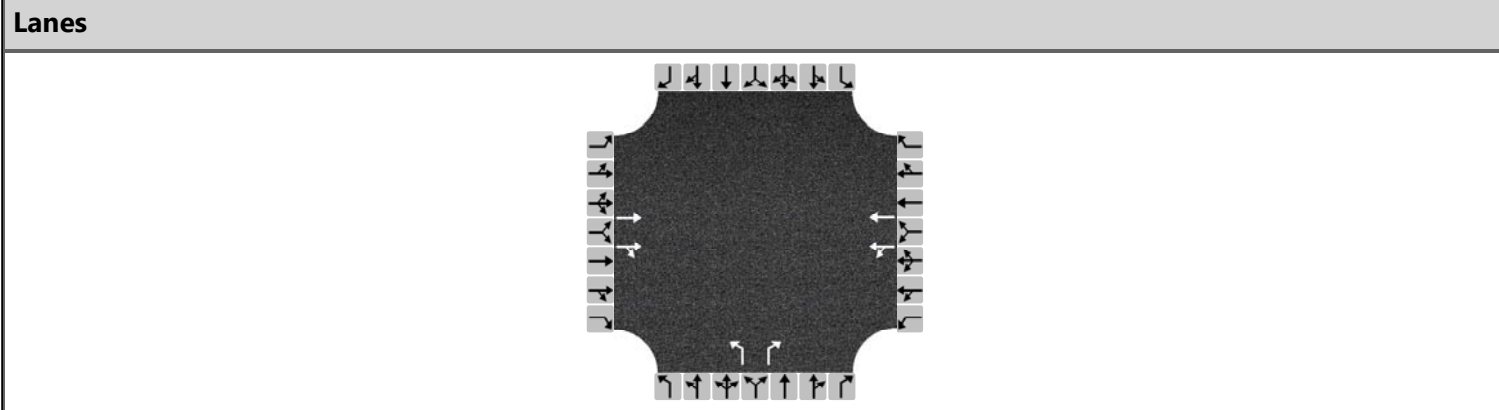
	WB	SB
HCM Control Delay, s	0	12
HCM LOS		B

Minor Lane/Major Mvmt

	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	567
HCM Lane V/C Ratio	-	-	0.096
HCM Control Delay (s)	-	-	12
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.3

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	BJH	Intersection	Knoxville Ctr at E Towne
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	City of Knoxville
Date Performed	12/15/2020	East/West Street	Knoxville Center Drive
Analysis Year	2022	North/South Street	East Towne Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.84
Time Analyzed	PM Peak		
Project Description	Combined 2022 PM		



Vehicle Volume and Adjustments												
Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume		11	65	182	29		49		327			
% Thrus in Shared Lane			50	50								
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	T	TR		LT	T		L	R				
Flow Rate, v (veh/h)	7	84		234	17		58	389				
Percent Heavy Vehicles	2	2		2	2		2	2				

Departure Headway and Service Time												
Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20				
Initial Degree of Utilization, x	0.006	0.075		0.208	0.015		0.052	0.346				
Final Departure Headway, hd (s)	6.04	5.39		6.25	5.79		6.00	4.81				
Final Degree of Utilization, x	0.011	0.126		0.406	0.028		0.097	0.520				
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3				
Service Time, ts (s)	3.74	3.09		3.95	3.49		3.70	2.51				

Capacity, Delay and Level of Service												
Flow Rate, v (veh/h)	7	84		234	17		58	389				
Capacity	596	668		576	622		600	749				
95% Queue Length, Q ₉₅ (veh)	0.0	0.4		2.0	0.1		0.3	3.0				
Control Delay (s/veh)	8.8	8.9		13.2	8.7		9.3	12.6				
Level of Service, LOS	A	A		B	A		A	B				
Approach Delay (s/veh)	8.9			12.9			12.2					
Approach LOS	A			B			B					
Intersection Delay, s/veh LOS	12.0						B					

Intersection	
Intersection Delay, s/veh	9.6
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	↑
Traffic Vol, veh/h	295	7	42	121	96	42
Future Vol, veh/h	295	7	42	121	96	42
Peak Hour Factor	0.93	0.93	0.75	0.93	0.89	0.81
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	317	8	56	130	108	52
Number of Lanes	2	0	0	2	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	9.7	9.2	9.8
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	51%	0%
Vol Thru, %	0%	0%	100%	93%	49%	100%
Vol Right, %	0%	100%	0%	7%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	96	42	197	105	82	81
LT Vol	96	0	0	0	42	0
Through Vol	0	0	197	98	40	81
RT Vol	0	42	0	7	0	0
Lane Flow Rate	108	52	211	113	99	87
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.187	0.073	0.305	0.162	0.154	0.128
Departure Headway (Hd)	6.249	5.042	5.186	5.139	5.573	5.316
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	572	706	692	695	641	671
Service Time	4.013	2.805	2.934	2.888	3.33	3.073
HCM Lane V/C Ratio	0.189	0.074	0.305	0.163	0.154	0.13
HCM Control Delay	10.5	8.2	10.2	8.9	9.4	8.9
HCM Lane LOS	B	A	B	A	A	A
HCM 95th-tile Q	0.7	0.2	1.3	0.6	0.5	0.4

Intersection	
Intersection Delay, s/veh	11.5
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	164	71	29	288	91	26
Future Vol, veh/h	164	71	29	288	91	26
Peak Hour Factor	0.86	0.86	0.86	0.81	0.78	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	191	83	34	356	117	30
Number of Lanes	1	1	2	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	11.3	12.1	10.5
HCM LOS	B	B	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	100%	0%	91%	0%
Vol Thru, %	100%	3%	0%	0%	9%	100%
Vol Right, %	0%	97%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	19	298	164	71	100	17
LT Vol	0	0	164	0	91	0
Through Vol	19	10	0	0	9	17
RT Vol	0	288	0	71	0	0
Lane Flow Rate	22	367	191	83	127	20
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.034	0.492	0.34	0.119	0.221	0.033
Departure Headway (Hd)	5.509	4.825	6.412	5.204	6.286	5.824
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	643	737	564	692	574	618
Service Time	3.3	2.616	4.12	2.911	3.986	3.524
HCM Lane V/C Ratio	0.034	0.498	0.339	0.12	0.221	0.032
HCM Control Delay	8.5	12.3	12.4	8.6	10.8	8.7
HCM Lane LOS	A	B	B	A	B	A
HCM 95th-tile Q	0.1	2.7	1.5	0.4	0.8	0.1

Intersection

Int Delay, s/veh 5.9

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations	↔		↕↕		↕↕	
Traffic Vol, veh/h	5	61	74	2	28	15
Future Vol, veh/h	5	61	74	2	28	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	70	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	66	80	2	40	16

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	209	28	56	0	-	0
Stage 1	48	-	-	-	-	-
Stage 2	161	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	760	1041	1547	-	-	-
Stage 1	968	-	-	-	-	-
Stage 2	851	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	720	1041	1547	-	-	-
Mov Cap-2 Maneuver	720	-	-	-	-	-
Stage 1	918	-	-	-	-	-
Stage 2	851	-	-	-	-	-

Approach EB NB SB

HCM Control Delay, s 8.8 7.3 0
 HCM LOS A

Minor Lane/Major Mvmt NBL NBT EBLn1 SBT SBR

Capacity (veh/h)	1547	-	1007	-	-
HCM Lane V/C Ratio	0.052	-	0.071	-	-
HCM Control Delay (s)	7.5	0	8.8	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	-	-

Lanes, Volumes, Timings
1: Mill Road & Washington Pike

Knoxville Center TIS
2027 Combined AM

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↖	↗↗
Traffic Volume (vph)	322	64	564	1152	54	322
Future Volume (vph)	322	64	564	1152	54	322
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	0.88
Fr _t	0.975					0.850
Fl _t Protected			0.950		0.950	
Satd. Flow (prot)	3451	0	1770	3539	1770	2787
Fl _t Permitted			0.372		0.950	
Satd. Flow (perm)	3451	0	693	3539	1770	2787
Satd. Flow (RTOR)	35					211
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Shared Lane Traffic (%)						
Lane Group Flow (vph)	434	0	634	1294	61	362
Turn Type	NA		pm+pt	NA	Prot	pm+ov
Protected Phases	2		1	6	4	1
Permitted Phases			6			4
Detector Phase	2		1	6	4	1
Switch Phase						
Minimum Initial (s)	12.0		10.0	12.0	10.0	10.0
Minimum Split (s)	19.0		17.0	19.0	17.0	17.0
Total Split (s)	19.0		24.0	43.0	17.0	24.0
Total Split (%)	31.7%		40.0%	71.7%	28.3%	40.0%
Maximum Green (s)	13.0		18.0	37.0	11.0	18.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
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)	6.0		6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	Max		None	Max	None	None
Act Effect Green (s)	17.2		37.9	40.8	10.2	23.1
Actuated g/C Ratio	0.33		0.72	0.78	0.19	0.44
v/c Ratio	0.38		0.80	0.47	0.18	0.27
Control Delay	17.1		15.9	5.4	22.1	3.4
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	17.1		15.9	5.4	22.1	3.4
LOS	B		B	A	C	A
Approach Delay	17.1			8.9	6.1	
Approach LOS	B			A	A	
Queue Length 50th (ft)	65		110	119	19	11
Queue Length 95th (ft)	104		#272	164	47	27
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200		100	100
Base Capacity (vph)	1153		877	2747	379	1533
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	0.38		0.72	0.47	0.16	0.24

Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

Knoxville Center TIS
2027 Combined AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	57	333	1151	101	5	123	44	363	2	16	2
Future Volume (vph)	6	57	333	1151	101	5	123	44	363	2	16	2
Lane Util. Factor	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	3433	1863	1583	1770	1863	2787	1770	3539	1583
Flt Permitted	0.686			0.950			0.645					
Satd. Flow (perm)	1278	3539	1583	3433	1863	1583	1201	1863	2787	1863	3539	1583
Satd. Flow (RTOR)			259			95			395			177
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	62	362	1251	110	5	134	48	395	2	17	2
Turn Type	pm+pt	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	1	6	7	5	2	3	7	4	5	3	8	1
Permitted Phases	6		6			2	4		4	8		8
Detector Phase	1	6	7	5	2	3	7	4	5	3	8	1
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	14.0	19.0	14.0	33.0	38.0	14.0	14.0	14.0	33.0	14.0	14.0	14.0
Total Split (%)	17.5%	23.8%	17.5%	41.3%	47.5%	17.5%	17.5%	17.5%	41.3%	17.5%	17.5%	17.5%
Maximum Green (s)	9.0	13.0	9.0	28.0	32.0	9.0	9.0	9.0	28.0	9.0	9.0	9.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	4.0	2.0	2.0	4.0
Recall Mode	None	C-Max	None	None	C-Max	None	None	None	None	None	None	None
Act Effect Green (s)	21.6	14.0	28.3	39.5	56.1	69.1	10.1	8.3	52.8	7.2	6.0	8.8
Actuated g/C Ratio	0.27	0.18	0.35	0.49	0.70	0.86	0.13	0.10	0.66	0.09	0.08	0.11
v/c Ratio	0.02	0.10	0.50	0.74	0.08	0.00	0.64	0.25	0.20	0.01	0.06	0.01
Control Delay	11.8	29.1	8.8	20.9	6.5	0.0	40.6	31.5	2.7	27.5	35.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.8	29.1	8.8	20.9	6.5	0.0	40.6	31.5	2.7	27.5	35.1	0.0
LOS	B	C	A	C	A	A	D	C	A	C	D	A
Approach Delay		11.7			19.6			13.9			31.0	
Approach LOS		B			B			B			C	
Queue Length 50th (ft)	2	14	35	225	11	0	71	25	0	1	4	0
Queue Length 95th (ft)	5	31	105	#442	59	0	118	57	27	6	14	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	300		170	160		160	150		75
Base Capacity (vph)	437	617	738	1696	1306	1454	226	209	1974	227	398	374
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.10	0.49	0.74	0.08	0.00	0.59	0.23	0.20	0.01	0.04	0.01

Lanes, Volumes, Timings
 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road

Knoxville Center TIS
 2027 Combined AM

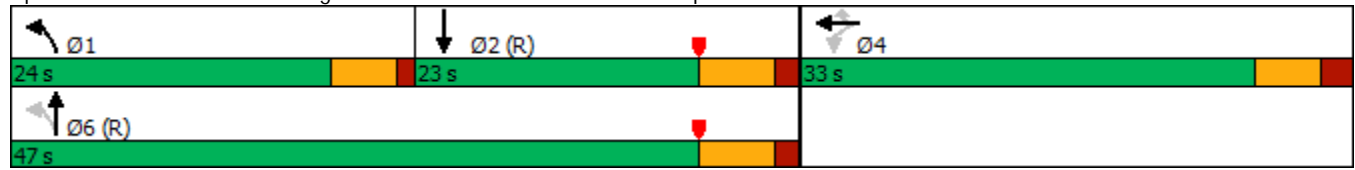


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↕	↗	↙	↕			↕	↗
Traffic Volume (vph)	0	0	0	26	350	125	319	427	0	0	343	1162
Future Volume (vph)	0	0	0	26	350	125	319	427	0	0	343	1162
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1770	1863	1583	1770	3539	0	0	3539	1583
Flt Permitted				0.950			0.459					
Satd. Flow (perm)	0	0	0	1770	1863	1583	855	3539	0	0	3539	1583
Satd. Flow (RTOR)							132					386
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	27	368	132	336	449	0	0	361	1223
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Free
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					Free
Detector Phase				4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0			10.0	
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0			19.0	
Total Split (s)				33.0	33.0	33.0	24.0	47.0			23.0	
Total Split (%)				41.3%	41.3%	41.3%	30.0%	58.8%			28.8%	
Maximum Green (s)				27.0	27.0	27.0	19.0	41.0			17.0	
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5			4.5	
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5			1.5	
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	
Total Lost Time (s)				6.0	6.0	6.0	5.0	6.0			6.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			2.0	
Recall Mode				None	None	None	None	C-Max			C-Max	
Act Effect Green (s)				21.0	21.0	21.0	48.0	47.0			29.5	80.0
Actuated g/C Ratio				0.26	0.26	0.26	0.60	0.59			0.37	1.00
v/c Ratio				0.06	0.75	0.26	0.51	0.22			0.28	0.77
Control Delay				20.0	36.9	5.2	10.9	4.8			10.9	13.2
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				20.0	36.9	5.2	10.9	4.8			10.9	13.2
LOS				B	D	A	B	A			B	B
Approach Delay					28.1			7.4			12.7	
Approach LOS					C			A			B	
Queue Length 50th (ft)				10	169	0	38	27			48	621
Queue Length 95th (ft)				26	237	35	100	37			m87	465
Internal Link Dist (ft)		569			2042			923			673	
Turn Bay Length (ft)						475	105					100
Base Capacity (vph)				597	628	621	730	2080			1305	1583
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	0.59	0.21	0.46	0.22			0.28	0.77

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 1 (1%), Referenced to phase 2:SBT and 6:NBTL, Start of Yellow
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.77
 Intersection Signal Delay: 14.1
 Intersection LOS: B
 Intersection Capacity Utilization 59.7%
 ICU Level of Service B
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road



Lanes, Volumes, Timings

Knoxville Center TIS

4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road

2027 Combined AM



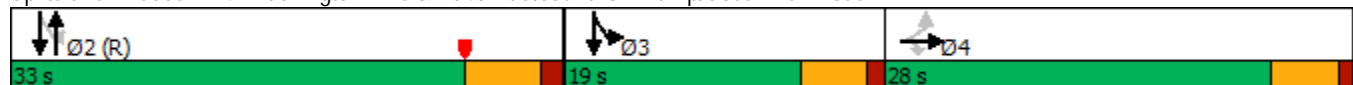
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↖	↗↗	↘					↖↖	↗	↘	↗↗	
Traffic Volume (vph)	276	208	226	0	0	0	0	449	39	136	257	0
Future Volume (vph)	276	208	226	0	0	0	0	449	39	136	257	0
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	3539	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.468		
Satd. Flow (perm)	3433	3539	1583	0	0	0	0	3539	1583	872	3539	0
Satd. Flow (RTOR)			251							95		
Peak Hour Factor	0.90	0.78	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	307	267	251	0	0	0	0	499	43	151	286	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	28.0	28.0	28.0					33.0	33.0	19.0		
Total Split (%)	35.0%	35.0%	35.0%					41.3%	41.3%	23.8%		
Maximum Green (s)	23.0	23.0	23.0					27.0	27.0	14.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	13.4	13.4	13.4					44.1	44.1	51.6	55.6	
Actuated g/C Ratio	0.17	0.17	0.17					0.55	0.55	0.64	0.70	
v/c Ratio	0.53	0.45	0.53					0.26	0.05	0.24	0.12	
Control Delay	33.1	31.5	8.2					10.7	0.3	4.8	1.8	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	33.1	31.5	8.2					10.7	0.3	4.8	1.8	
LOS	C	C	A					B	A	A	A	
Approach Delay		25.0						9.8			2.9	
Approach LOS		C						A			A	
Queue Length 50th (ft)	73	64	0					62	0	7	7	
Queue Length 95th (ft)	101	77	55					110	2	26	12	
Internal Link Dist (ft)		2101			1667			717			923	
Turn Bay Length (ft)	400		265						150	120		
Base Capacity (vph)	986	1017	633					1950	915	800	2790	
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	0.31	0.26	0.40					0.26	0.05	0.19	0.10	

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 11 (14%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.53
 Intersection Signal Delay: 15.1
 Intersection Capacity Utilization 59.7%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service B

Splits and Phases: 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road



Intersection

Int Delay, s/veh 0

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	6	435	0	0	0	0
Future Vol, veh/h	6	435	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16979	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	518	0	0	0	0

Major/Minor Major1 Minor2

Conflicting Flow All	0	0	273	-
Stage 1	-	-	0	-
Stage 2	-	-	273	-
Critical Hdwy	4.14	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	2.22	-	3.52	-
Pot Cap-1 Maneuver	-	-	694	0
Stage 1	-	-	-	0
Stage 2	-	-	748	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	694	-
Mov Cap-2 Maneuver	-	-	694	-
Stage 1	-	-	-	-
Stage 2	-	-	748	-

Approach EB SB

HCM Control Delay, s 0
HCM LOS A

Minor Lane/Major Mvmt EBL EBT SBLn1

Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	-	0
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	0.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕↔						↕				
Traffic Vol, veh/h	87	370	15	0	0	0	0	0	7	0	0	0
Future Vol, veh/h	87	370	15	0	0	0	0	0	7	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	69	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	126	430	17	0	0	0	0	0	8	0	0	0

Major/Minor	Major1			Minor1		
Conflicting Flow All	0	0	0	-	691	224
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.14	-	-	-	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.22	-	-	-	4.02	3.32
Pot Cap-1 Maneuver	-	-	-	0	366	779
Stage 1	-	-	-	0	444	-
Stage 2	-	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	0	779
Mov Cap-2 Maneuver	-	-	-	-	0	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-

Approach	EB	NB
HCM Control Delay, s		9.7
HCM LOS		A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	779	-	-	-
HCM Lane V/C Ratio	0.01	-	-	-
HCM Control Delay (s)	9.7	-	-	-
HCM Lane LOS	A	-	-	-
HCM 95th %tile Q(veh)	0	-	-	-

Lanes, Volumes, Timings
7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

Knoxville Center TIS
2027 Combined AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖	↖					↑↑	↖	↖	↑↑	
Traffic Volume (vph)	138	151	28	0	0	0	0	101	110	696	261	0
Future Volume (vph)	138	151	28	0	0	0	0	101	110	696	261	0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Fr't			0.850						0.850			
Flt Protected	0.950	0.996								0.950		
Satd. Flow (prot)	1681	1763	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.996								0.683		
Satd. Flow (perm)	1681	1763	1583	0	0	0	0	3539	1583	1272	3539	0
Satd. Flow (RTOR)			85							118		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)	10%											
Lane Group Flow (vph)	133	177	30	0	0	0	0	109	118	748	281	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	20.0	20.0	20.0					35.0	35.0	35.0		
Total Split (%)	22.2%	22.2%	22.2%					38.9%	38.9%	38.9%		
Maximum Green (s)	15.0	15.0	15.0					30.0	30.0	30.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag								Lead	
Lead-Lag Optimize?	Yes	Yes	Yes								Yes	
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	12.6	12.6	12.6					39.3	39.3	62.4	67.4	
Actuated g/C Ratio	0.14	0.14	0.14					0.44	0.44	0.69	0.75	
v/c Ratio	0.57	0.72	0.10					0.07	0.16	0.74	0.11	
Control Delay	45.3	53.3	0.7					18.4	4.9	10.9	1.8	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	45.3	53.3	0.7					18.4	4.9	10.9	1.8	
LOS	D	D	A					B	A	B	A	
Approach Delay		45.5						11.4			8.4	
Approach LOS		D						B			A	
Queue Length 50th (ft)	74	102	0					20	0	55	10	
Queue Length 95th (ft)	132	170	0					41	36	289	11	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	282	295	336					1546	757	1138	2902	
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	0.47	0.60	0.09					0.07	0.16	0.66	0.10	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 89 (99%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.74	
Intersection Signal Delay: 16.7	Intersection LOS: B
Intersection Capacity Utilization 74.4%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp



Lanes, Volumes, Timings
 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp

Knoxville Center TIS
 2027 Combined AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	92	145	324	26	211	0	0	857	332
Future Volume (vph)	0	0	0	92	145	324	26	211	0	0	857	332
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.997		0.950					
Satd. Flow (prot)	0	0	0	1681	1764	2787	1770	3539	0	0	3539	1583
Flt Permitted				0.950	0.997		0.276					
Satd. Flow (perm)	0	0	0	1681	1764	2787	514	3539	0	0	3539	1583
Satd. Flow (RTOR)						360						369
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	0	92	171	360	29	234	0	0	952	369
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2			2	
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				33.0	33.0	33.0	57.0	57.0			57.0	57.0
Total Split (%)				36.7%	36.7%	36.7%	63.3%	63.3%			63.3%	63.3%
Maximum Green (s)				26.0	26.0	26.0	51.0	51.0			51.0	51.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)				7.0	7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)				15.6	15.6	15.6	61.4	61.4			61.4	61.4
Actuated g/C Ratio				0.17	0.17	0.17	0.68	0.68			0.68	0.68
v/c Ratio				0.32	0.56	0.46	0.08	0.10			0.39	0.31
Control Delay				33.8	40.2	5.3	1.0	1.1			3.5	1.3
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				33.8	40.2	5.3	1.0	1.1			3.5	1.3
LOS				C	D	A	A	A			A	A
Approach Delay					19.1			1.1			2.9	
Approach LOS					B			A			A	
Queue Length 50th (ft)				49	95	0	0	0			54	0
Queue Length 95th (ft)				86	147	35	m0	1			29	0
Internal Link Dist (ft)		1096			1137			650			484	
Turn Bay Length (ft)				450		800	95					
Base Capacity (vph)				485	509	1061	350	2412			2412	1196
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				0.19	0.34	0.34	0.08	0.10			0.39	0.31

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 20 (22%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.56	
Intersection Signal Delay: 7.3	Intersection LOS: A
Intersection Capacity Utilization 74.4%	ICU Level of Service D
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp



Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way

Knoxville Center TIS
2027 Combined AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↑↑	↗	↖	↑↑	↗
Traffic Volume (vph)	23	21	11	175	15	60	13	358	130	67	990	30
Future Volume (vph)	23	21	11	175	15	60	13	358	130	67	990	30
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.942				0.850			0.850			0.850
Flt Protected	0.950			0.950	0.960		0.950			0.950		
Satd. Flow (prot)	1770	1755	0	1681	1699	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950	0.960		0.242			0.950		
Satd. Flow (perm)	1770	1755	0	1681	1699	1583	451	3539	1583	1770	3539	1583
Satd. Flow (RTOR)		14				85			137			85
Peak Hour Factor	0.79	0.95	0.78	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	29	36	0	99	101	63	14	377	137	71	1042	32
Turn Type	Split	NA		Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4		3	3	1	5	2	3	1	6	4
Permitted Phases						3	2		2			6
Detector Phase	4	4		3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0		16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	16.0	16.0		17.0	17.0	14.0	14.0	43.0	17.0	14.0	43.0	16.0
Total Split (%)	17.8%	17.8%		18.9%	18.9%	15.6%	15.6%	47.8%	18.9%	15.6%	47.8%	17.8%
Maximum Green (s)	11.0	11.0		12.0	12.0	9.0	9.0	38.0	12.0	9.0	38.0	11.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)	7.6	7.6		10.1	10.1	19.3	53.5	48.7	64.8	8.2	57.5	66.7
Actuated g/C Ratio	0.08	0.08		0.11	0.11	0.21	0.59	0.54	0.72	0.09	0.64	0.74
v/c Ratio	0.20	0.23		0.53	0.53	0.16	0.04	0.20	0.12	0.44	0.46	0.03
Control Delay	41.3	30.4		47.6	47.6	3.0	4.9	9.3	1.0	53.9	7.7	0.4
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.3	30.4		47.6	47.6	3.0	4.9	9.3	1.0	53.9	7.7	0.4
LOS	D	C		D	D	A	A	A	A	D	A	A
Approach Delay		35.2			36.9			7.0			10.4	
Approach LOS		D			D			A			B	
Queue Length 50th (ft)	16	12		56	57	0	2	41	0	44	58	0
Queue Length 95th (ft)	36	40		108	109	14	m5	77	20	m60	134	m0
Internal Link Dist (ft)		713			953			484			243	
Turn Bay Length (ft)	290			155		245	180		180	120		105
Base Capacity (vph)	216	226		224	226	427	412	1916	1193	186	2262	1189
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.16		0.44	0.45	0.15	0.03	0.20	0.11	0.38	0.46	0.03

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	2	6	449	1097	9
Future Vol, veh/h	0	2	6	449	1097	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	2	7	493	1205	10

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1471	1210	1215	0	-	0
Stage 1	1210	-	-	-	-	-
Stage 2	261	-	-	-	-	-
Critical Hdwy	6.63	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	128	222	572	-	-	-
Stage 1	281	-	-	-	-	-
Stage 2	760	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	126	222	572	-	-	-
Mov Cap-2 Maneuver	126	-	-	-	-	-
Stage 1	276	-	-	-	-	-
Stage 2	760	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.4	0.2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	572	-	-	222	-	-
HCM Lane V/C Ratio	0.012	-	-	0.01	-	-
HCM Control Delay (s)	11.4	0.1	0	21.4	-	-
HCM Lane LOS	B	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	-	0	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road

Knoxville Center TIS
2027 Combined AM











Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	2	33	95	14	85	22	338	48	136	979	2
Future Volume (vph)	7	2	33	95	14	85	22	338	48	136	979	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.858			0.872			0.981				
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1598	0	1770	1624	0	1770	1827	0	1770	1863	0
Flt Permitted	0.690			0.422			0.083			0.404		
Satd. Flow (perm)	1285	1598	0	786	1624	0	155	1827	0	753	1863	0
Satd. Flow (RTOR)		35			89			10				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	37	0	100	104	0	23	407	0	143	1033	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	15.0	16.0		15.0	16.0		15.0	24.0		14.0	24.0	
Total Split (s)	15.0	16.0		15.0	16.0		15.0	45.0		14.0	44.0	
Total Split (%)	16.7%	17.8%		16.7%	17.8%		16.7%	50.0%		15.6%	48.9%	
Maximum Green (s)	10.0	11.0		10.0	11.0		10.0	40.0		9.0	39.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effect Green (s)	10.8	7.3		16.4	14.5		59.3	53.1		64.6	62.0	
Actuated g/C Ratio	0.12	0.08		0.18	0.16		0.66	0.59		0.72	0.69	
v/c Ratio	0.04	0.23		0.41	0.31		0.11	0.38		0.23	0.81	
Control Delay	25.7	17.6		34.2	12.3		9.7	11.3		5.6	20.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	25.7	17.6		34.2	12.3		9.7	11.3		5.6	20.0	
LOS	C	B		C	B		A	B		A	B	
Approach Delay		18.9			23.0			11.2			18.2	
Approach LOS		B			C			B			B	
Queue Length 50th (ft)	3	1		46	7		4	87		30	304	
Queue Length 95th (ft)	14	30		85	53		16	142		m34	m#891	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)				175						65		
Base Capacity (vph)	263	226		261	358		288	1081		644	1282	
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	0.03	0.16		0.38	0.29		0.08	0.38		0.22	0.81	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 84 (93%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow	
Natural Cycle: 110	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 17.1	Intersection LOS: B
Intersection Capacity Utilization 81.1%	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.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 11: Millertown Pike & Loves Creek Road

 Ø1 14 s	 Ø2 (R) 45 s	 Ø3 15 s	 Ø4 16 s
 Ø5 15 s	 Ø6 (R) 44 s	 Ø7 15 s	 Ø8 16 s

Lanes, Volumes, Timings
12: Millertown Pike & Mill Road

Knoxville Center TIS
2027 Combined AM

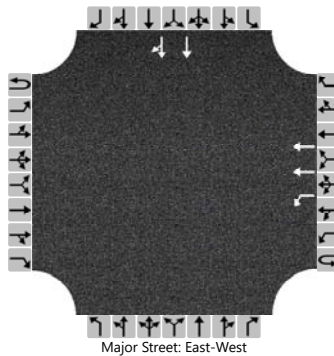


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	46	609	285	131	522	105
Future Volume (vph)	46	609	285	131	522	105
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.977	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1820	0
Flt Permitted	0.950		0.164			
Satd. Flow (perm)	1770	1583	305	1863	1820	0
Satd. Flow (RTOR)		195			14	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)						
Lane Group Flow (vph)	49	655	306	141	674	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	13.6	32.0	32.0	76.4	44.4	
Total Split (%)	15.1%	35.6%	35.6%	84.9%	49.3%	
Maximum Green (s)	8.1	26.5	26.5	70.4	38.4	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	C-Min	C-Min	
Act Effect Green (s)	8.0	34.5	76.4	78.3	44.0	
Actuated g/C Ratio	0.09	0.38	0.85	0.87	0.49	
v/c Ratio	0.31	0.90	0.44	0.09	0.75	
Control Delay	44.0	34.3	10.5	2.3	27.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	44.0	34.3	10.5	2.3	27.1	
LOS	D	C	B	A	C	
Approach Delay	35.0			7.9	27.1	
Approach LOS	D			A	C	
Queue Length 50th (ft)	27	226	94	25	331	
Queue Length 95th (ft)	62	#410	182	22	#544	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85	330			
Base Capacity (vph)	159	740	701	1620	896	
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	0.31	0.89	0.44	0.09	0.75	

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	BJH			Intersection	N Mall Rd at East Towne W		
Agency/Co.	Cannon & Cannon, Inc.			Jurisdiction	City of Knoxville		
Date Performed	12/15/2020			East/West Street	North Mall Road		
Analysis Year	2027			North/South Street	East Towne Road (West)		
Time Analyzed	AM Peak			Peak Hour Factor	0.84		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Combined 2027 AM						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	0	0	0	1	2	0		0	0	0		0	2	0
Configuration						L	T								T	TR
Volume (veh/h)						9	444								36	0
Percent Heavy Vehicles (%)						2									2	2
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						5.3									6.5	6.9
Critical Headway (sec)						0.00									6.54	6.94
Base Follow-Up Headway (sec)						3.1									4.0	3.3
Follow-Up Headway (sec)						3.12									4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						11									21	21
Capacity, c (veh/h)						1154									437	437
v/c Ratio						0.01									0.05	0.05
95% Queue Length, Q ₉₅ (veh)						0.0									0.2	0.2
Control Delay (s/veh)						8.1									13.7	13.7
Level of Service (LOS)						A									B	B
Approach Delay (s/veh)						0.2									13.7	
Approach LOS															B	

Intersection	
Intersection Delay, s/veh	11.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑↑				
Traffic Vol, veh/h	0	0	0	0	440	13	2	83	0	0	0	0
Future Vol, veh/h	0	0	0	0	440	13	2	83	0	0	0	0
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.63	0.72	0.72	0.72	0.72
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	611	18	3	132	0	0	0	0
Number of Lanes	0	0	0	0	2	0	0	2	0	0	0	0

Approach	WB	NB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NB	
Conflicting Lanes Left	2	0
Conflicting Approach Right		WB
Conflicting Lanes Right	0	2
HCM Control Delay	12.3	9.6
HCM LOS	B	A

Lane	NBLn1	NBLn2	WBLn1	WBLn2
Vol Left, %	7%	0%	0%	0%
Vol Thru, %	93%	100%	100%	92%
Vol Right, %	0%	0%	0%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	30	55	293	160
LT Vol	2	0	0	0
Through Vol	28	55	293	147
RT Vol	0	0	0	13
Lane Flow Rate	47	88	407	222
Geometry Grp	7	7	7	7
Degree of Util (X)	0.078	0.146	0.557	0.3
Departure Headway (Hd)	6.003	5.969	4.926	4.869
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	596	600	733	738
Service Time	3.745	3.711	2.657	2.6
HCM Lane V/C Ratio	0.079	0.147	0.555	0.301
HCM Control Delay	9.3	9.7	13.7	9.7
HCM Lane LOS	A	A	B	A
HCM 95th-tile Q	0.3	0.5	3.5	1.3

Intersection

Int Delay, s/veh 0.1

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations			↑↑			↑
Traffic Vol, veh/h	0	0	459	76	0	7
Future Vol, veh/h	0	0	459	76	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	83	83	83	59	83	83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	553	129	0	8

Major/Minor Major2 Minor2

Conflicting Flow All	-	0	-	341
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	655
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	655
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach WB SB

HCM Control Delay, s	0	10.6
HCM LOS		B

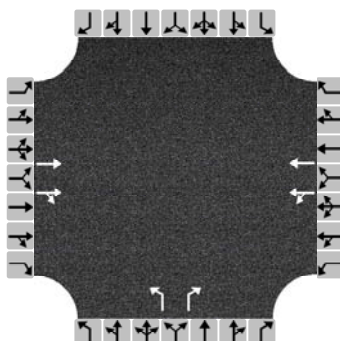
Minor Lane/Major Mvmt WBT WBR SBLn1

Capacity (veh/h)	-	-	655
HCM Lane V/C Ratio	-	-	0.013
HCM Control Delay (s)	-	-	10.6
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	BJH	Intersection	Knoxville Ctr at E Towne
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	City of Knoxville
Date Performed	12/15/2020	East/West Street	Knoxville Center Drive
Analysis Year	2027	North/South Street	East Towne Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.75
Time Analyzed	AM Peak		
Project Description	Combined 2027 AM		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume		14	255	20	9		16		159			
% Thrus in Shared Lane			50	50								
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	T	TR		LT	T		L	R				
Flow Rate, v (veh/h)	9	349		33	6		21	212				
Percent Heavy Vehicles	2	2		2	2		2	2				

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20				
Initial Degree of Utilization, x	0.008	0.311		0.029	0.005		0.019	0.188				
Final Departure Headway, hd (s)	5.17	4.49		5.86	5.45		5.92	4.73				
Final Degree of Utilization, x	0.013	0.435		0.053	0.009		0.035	0.278				
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3				
Service Time, ts (s)	2.87	2.19		3.56	3.15		3.62	2.43				

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	9	349		33	6		21	212				
Capacity	696	802		614	660		608	762				
95% Queue Length, Q ₉₅ (veh)	0.0	2.2		0.2	0.0		0.1	1.1				
Control Delay (s/veh)	7.9	10.6		8.9	8.2		8.8	9.2				
Level of Service, LOS	A	B		A	A		A	A				
Approach Delay (s/veh)	10.5			8.8			9.2					
Approach LOS	B			A			A					
Intersection Delay, s/veh LOS	9.9						A					

Intersection	
Intersection Delay, s/veh	8.5
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	↑
Traffic Vol, veh/h	120	2	6	26	61	19
Future Vol, veh/h	120	2	6	26	61	19
Peak Hour Factor	0.68	0.74	0.74	0.74	0.61	0.59
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	176	3	8	35	100	32
Number of Lanes	2	0	0	2	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	8.4	8	8.8
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	41%	0%
Vol Thru, %	0%	0%	100%	95%	59%	100%
Vol Right, %	0%	100%	0%	5%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	61	19	80	42	15	17
LT Vol	61	0	0	0	6	0
Through Vol	0	0	80	40	9	17
RT Vol	0	19	0	2	0	0
Lane Flow Rate	100	32	118	62	20	23
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.155	0.039	0.161	0.084	0.029	0.033
Departure Headway (Hd)	5.578	4.375	4.938	4.904	5.264	5.059
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	645	820	729	733	682	709
Service Time	3.295	2.092	2.651	2.617	2.982	2.777
HCM Lane V/C Ratio	0.155	0.039	0.162	0.085	0.029	0.032
HCM Control Delay	9.3	7.3	8.6	8.1	8.1	8
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0.5	0.1	0.6	0.3	0.1	0.1

Intersection	
Intersection Delay, s/veh	9.3
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	95	18	7	75	141	6
Future Vol, veh/h	95	18	7	75	141	6
Peak Hour Factor	0.74	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	128	21	8	87	164	7
Number of Lanes	1	1	2	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	9.5	7.7	10.1
HCM LOS	A	A	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	100%	0%	99%	0%
Vol Thru, %	100%	3%	0%	0%	1%	100%
Vol Right, %	0%	97%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	5	77	95	18	143	4
LT Vol	0	0	95	0	141	0
Through Vol	5	2	0	0	2	4
RT Vol	0	75	0	18	0	0
Lane Flow Rate	5	90	128	21	166	5
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.008	0.111	0.204	0.026	0.256	0.007
Departure Headway (Hd)	5.136	4.453	5.712	4.508	5.534	5.039
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	697	805	629	794	650	711
Service Time	2.864	2.181	3.442	2.238	3.259	2.764
HCM Lane V/C Ratio	0.007	0.112	0.203	0.026	0.255	0.007
HCM Control Delay	7.9	7.7	9.9	7.4	10.2	7.8
HCM Lane LOS	A	A	A	A	B	A
HCM 95th-tile Q	0	0.4	0.8	0.1	1	0

Intersection						
Int Delay, s/veh	2.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	0	82	14	5	207	2
Future Vol, veh/h	0	82	14	5	207	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	95	16	6	241	2

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	277	122	243	0	-	0
Stage 1	242	-	-	-	-	-
Stage 2	35	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	690	906	1320	-	-	-
Stage 1	776	-	-	-	-	-
Stage 2	983	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	682	906	1320	-	-	-
Mov Cap-2 Maneuver	682	-	-	-	-	-
Stage 1	767	-	-	-	-	-
Stage 2	983	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.4	5.7	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1320	-	906	-	-
HCM Lane V/C Ratio	0.012	-	0.105	-	-
HCM Control Delay (s)	7.8	0	9.4	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Lanes, Volumes, Timings
1: Mill Road & Washington Pike

Knoxville Center TIS
2027 Combined PM

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗↗
Traffic Volume (vph)	1004	126	351	522	95	712
Future Volume (vph)	1004	126	351	522	95	712
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	0.88
Frt	0.983					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3479	0	1770	3539	1770	2787
Flt Permitted			0.125		0.950	
Satd. Flow (perm)	3479	0	233	3539	1770	2787
Satd. Flow (RTOR)	10					10
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1190	0	369	549	100	749
Turn Type	NA		pm+pt	NA	Prot	pm+ov
Protected Phases	2		1	6	4	1
Permitted Phases			6			4
Detector Phase	2		1	6	4	1
Switch Phase						
Minimum Initial (s)	12.0		10.0	12.0	10.0	10.0
Minimum Split (s)	19.0		17.0	19.0	17.0	17.0
Total Split (s)	45.0		45.0	90.0	50.0	45.0
Total Split (%)	32.1%		32.1%	64.3%	35.7%	32.1%
Maximum Green (s)	39.0		39.0	84.0	44.0	39.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
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)	6.0		6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	Max		None	Max	None	None
Act Effect Green (s)	54.6		84.0	84.0	12.0	41.4
Actuated g/C Ratio	0.51		0.78	0.78	0.11	0.38
v/c Ratio	0.68		0.72	0.20	0.51	0.70
Control Delay	23.8		24.7	3.5	54.7	30.7
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	23.8		24.7	3.5	54.7	30.7
LOS	C		C	A	D	C
Approach Delay	23.8			12.0	33.6	
Approach LOS	C			B	C	
Queue Length 50th (ft)	295		130	41	66	247
Queue Length 95th (ft)	485		232	67	121	269
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200		100	100
Base Capacity (vph)	1762		736	2753	721	1474
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	0.68		0.50	0.20	0.14	0.51

Intersection Summary

























Cycle Length: 140	
Actuated Cycle Length: 108	
Natural Cycle: 60	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 22.9	Intersection LOS: C
Intersection Capacity Utilization 74.5%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 1: Mill Road & Washington Pike



Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

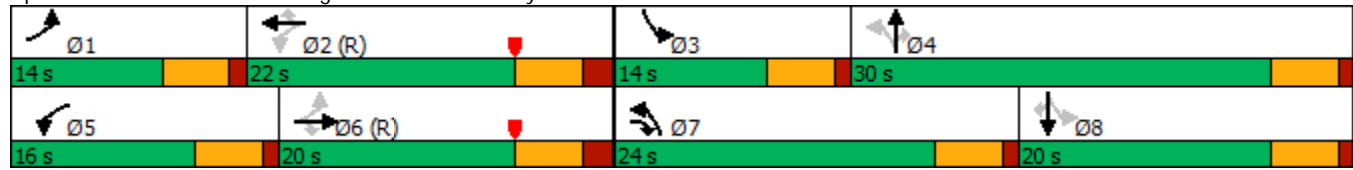
Knoxville Center TIS
2027 Combined PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	109	333	525	68	13	317	329	972	67	337	57
Future Volume (vph)	55	109	333	525	68	13	317	329	972	67	337	57
Lane Util. Factor	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	3433	1863	1583	1770	1863	2787	1770	3539	1583
Flt Permitted	0.708			0.520			0.307			0.543		
Satd. Flow (perm)	1319	3539	1583	1879	1863	1583	572	1863	2787	1011	3539	1583
Satd. Flow (RTOR)			95			232			1080			245
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	121	370	583	76	14	352	366	1080	74	374	63
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	7	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	14.0	20.0	24.0	16.0	22.0	22.0	24.0	30.0	30.0	14.0	20.0	20.0
Total Split (%)	17.5%	25.0%	30.0%	20.0%	27.5%	27.5%	30.0%	37.5%	37.5%	17.5%	25.0%	25.0%
Maximum Green (s)	9.0	14.0	19.0	11.0	16.0	16.0	19.0	25.0	25.0	9.0	15.0	15.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	C-Max	None	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	26.6	17.7	39.3	34.8	26.8	26.8	34.0	24.4	24.4	20.1	13.3	13.3
Actuated g/C Ratio	0.33	0.22	0.49	0.44	0.34	0.34	0.42	0.30	0.30	0.25	0.17	0.17
v/c Ratio	0.13	0.15	0.45	0.55	0.12	0.02	0.74	0.64	0.67	0.23	0.63	0.13
Control Delay	15.9	27.8	12.1	18.3	24.9	0.1	16.5	20.9	5.7	15.6	35.9	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.9	27.8	12.1	18.3	24.9	0.1	16.5	20.9	5.7	15.6	35.9	0.6
LOS	B	C	B	B	C	A	B	C	A	B	D	A
Approach Delay		16.0			18.7			10.9			28.6	
Approach LOS		B			B			B			C	
Queue Length 50th (ft)	17	27	90	97	29	0	65	145	102	21	92	0
Queue Length 95th (ft)	43	51	150	151	68	0	m91	m228	137	40	133	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	300		170	160		160	150		75
Base Capacity (vph)	507	782	888	1058	624	685	527	602	1632	367	680	501
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.15	0.42	0.55	0.12	0.02	0.67	0.61	0.66	0.20	0.55	0.13

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 72 (90%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.74
 Intersection Signal Delay: 15.7
 Intersection LOS: B
 Intersection Capacity Utilization 61.9%
 ICU Level of Service B
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Washington Pike & Greenway Drive



Lanes, Volumes, Timings
 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road

Knoxville Center TIS
 2027 Combined PM

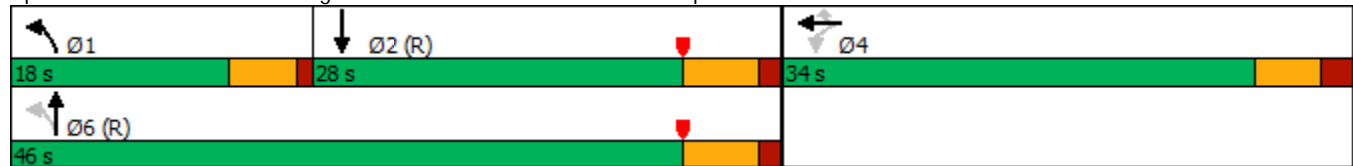


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↖	↗	↖	↖	↗			↗	↖
Traffic Volume (vph)	0	0	0	119	411	338	266	1300	0	0	627	544
Future Volume (vph)	0	0	0	119	411	338	266	1300	0	0	627	544
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1770	1863	1583	1770	3539	0	0	3539	1583
Flt Permitted				0.950			0.241					
Satd. Flow (perm)	0	0	0	1770	1863	1583	449	3539	0	0	3539	1583
Satd. Flow (RTOR)						109						370
Peak Hour Factor	0.92	0.92	0.92	0.92	0.86	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	129	478	367	289	1413	0	0	682	591
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Free
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					Free
Detector Phase				4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0			10.0	
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0			19.0	
Total Split (s)				34.0	34.0	34.0	18.0	46.0			28.0	
Total Split (%)				42.5%	42.5%	42.5%	22.5%	57.5%			35.0%	
Maximum Green (s)				28.0	28.0	28.0	13.0	40.0			22.0	
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5			4.5	
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5			1.5	
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	
Total Lost Time (s)				6.0	6.0	6.0	5.0	6.0			6.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			2.0	
Recall Mode				None	None	None	None	C-Max			C-Max	
Act Effect Green (s)				25.1	25.1	25.1	43.9	42.9			26.8	80.0
Actuated g/C Ratio				0.31	0.31	0.31	0.55	0.54			0.34	1.00
v/c Ratio				0.23	0.82	0.64	0.68	0.74			0.58	0.37
Control Delay				20.4	37.3	21.3	13.7	8.1			26.9	0.6
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				20.4	37.3	21.3	13.7	8.1			26.9	0.6
LOS				C	D	C	B	A			C	A
Approach Delay					29.0			9.1			14.7	
Approach LOS					C			A			B	
Queue Length 50th (ft)				45	207	102	23	57			187	1
Queue Length 95th (ft)				84	295	189	m61	314			247	0
Internal Link Dist (ft)		569			2042			923			673	
Turn Bay Length (ft)						475	105					100
Base Capacity (vph)				619	652	624	460	1897			1186	1583
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				0.21	0.73	0.59	0.63	0.74			0.58	0.37

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 19 (24%), Referenced to phase 2:SBT and 6:NBTL, Start of Yellow
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.82
 Intersection Signal Delay: 15.8
 Intersection LOS: B
 Intersection Capacity Utilization 75.4%
 ICU Level of Service D
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road



Lanes, Volumes, Timings

Knoxville Center TIS

4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road

2027 Combined PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	952	588	395	0	0	0	0	607	61	361	384	0
Future Volume (vph)	952	588	395	0	0	0	0	607	61	361	384	0
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	3539	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.288		
Satd. Flow (perm)	3433	3539	1583	0	0	0	0	3539	1583	536	3539	0
Satd. Flow (RTOR)			403							95		
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)	971	600	403	0	0	0	0	619	62	368	392	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	32.0	32.0	32.0					26.0	26.0	22.0		
Total Split (%)	40.0%	40.0%	40.0%					32.5%	32.5%	27.5%		
Maximum Green (s)	27.0	27.0	27.0					20.0	20.0	17.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	27.2	27.2	27.2					22.0	22.0	37.8	41.8	
Actuated g/C Ratio	0.34	0.34	0.34					0.28	0.28	0.47	0.52	
v/c Ratio	0.83	0.50	0.50					0.64	0.12	0.77	0.21	
Control Delay	32.0	22.7	4.7					29.8	3.0	18.1	5.8	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	32.0	22.7	4.7					29.8	3.0	18.1	5.8	
LOS	C	C	A					C	A	B	A	
Approach Delay		23.6						27.3			11.8	
Approach LOS		C						C			B	
Queue Length 50th (ft)	228	124	0					147	0	34	18	
Queue Length 95th (ft)	#314	172	58					205	15	#80	48	
Internal Link Dist (ft)		2101			1667			717			923	
Turn Bay Length (ft)	400		265						150	120		
Base Capacity (vph)	1185	1221	810					973	504	530	1946	
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	0.82	0.49	0.50					0.64	0.12	0.69	0.20	

Intersection

Int Delay, s/veh 0

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1090	0	0	0	0
Future Vol, veh/h	0	1090	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	81	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1172	0	0	0	0

Major/Minor Major1 Minor2

Conflicting Flow All	-	0	586	-
Stage 1	-	-	0	-
Stage 2	-	-	586	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	441	0
Stage 1	0	-	-	0
Stage 2	0	-	519	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	441	-
Mov Cap-2 Maneuver	-	-	441	-
Stage 1	-	-	-	-
Stage 2	-	-	519	-

Approach EB SB

HCM Control Delay, s	0	0
HCM LOS		A

Minor Lane/Major Mvmt EBT SBLn1

Capacity (veh/h)	-	-
HCM Lane V/C Ratio	-	-
HCM Control Delay (s)	-	0
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	-

Intersection												
Int Delay, s/veh	0.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗						↘				
Traffic Vol, veh/h	270	877	28	0	0	0	0	6	32	0	0	0
Future Vol, veh/h	270	877	28	0	0	0	0	6	32	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	303	985	31	0	0	0	0	7	36	0	0	0

Major/Minor	Major1			Minor1		
Conflicting Flow All	0	0	0	-	1607	508
Stage 1	-	-	-	-	1607	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.14	-	-	-	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.22	-	-	-	4.02	3.32
Pot Cap-1 Maneuver	-	-	-	0	104	510
Stage 1	-	-	-	0	163	-
Stage 2	-	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	0	510
Mov Cap-2 Maneuver	-	-	-	-	0	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-

Approach	EB	NB
HCM Control Delay, s		12.7
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	510	-	-	-
HCM Lane V/C Ratio	0.084	-	-	-
HCM Control Delay (s)	12.7	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.3	-	-	-

Lanes, Volumes, Timings
7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

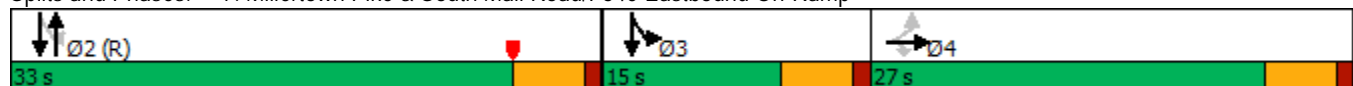
Knoxville Center TIS
2027 Combined PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	512	310	63	0	0	0	0	329	140	487	483	0
Future Volume (vph)	512	310	63	0	0	0	0	329	140	487	483	0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.987								0.950		
Satd. Flow (prot)	1681	1747	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.987								0.527		
Satd. Flow (perm)	1681	1747	1583	0	0	0	0	3539	1583	982	3539	0
Satd. Flow (RTOR)			102							154		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Shared Lane Traffic (%)	21%											
Lane Group Flow (vph)	445	459	69	0	0	0	0	362	154	535	531	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	27.0	27.0	27.0					33.0	33.0	15.0		
Total Split (%)	36.0%	36.0%	36.0%					44.0%	44.0%	20.0%		
Maximum Green (s)	22.0	22.0	22.0					28.0	28.0	10.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	21.3	21.3	21.3					29.0	29.0	38.7	43.7	
Actuated g/C Ratio	0.28	0.28	0.28					0.39	0.39	0.52	0.58	
v/c Ratio	0.93	0.93	0.13					0.26	0.22	0.88	0.26	
Control Delay	54.7	52.9	1.6					16.7	3.9	27.9	3.0	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	54.7	52.9	1.6					16.7	3.9	27.9	3.0	
LOS	D	D	A					B	A	C	A	
Approach Delay		50.1						12.9			15.5	
Approach LOS		D						B			B	
Queue Length 50th (ft)	208	214	0					60	0	74	12	
Queue Length 95th (ft)	#389	#389	m6					91	34	#370	22	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	493	512	536					1370	707	616	2078	
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	0.90	0.90	0.13					0.26	0.22	0.87	0.26	

Intersection Summary

Cycle Length: 75	
Actuated Cycle Length: 75	
Offset: 53 (71%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.93	
Intersection Signal Delay: 28.1	Intersection LOS: C
Intersection Capacity Utilization 82.6%	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.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp



Lanes, Volumes, Timings
 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp

Knoxville Center TIS
 2027 Combined PM

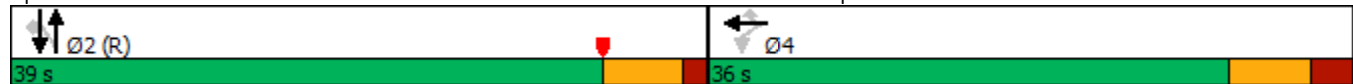


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↕			↕	↘
Traffic Volume (vph)	0	0	0	170	406	656	85	739	0	0	795	347
Future Volume (vph)	0	0	0	170	406	656	85	739	0	0	795	347
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.998		0.950					
Satd. Flow (prot)	0	0	0	1681	1766	2787	1770	3539	0	0	3539	1583
Flt Permitted				0.950	0.998		0.275					
Satd. Flow (perm)	0	0	0	1681	1766	2787	512	3539	0	0	3539	1583
Satd. Flow (RTOR)						185						258
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	0	161	445	691	89	778	0	0	837	365
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2			2	
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				36.0	36.0	36.0	39.0	39.0			39.0	39.0
Total Split (%)				48.0%	48.0%	48.0%	52.0%	52.0%			52.0%	52.0%
Maximum Green (s)				29.0	29.0	29.0	33.0	33.0			33.0	33.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)				7.0	7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)				25.9	25.9	25.9	36.1	36.1			36.1	36.1
Actuated g/C Ratio				0.35	0.35	0.35	0.48	0.48			0.48	0.48
v/c Ratio				0.28	0.73	0.64	0.36	0.46			0.49	0.41
Control Delay				18.1	28.7	17.1	6.6	4.1			7.8	2.2
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				18.1	28.7	17.1	6.6	4.1			7.8	2.2
LOS				B	C	B	A	A			A	A
Approach Delay					21.2			4.3			6.1	
Approach LOS					C			A			A	
Queue Length 50th (ft)				52	173	100	5	22			57	2
Queue Length 95th (ft)				95	277	157	m6	m25			113	20
Internal Link Dist (ft)		1096			1137			650			484	
Turn Bay Length (ft)				450		800	95					
Base Capacity (vph)				649	682	1191	246	1701			1701	895
Starvation Cap Reductn				0	0	0	0	0			0	0
Spillback Cap Reductn				0	0	4	0	61			0	0
Storage Cap Reductn				0	0	0	0	0			0	0
Reduced v/c Ratio				0.25	0.65	0.58	0.36	0.47			0.49	0.41

Intersection Summary
























Cycle Length: 75	
Actuated Cycle Length: 75	
Offset: 45 (60%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 11.5	Intersection LOS: B
Intersection Capacity Utilization 82.6%	ICU Level of Service E
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp



Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way

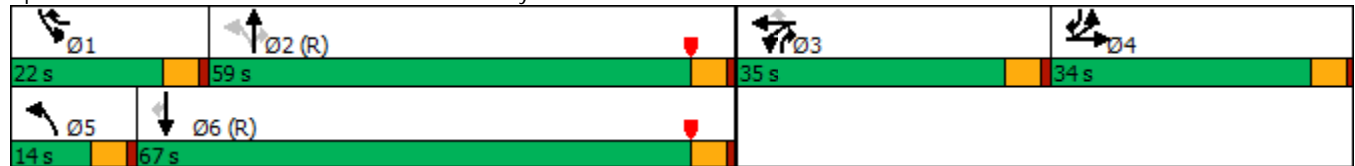
Knoxville Center TIS
2027 Combined PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	201	59	89	371	47	159	61	881	439	111	648	90
Future Volume (vph)	201	59	89	371	47	159	61	881	439	111	648	90
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.906				0.850			0.850			0.850
Flt Protected	0.950			0.950	0.963		0.950			0.950		
Satd. Flow (prot)	1770	1688	0	1681	1704	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950	0.963		0.356			0.950		
Satd. Flow (perm)	1770	1688	0	1681	1704	1583	663	3539	1583	1770	3539	1583
Satd. Flow (RTOR)		49				105			458			84
Peak Hour Factor	0.89	0.95	0.86	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				44%								
Lane Group Flow (vph)	226	165	0	219	221	167	64	927	462	117	682	95
Turn Type	Split	NA		Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4		3	3	1	5	2	3	1	6	4
Permitted Phases						3	2		2			6
Detector Phase	4	4		3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0		16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	34.0	34.0		35.0	35.0	22.0	14.0	59.0	35.0	22.0	67.0	34.0
Total Split (%)	22.7%	22.7%		23.3%	23.3%	14.7%	9.3%	39.3%	23.3%	14.7%	44.7%	22.7%
Maximum Green (s)	29.0	29.0		30.0	30.0	17.0	9.0	54.0	30.0	17.0	62.0	29.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)	24.0	24.0		25.8	25.8	39.4	73.8	66.5	97.3	13.7	75.2	100.2
Actuated g/C Ratio	0.16	0.16		0.17	0.17	0.26	0.49	0.44	0.65	0.09	0.50	0.67
v/c Ratio	0.80	0.53		0.76	0.76	0.34	0.17	0.59	0.39	0.73	0.38	0.09
Control Delay	80.7	45.7		75.7	75.3	10.3	16.6	32.3	2.6	98.1	21.7	0.6
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.6	0.3	0.0	0.0	0.0
Total Delay	80.7	45.7		75.7	75.3	10.3	16.6	32.9	2.9	98.1	21.7	0.6
LOS	F	D		E	E	B	B	C	A	F	C	A
Approach Delay		66.0			57.6			22.7			29.5	
Approach LOS		E			E			C			C	
Queue Length 50th (ft)	214	104		213	214	30	24	340	21	121	175	0
Queue Length 95th (ft)	299	178		309	311	62	m56	489	48	m172	m265	m5
Internal Link Dist (ft)		713			953			484			243	
Turn Bay Length (ft)	290			155		245	180		180	120		105
Base Capacity (vph)	342	365		336	340	526	400	1570	1219	200	1774	1110
Starvation Cap Reductn	0	0		0	0	0	0	290	291	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.66	0.45		0.65	0.65	0.32	0.16	0.72	0.50	0.58	0.38	0.09

Intersection Summary

Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 147 (98%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.80
 Intersection Signal Delay: 35.9
 Intersection LOS: D
 Intersection Capacity Utilization 69.8%
 ICU Level of Service C
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Millertown Pike & Kinzel Way



Intersection

Int Delay, s/veh 1.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	41	48	13	1270	839	40
Future Vol, veh/h	41	48	13	1270	839	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	42	49	13	1309	865	41

Major/Minor

	Minor2	Major1	Major2			
Conflicting Flow All	1567	886	906	0	-	0
Stage 1	886	-	-	-	-	-
Stage 2	681	-	-	-	-	-
Critical Hdwy	6.63	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	112	343	749	-	-	-
Stage 1	402	-	-	-	-	-
Stage 2	465	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	105	343	749	-	-	-
Mov Cap-2 Maneuver	105	-	-	-	-	-
Stage 1	376	-	-	-	-	-
Stage 2	465	-	-	-	-	-

Approach

	EB	NB	SB
HCM Control Delay, s	37.3	0.4	0
HCM LOS	E		

Minor Lane/Major Mvmt

	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	749	-	105	343	-	-
HCM Lane V/C Ratio	0.018	-	0.403	0.144	-	-
HCM Control Delay (s)	9.9	0.3	60.7	17.3	-	-
HCM Lane LOS	A	A	F	C	-	-
HCM 95th %tile Q(veh)	0.1	-	1.7	0.5	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road

Knoxville Center TIS
2027 Combined PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	91	43	99	157	48	200	103	1058	88	84	618	16
Future Volume (vph)	91	43	99	157	48	200	103	1058	88	84	618	16
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.895			0.879			0.988			0.996	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1667	0	1770	1637	0	1770	1840	0	1770	1855	0
Flt Permitted	0.270			0.311			0.294			0.042		
Satd. Flow (perm)	503	1667	0	579	1637	0	548	1840	0	78	1855	0
Satd. Flow (RTOR)		62			111			5			2	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	96	149	0	165	262	0	108	1207	0	88	668	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	15.0	16.0		15.0	16.0		15.0	24.0		14.0	24.0	
Total Split (s)	15.0	20.0		16.0	21.0		15.0	100.0		14.0	99.0	
Total Split (%)	10.0%	13.3%		10.7%	14.0%		10.0%	66.7%		9.3%	66.0%	
Maximum Green (s)	10.0	15.0		11.0	16.0		10.0	95.0		9.0	94.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effect Green (s)	24.3	14.7		27.2	16.2		104.9	96.8		103.7	96.2	
Actuated g/C Ratio	0.16	0.10		0.18	0.11		0.70	0.65		0.69	0.64	
v/c Ratio	0.59	0.68		0.86	0.95		0.24	1.02		0.64	0.56	
Control Delay	66.2	54.0		90.6	81.2		3.0	49.8		45.5	17.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.7	
Total Delay	66.2	54.0		90.6	81.2		3.0	49.8		45.5	18.2	
LOS	E	D		F	F		A	D		D	B	
Approach Delay		58.8			84.8			45.9			21.4	
Approach LOS		E			F			D			C	
Queue Length 50th (ft)	80	83		143	154		7	~583		33	348	
Queue Length 95th (ft)	136	162		#233	#337		m12	#1538		96	473	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)				175						65		
Base Capacity (vph)	167	222		192	275		471	1188		156	1189	
Starvation Cap Reductn	0	0		0	0		0	0		0	222	
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	0.57	0.67		0.86	0.95		0.23	1.02		0.56	0.69	

Intersection Summary

Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 12 (8%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 46.4	Intersection LOS: D
Intersection Capacity Utilization 102.6%	ICU Level of Service G
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.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 11: Millertown Pike & Loves Creek Road

 Ø1 14 s	 Ø2 (R) 100 s	 Ø3 15 s	 Ø4 21 s
 Ø5 15 s	 Ø6 (R) 99 s	 Ø7 16 s	 Ø8 20 s

Lanes, Volumes, Timings
12: Millertown Pike & Mill Road

Knoxville Center TIS
2027 Combined PM

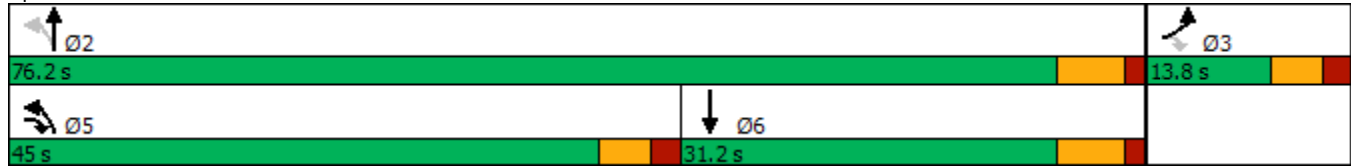


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	91	418	768	646	330	84
Future Volume (vph)	91	418	768	646	330	84
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.973	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1812	0
Flt Permitted	0.950		0.176			
Satd. Flow (perm)	1770	1583	328	1863	1812	0
Satd. Flow (RTOR)		216			14	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	96	440	808	680	435	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	13.8	45.0	45.0	76.2	31.2	
Total Split (%)	15.3%	50.0%	50.0%	84.7%	34.7%	
Maximum Green (s)	8.3	39.5	39.5	70.2	25.2	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	8.6	47.4	66.4	67.8	22.9	
Actuated g/C Ratio	0.10	0.58	0.81	0.82	0.28	
v/c Ratio	0.52	0.44	0.88	0.44	0.85	
Control Delay	50.5	6.1	28.6	4.2	45.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	50.5	6.1	28.6	4.2	45.6	
LOS	D	A	C	A	D	
Approach Delay	14.1			17.4	45.6	
Approach LOS	B			B	D	
Queue Length 50th (ft)	53	56	329	103	226	
Queue Length 95th (ft)	#115	114	#588	152	#388	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85	330			
Base Capacity (vph)	186	1069	987	1539	589	
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	0.52	0.41	0.82	0.44	0.74	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 82.3	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.88	
Intersection Signal Delay: 21.7	Intersection LOS: C
Intersection Capacity Utilization 85.9%	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.	

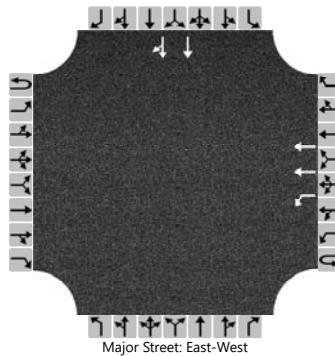
Splits and Phases: 12: Millertown Pike & Mill Road



HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	BJH			Intersection	N Mall Rd at East Towne W		
Agency/Co.	Cannon & Cannon, Inc.			Jurisdiction	City of Knoxville		
Date Performed	12/15/2020			East/West Street	North Mall Road		
Analysis Year	2027			North/South Street	East Towne Road (West)		
Time Analyzed	PM Peak			Peak Hour Factor	0.88		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Combined 2027 PM						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	0	0	0	1	2	0		0	0	0		0	2	0
Configuration						L	T								T	TR
Volume (veh/h)						23	732								35	0
Percent Heavy Vehicles (%)						2									2	2
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						5.3									6.5	6.9
Critical Headway (sec)						0.00									6.54	6.94
Base Follow-Up Headway (sec)						3.1									4.0	3.3
Follow-Up Headway (sec)						3.12									4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					26										20	20
Capacity, c (veh/h)					1154										276	276
v/c Ratio					0.02										0.07	0.07
95% Queue Length, Q ₉₅ (veh)					0.1										0.2	0.2
Control Delay (s/veh)					8.2										19.0	19.0
Level of Service (LOS)					A										C	C
Approach Delay (s/veh)						0.2									19.0	
Approach LOS															C	

Intersection	
Intersection Delay, s/veh	17.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑↑				
Traffic Vol, veh/h	0	0	0	0	732	25	1	267	0	0	0	0
Future Vol, veh/h	0	0	0	0	732	25	1	267	0	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.91	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	771	26	1	293	0	0	0	0
Number of Lanes	0	0	0	0	2	0	0	2	0	0	0	0

Approach	WB	NB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NB	
Conflicting Lanes Left	2	0
Conflicting Approach Right		WB
Conflicting Lanes Right	0	2
HCM Control Delay	19.8	12
HCM LOS	C	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2
Vol Left, %	1%	0%	0%	0%
Vol Thru, %	99%	100%	100%	91%
Vol Right, %	0%	0%	0%	9%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	90	178	488	269
LT Vol	1	0	0	0
Through Vol	89	178	488	244
RT Vol	0	0	0	25
Lane Flow Rate	99	196	514	283
Geometry Grp	7	7	7	7
Degree of Util (X)	0.178	0.352	0.77	0.419
Departure Headway (Hd)	6.485	6.479	5.398	5.332
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	557	559	663	668
Service Time	4.185	4.179	3.194	3.129
HCM Lane V/C Ratio	0.178	0.351	0.775	0.424
HCM Control Delay	10.6	12.7	24.1	12
HCM Lane LOS	B	B	C	B
HCM 95th-tile Q	0.6	1.6	7.3	2.1

Intersection

Int Delay, s/veh 0.7

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations			↑↓			↑
Traffic Vol, veh/h	0	0	767	135	0	55
Future Vol, veh/h	0	0	767	135	0	55
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	87	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	799	155	0	57

Major/Minor Major2 Minor2

Conflicting Flow All	-	0	-	477
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	534
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	534
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach WB SB

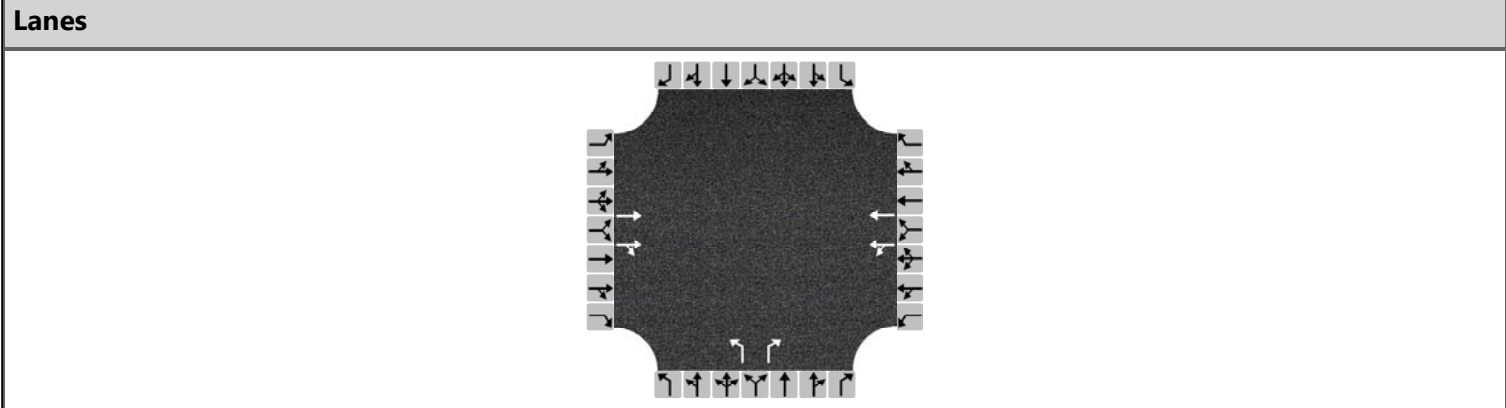
HCM Control Delay, s	0	12.6
HCM LOS		B

Minor Lane/Major Mvmt WBT WBR SBLn1

Capacity (veh/h)	-	-	534
HCM Lane V/C Ratio	-	-	0.107
HCM Control Delay (s)	-	-	12.6
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.4

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	BJH	Intersection	Knoxville Ctr at E Towne
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	City of Knoxville
Date Performed	12/15/2020	East/West Street	Knoxville Center Drive
Analysis Year	2027	North/South Street	East Towne Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.85
Time Analyzed	PM Peak		
Project Description	Combined 2027 PM		



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume		13	69	192	32		54		350			
% Thrus in Shared Lane			50	50								
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	T	TR		LT	T		L	R				
Flow Rate, v (veh/h)	8	89		245	19		64	412				
Percent Heavy Vehicles	2	2		2	2		2	2				

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20				
Initial Degree of Utilization, x	0.007	0.079		0.218	0.017		0.056	0.366				
Final Departure Headway, hd (s)	6.16	5.52		6.34	5.88		6.08	4.88				
Final Degree of Utilization, x	0.013	0.136		0.431	0.031		0.107	0.559				
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3				
Service Time, ts (s)	3.86	3.22		4.04	3.58		3.78	2.58				

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	8	89		245	19		64	412				
Capacity	584	653		567	612		592	737				
95% Queue Length, Q ₉₅ (veh)	0.0	0.5		2.2	0.1		0.4	3.5				
Control Delay (s/veh)	8.9	9.1		13.8	8.8		9.5	13.6				
Level of Service, LOS	A	A		B	A		A	B				
Approach Delay (s/veh)	9.1			13.4			13.0					
Approach LOS	A			B			B					
Intersection Delay, s/veh LOS	12.7						B					

Intersection	
Intersection Delay, s/veh	9.8
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	↑
Traffic Vol, veh/h	318	8	44	131	100	43
Future Vol, veh/h	318	8	44	131	100	43
Peak Hour Factor	0.93	0.93	0.73	0.93	0.89	0.83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	342	9	60	141	112	52
Number of Lanes	2	0	0	2	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	10	9.3	9.9
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	50%	0%
Vol Thru, %	0%	0%	100%	93%	50%	100%
Vol Right, %	0%	100%	0%	7%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	100	43	212	114	88	87
LT Vol	100	0	0	0	44	0
Through Vol	0	0	212	106	44	87
RT Vol	0	43	0	8	0	0
Lane Flow Rate	112	52	228	123	107	94
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.198	0.074	0.331	0.176	0.167	0.14
Departure Headway (Hd)	6.339	5.13	5.223	5.174	5.618	5.365
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	563	693	686	690	635	665
Service Time	4.11	2.901	2.977	2.928	3.382	3.129
HCM Lane V/C Ratio	0.199	0.075	0.332	0.178	0.169	0.141
HCM Control Delay	10.7	8.3	10.6	9	9.5	9
HCM Lane LOS	B	A	B	A	A	A
HCM 95th-tile Q	0.7	0.2	1.4	0.6	0.6	0.5

Intersection	
Intersection Delay, s/veh	12.5
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	177	78	32	312	97	29
Future Vol, veh/h	177	78	32	312	97	29
Peak Hour Factor	0.86	0.86	0.86	0.81	0.78	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	206	91	37	385	124	34
Number of Lanes	1	1	2	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	11.8	13.5	10.9
HCM LOS	B	B	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	100%	0%	91%	0%
Vol Thru, %	100%	3%	0%	0%	9%	100%
Vol Right, %	0%	97%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	21	323	177	78	107	19
LT Vol	0	0	177	0	97	0
Through Vol	21	11	0	0	10	19
RT Vol	0	312	0	78	0	0
Lane Flow Rate	25	398	206	91	136	22
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.039	0.555	0.374	0.134	0.241	0.037
Departure Headway (Hd)	5.711	5.027	6.543	5.333	6.41	5.948
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	631	724	552	673	561	602
Service Time	3.411	2.727	4.271	3.06	4.14	3.678
HCM Lane V/C Ratio	0.04	0.55	0.373	0.135	0.242	0.037
HCM Control Delay	8.6	13.8	13.1	8.9	11.2	8.9
HCM Lane LOS	A	B	B	A	B	A
HCM 95th-tile Q	0.1	3.4	1.7	0.5	0.9	0.1

Intersection

Int Delay, s/veh 5.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	6	68	82	2	29	16
Future Vol, veh/h	6	68	82	2	29	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	66	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	74	89	2	44	17

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	232	31	61	0	0
Stage 1	53	-	-	-	-
Stage 2	179	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-
Pot Cap-1 Maneuver	736	1036	1540	-	-
Stage 1	963	-	-	-	-
Stage 2	834	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	693	1036	1540	-	-
Mov Cap-2 Maneuver	693	-	-	-	-
Stage 1	907	-	-	-	-
Stage 2	834	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.9	7.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1540	-	996	-	-
HCM Lane V/C Ratio	0.058	-	0.081	-	-
HCM Control Delay (s)	7.5	0	8.9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.3	-	-

APPENDIX F | ANALYSES FOR COMBINED TRAFFIC WITH IMPROVEMENTS

Lanes, Volumes, Timings
1: Mill Road & Washington Pike

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↖	↗	↖	↗
Traffic Volume (vph)	291	58	511	1044	49	291
Future Volume (vph)	291	58	511	1044	49	291
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.978					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1822	0	1770	1863	1770	1583
Flt Permitted			0.382		0.950	
Satd. Flow (perm)	1822	0	712	1863	1770	1583
Satd. Flow (RTOR)	15					327
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Shared Lane Traffic (%)						
Lane Group Flow (vph)	392	0	574	1173	55	327
Turn Type	NA		pm+pt	NA	Prot	Free
Protected Phases	2		1	6	4	
Permitted Phases			6			Free
Detector Phase	2		1	6	4	
Switch Phase						
Minimum Initial (s)	12.0		10.0	12.0	10.0	
Minimum Split (s)	19.0		17.0	19.0	17.0	
Total Split (s)	33.0		25.0	58.0	17.0	
Total Split (%)	44.0%		33.3%	77.3%	22.7%	
Maximum Green (s)	27.0		19.0	52.0	11.0	
Yellow Time (s)	4.0		4.0	4.0	4.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	6.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	Max		None	Max	None	
Act Effect Green (s)	31.9		52.8	55.6	10.2	67.7
Actuated g/C Ratio	0.47		0.78	0.82	0.15	1.00
v/c Ratio	0.45		0.73	0.77	0.21	0.21
Control Delay	17.2		10.8	12.2	30.1	0.3
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	17.2		10.8	12.2	30.1	0.3
LOS	B		B	B	C	A
Approach Delay	17.2			11.8	4.6	
Approach LOS	B			B	A	
Queue Length 50th (ft)	130		95	353	23	0
Queue Length 95th (ft)	219		166	#724	54	0
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200		100	
Base Capacity (vph)	866		856	1529	292	1583
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	0.45		0.67	0.77	0.19	0.21

Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

Knoxville Center TIS
2022 Combined AM - Improvements



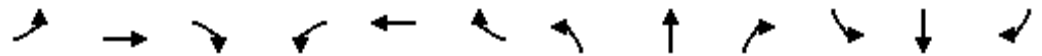
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	52	294	1042	92	4	111	40	329	2	15	2
Future Volume (vph)	5	52	294	1042	92	4	111	40	329	2	15	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	3539	1583
Flt Permitted	0.692			0.463			0.444					
Satd. Flow (perm)	1289	1863	1583	862	1863	1583	827	1863	1583	1863	3539	1583
Satd. Flow (RTOR)			202			119			358			179
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	57	320	1133	100	4	121	43	358	2	16	2
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	7	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	14.0	19.0	15.0	62.0	67.0	67.0	15.0	15.0	15.0	14.0	14.0	14.0
Total Split (%)	12.7%	17.3%	13.6%	56.4%	60.9%	60.9%	13.6%	13.6%	13.6%	12.7%	12.7%	12.7%
Maximum Green (s)	9.0	13.0	10.0	57.0	61.0	61.0	10.0	10.0	10.0	9.0	9.0	9.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	C-Max	None	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	20.6	13.0	28.4	85.6	82.3	82.3	14.2	12.2	12.2	9.0	6.6	6.6
Actuated g/C Ratio	0.19	0.12	0.26	0.78	0.75	0.75	0.13	0.11	0.11	0.08	0.06	0.06
v/c Ratio	0.02	0.26	0.57	0.93	0.07	0.00	0.65	0.21	0.73	0.01	0.08	0.01
Control Delay	20.2	47.6	17.2	27.3	6.0	0.0	49.3	35.8	16.0	36.5	48.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.2	47.6	17.2	27.3	6.0	0.0	49.3	35.8	16.0	36.5	48.9	0.0
LOS	C	D	B	C	A	A	D	D	B	D	D	A
Approach Delay		21.8			25.5			25.4			42.8	
Approach LOS		C			C			C			D	
Queue Length 50th (ft)	2	37	67	407	11	0	59	21	0	1	5	0
Queue Length 95th (ft)	8	77	159	#1030	55	0	88	42	75	8	17	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	335		170	160			150		75
Base Capacity (vph)	308	220	566	1221	1393	1213	196	216	500	195	289	293
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.26	0.57	0.93	0.07	0.00	0.62	0.20	0.72	0.01	0.06	0.01

Lanes, Volumes, Timings

Knoxville Center TIS

3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road

2022 Combined AM - Improvements

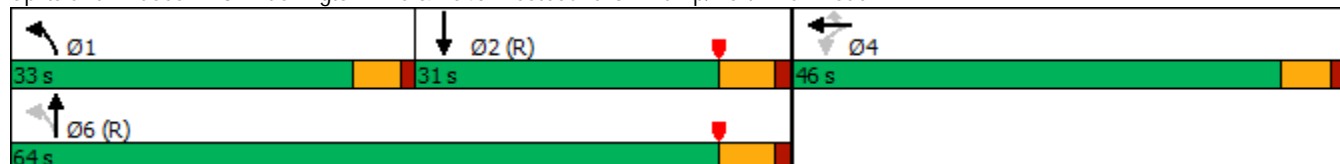


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↖	↗	↖	↖	↗			↗	↖
Traffic Volume (vph)	0	0	0	24	317	113	289	387	0	0	311	1053
Future Volume (vph)	0	0	0	24	317	113	289	387	0	0	311	1053
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1770	1863	1583	1770	3539	0	0	3539	1583
Flt Permitted				0.950			0.508					
Satd. Flow (perm)	0	0	0	1770	1863	1583	946	3539	0	0	3539	1583
Satd. Flow (RTOR)							119					443
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	25	334	119	304	407	0	0	327	1108
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Free
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					Free
Detector Phase				4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0			10.0	
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0			19.0	
Total Split (s)				46.0	46.0	46.0	33.0	64.0			31.0	
Total Split (%)				41.8%	41.8%	41.8%	30.0%	58.2%			28.2%	
Maximum Green (s)				40.0	40.0	40.0	28.0	58.0			25.0	
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5			4.5	
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5			1.5	
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	
Total Lost Time (s)				6.0	6.0	6.0	5.0	6.0			6.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			2.0	
Recall Mode				None	None	None	None	C-Max			C-Max	
Act Effect Green (s)				25.7	25.7	25.7	73.3	72.3			54.6	110.0
Actuated g/C Ratio				0.23	0.23	0.23	0.67	0.66			0.50	1.00
v/c Ratio				0.06	0.77	0.26	0.42	0.18			0.19	0.70
Control Delay				29.8	50.6	6.7	8.2	4.8			21.3	3.0
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				29.8	50.6	6.7	8.2	4.8			21.3	3.0
LOS				C	D	A	A	A			C	A
Approach Delay					38.6			6.2			7.2	
Approach LOS					D			A			A	
Queue Length 50th (ft)				14	222	0	51	36			68	0
Queue Length 95th (ft)				33	291	41	170	51			m108	m35
Internal Link Dist (ft)		569			2042			923			673	
Turn Bay Length (ft)						475	105					100
Base Capacity (vph)				643	677	651	839	2324			1757	1583
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	0.49	0.18	0.36	0.18			0.19	0.70

Intersection Summary

Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 63 (57%), Referenced to phase 2:SBT and 6:NBTL, Start of Yellow	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 12.7	Intersection LOS: B
Intersection Capacity Utilization 55.5%	ICU Level of Service B
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road



Lanes, Volumes, Timings

Knoxville Center TIS

4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road

2022 Combined AM - Improvements



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↕	↖					↕	↖	↖	↕	↖
Traffic Volume (vph)	250	188	205	0	0	0	0	407	35	123	233	0
Future Volume (vph)	250	188	205	0	0	0	0	407	35	123	233	0
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Fr't			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	3539	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.491		
Satd. Flow (perm)	3433	3539	1583	0	0	0	0	3539	1583	915	3539	0
Satd. Flow (RTOR)			228							139		
Peak Hour Factor	0.90	0.78	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	278	241	228	0	0	0	0	452	39	137	259	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	17.0	17.0	17.0					23.0	23.0	15.0		
Total Split (%)	30.9%	30.9%	30.9%					41.8%	41.8%	27.3%		
Maximum Green (s)	12.0	12.0	12.0					17.0	17.0	10.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	10.4	10.4	10.4					22.3	22.3	29.6	33.6	
Actuated g/C Ratio	0.19	0.19	0.19					0.41	0.41	0.54	0.61	
v/c Ratio	0.43	0.36	0.47					0.31	0.05	0.23	0.12	
Control Delay	21.1	20.3	6.6					12.8	0.1	6.7	4.6	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	21.1	20.3	6.6					12.8	0.1	6.7	4.6	
LOS	C	C	A					B	A	A	A	
Approach Delay		16.4						11.8			5.3	
Approach LOS		B						B			A	
Queue Length 50th (ft)	42	37	0					48	0	18	18	
Queue Length 95th (ft)	63	48	42					95	0	31	27	
Internal Link Dist (ft)		2101			1667			717			923	
Turn Bay Length (ft)	400		265						150	120		
Base Capacity (vph)	783	807	536					1436	725	709	2401	
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	0.36	0.30	0.43					0.31	0.05	0.19	0.11	

Intersection Summary

Cycle Length: 55

Actuated Cycle Length: 55

Offset: 52 (95%), Referenced to phase 2:NBSB, Start of Yellow

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.47

Intersection Signal Delay: 12.3

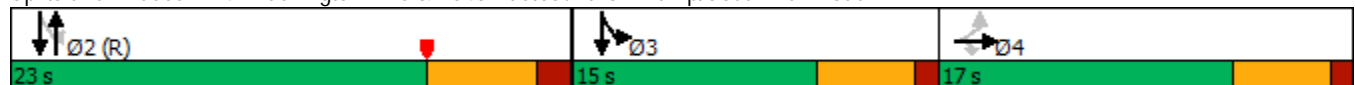
Intersection LOS: B

Intersection Capacity Utilization 55.5%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road



Intersection

Int Delay, s/veh 0.8

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↑↑			↑	
Traffic Vol, veh/h	0	394	0	0	33	0
Future Vol, veh/h	0	394	0	0	33	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	469	0	0	39	0

Major/Minor Major1 Minor2

Conflicting Flow All	-	0	235	-
Stage 1	-	-	0	-
Stage 2	-	-	235	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	732	0
Stage 1	0	-	-	0
Stage 2	0	-	782	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	732	-
Mov Cap-2 Maneuver	-	-	732	-
Stage 1	-	-	-	-
Stage 2	-	-	782	-

Approach EB SB

HCM Control Delay, s	0	10.2
HCM LOS		B

Minor Lane/Major Mvmt EBT SBLn1

Capacity (veh/h)	-	732
HCM Lane V/C Ratio	-	0.054
HCM Control Delay (s)	-	10.2
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.2

Intersection												
Int Delay, s/veh	0.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗						↘				
Traffic Vol, veh/h	79	335	14	0	0	0	0	0	6	0	0	0
Future Vol, veh/h	79	335	14	0	0	0	0	0	6	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	116	390	16	0	0	0	0	0	7	0	0	0

Major/Minor	Major1			Minor1		
Conflicting Flow All	0	0	0	-	630	203
Stage 1	-	-	-	-	630	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.14	-	-	-	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.22	-	-	-	4.02	3.32
Pot Cap-1 Maneuver	-	-	-	0	397	804
Stage 1	-	-	-	0	473	-
Stage 2	-	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	0	804
Mov Cap-2 Maneuver	-	-	-	-	0	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-

Approach	EB	NB
HCM Control Delay, s		9.5
HCM LOS		A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	804	-	-	-
HCM Lane V/C Ratio	0.009	-	-	-
HCM Control Delay (s)	9.5	-	-	-
HCM Lane LOS	A	-	-	-
HCM 95th %tile Q(veh)	0	-	-	-

Lanes, Volumes, Timings

Knoxville Center TIS

7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

2022 Combined AM - Improvements



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	137	25	0	0	0	0	92	100	630	236	0
Future Volume (vph)	125	137	25	0	0	0	0	92	100	630	236	0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.996								0.950		
Satd. Flow (prot)	1681	1763	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.996								0.690		
Satd. Flow (perm)	1681	1763	1583	0	0	0	0	3539	1583	1285	3539	0
Satd. Flow (RTOR)			85							108		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)	10%											
Lane Group Flow (vph)	121	160	27	0	0	0	0	99	108	677	254	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	20.0	20.0	20.0					35.0	35.0	35.0		
Total Split (%)	22.2%	22.2%	22.2%					38.9%	38.9%	38.9%		
Maximum Green (s)	15.0	15.0	15.0					30.0	30.0	30.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	12.1	12.1	12.1					42.5	42.5	62.9	67.9	
Actuated g/C Ratio	0.13	0.13	0.13					0.47	0.47	0.70	0.75	
v/c Ratio	0.54	0.68	0.09					0.06	0.13	0.67	0.10	
Control Delay	44.8	51.3	0.6					16.8	4.8	7.4	1.7	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	44.8	51.3	0.6					16.8	4.8	7.4	1.7	
LOS	D	D	A					B	A	A	A	
Approach Delay		44.3						10.5			5.8	
Approach LOS		D						B			A	
Queue Length 50th (ft)	68	91	0					16	0	61	10	
Queue Length 95th (ft)	122	155	0					37	34	95	10	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	280	293	334					1672	805	1185	3017	
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	0.43	0.55	0.08					0.06	0.13	0.57	0.08	

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 74 (82%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.68
 Intersection Signal Delay: 14.7
 Intersection Capacity Utilization 72.1%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service C

Splits and Phases: 7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

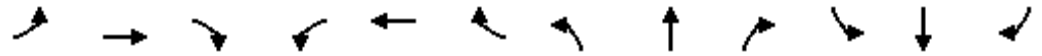


Lanes, Volumes, Timings

Knoxville Center TIS

8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp

2022 Combined AM - Improvements



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↕			↕	↘
Traffic Volume (vph)	0	0	0	83	131	293	24	191	0	0	776	301
Future Volume (vph)	0	0	0	83	131	293	24	191	0	0	776	301
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.997		0.950					
Satd. Flow (prot)	0	0	0	1681	1764	2787	1770	3539	0	0	3539	1583
Flt Permitted				0.950	0.997		0.311					
Satd. Flow (perm)	0	0	0	1681	1764	2787	579	3539	0	0	3539	1583
Satd. Flow (RTOR)						326						334
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	0	83	155	326	27	212	0	0	862	334
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2			2	
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				34.0	34.0	34.0	56.0	56.0			56.0	56.0
Total Split (%)				37.8%	37.8%	37.8%	62.2%	62.2%			62.2%	62.2%
Maximum Green (s)				27.0	27.0	27.0	50.0	50.0			50.0	50.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)				7.0	7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)				14.6	14.6	14.6	62.4	62.4			62.4	62.4
Actuated g/C Ratio				0.16	0.16	0.16	0.69	0.69			0.69	0.69
v/c Ratio				0.30	0.54	0.45	0.07	0.09			0.35	0.28
Control Delay				34.6	40.8	5.6	1.9	2.6			4.2	1.2
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				34.6	40.8	5.6	1.9	2.6			4.2	1.2
LOS				C	D	A	A	A			A	A
Approach Delay					19.6			2.5			3.4	
Approach LOS					B			A			A	
Queue Length 50th (ft)				44	87	0	0	0			45	0
Queue Length 95th (ft)				82	138	35	m0	1			56	9
Internal Link Dist (ft)		1096			1137			650			484	
Turn Bay Length (ft)				450		800	95					
Base Capacity (vph)				504	529	1064	401	2452			2452	1199
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				0.16	0.29	0.31	0.07	0.09			0.35	0.28

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 7 (8%), Referenced to phase 2:NBSB, Start of Yellow

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 7.8

Intersection LOS: A

Intersection Capacity Utilization 72.1%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp



Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way

Knoxville Center TIS
2022 Combined AM - Improvements



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	19	10	158	14	54	11	325	118	60	916	51
Future Volume (vph)	21	19	10	158	14	54	11	325	118	60	916	51
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.941				0.850			0.850			0.850
Flt Protected	0.950			0.950	0.960		0.950			0.950		
Satd. Flow (prot)	1770	1753	0	1681	1699	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950	0.960		0.272			0.950		
Satd. Flow (perm)	1770	1753	0	1681	1699	1583	507	3539	1583	1770	3539	1583
Satd. Flow (RTOR)		13				85			124			85
Peak Hour Factor	0.79	0.95	0.78	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	27	33	0	90	91	57	12	342	124	63	964	54
Turn Type	Split	NA		Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4		3	3	1	5	2	3	1	6	4
Permitted Phases						3	2		2			6
Detector Phase	4	4		3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0		16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	16.0	16.0		16.0	16.0	15.0	15.0	43.0	16.0	15.0	43.0	16.0
Total Split (%)	17.8%	17.8%		17.8%	17.8%	16.7%	16.7%	47.8%	17.8%	16.7%	47.8%	17.8%
Maximum Green (s)	11.0	11.0		11.0	11.0	10.0	10.0	38.0	11.0	10.0	38.0	11.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)	7.5	7.5		9.5	9.5	18.4	54.5	49.7	65.2	7.9	58.2	67.3
Actuated g/C Ratio	0.08	0.08		0.11	0.11	0.20	0.61	0.55	0.72	0.09	0.65	0.75
v/c Ratio	0.18	0.21		0.51	0.51	0.15	0.03	0.18	0.10	0.41	0.42	0.04
Control Delay	41.1	30.2		48.0	47.8	2.6	4.9	9.1	1.7	56.9	4.7	0.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.1	30.2		48.0	47.8	2.6	4.9	9.1	1.7	56.9	4.7	0.1
LOS	D	C		D	D	A	A	A	A	E	A	A
Approach Delay		35.1			37.1			7.0			7.5	
Approach LOS		D			D			A			A	
Queue Length 50th (ft)	15	11		51	51	0	1	33	0	34	38	0
Queue Length 95th (ft)	35	39		101	101	11	m7	69	20	m58	57	m1
Internal Link Dist (ft)		713			953			484			243	
Turn Bay Length (ft)	290			155		245	180		180	120		105
Base Capacity (vph)	216	225		205	207	429	465	1953	1188	199	2288	1200
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.15		0.44	0.44	0.13	0.03	0.18	0.10	0.32	0.42	0.04

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	2	5	407	994	8
Future Vol, veh/h	0	2	5	407	994	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	2	5	447	1092	9

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1331	1097	1101	0	-	0
Stage 1	1097	-	-	-	-	-
Stage 2	234	-	-	-	-	-
Critical Hdwy	6.63	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	158	258	632	-	-	-
Stage 1	319	-	-	-	-	-
Stage 2	783	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	157	258	632	-	-	-
Mov Cap-2 Maneuver	157	-	-	-	-	-
Stage 1	316	-	-	-	-	-
Stage 2	783	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	19.1	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	632	-	-	258	-	-
HCM Lane V/C Ratio	0.009	-	-	0.009	-	-
HCM Control Delay (s)	10.7	-	0	19.1	-	-
HCM Lane LOS	B	-	A	C	-	-
HCM 95th %tile Q(veh)	0	-	-	0	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road

Knoxville Center TIS
2022 Combined AM - Improvements

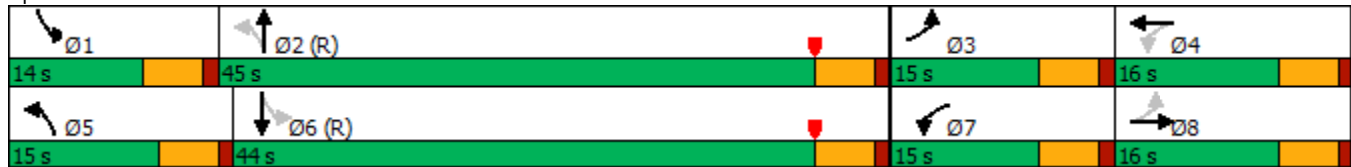


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	2	30	86	12	77	20	306	44	123	886	2
Future Volume (vph)	6	2	30	86	12	77	20	306	44	123	886	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt		0.859			0.871			0.981				
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1600	0	1770	1622	0	1770	3472	0	1770	1863	0
Flt Permitted	0.696			0.421			0.122			0.486		
Satd. Flow (perm)	1296	1600	0	784	1622	0	227	3472	0	905	1863	0
Satd. Flow (RTOR)		32			81			22				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	6	34	0	91	94	0	21	368	0	129	935	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	15.0	16.0		15.0	16.0		15.0	24.0		14.0	24.0	
Total Split (s)	15.0	16.0		15.0	16.0		15.0	45.0		14.0	44.0	
Total Split (%)	16.7%	17.8%		16.7%	17.8%		16.7%	50.0%		15.6%	48.9%	
Maximum Green (s)	10.0	11.0		10.0	11.0		10.0	40.0		9.0	39.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effect Green (s)	10.7	7.3		16.2	14.3		59.6	53.5		64.6	62.2	
Actuated g/C Ratio	0.12	0.08		0.18	0.16		0.66	0.59		0.72	0.69	
v/c Ratio	0.03	0.22		0.38	0.29		0.08	0.18		0.18	0.73	
Control Delay	25.7	18.0		33.5	12.3		8.5	7.7		6.3	19.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	25.7	18.0		33.5	12.3		8.5	7.7		6.3	19.8	
LOS	C	B		C	B		A	A		A	B	
Approach Delay		19.1			22.7			7.7			18.2	
Approach LOS		B			C			A			B	
Queue Length 50th (ft)	3	1		42	6		3	30		25	333	
Queue Length 95th (ft)	12	29		79	50		17	51		50	#800	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)				175			200			65		
Base Capacity (vph)	263	223		260	350		331	2072		738	1286	
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	0.02	0.15		0.35	0.27		0.06	0.18		0.17	0.73	

Intersection Summary













Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 73 (81%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
 Natural Cycle: 100
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.73
 Intersection Signal Delay: 16.3
 Intersection LOS: B
 Intersection Capacity Utilization 75.7%
 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: 11: Millertown Pike & Loves Creek Road



Lanes, Volumes, Timings
12: Millertown Pike & Mill Road

Knoxville Center TIS
2022 Combined AM - Improvements

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	42	551	258	119	472	95
Future Volume (vph)	42	551	258	119	472	95
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.977	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1820	0
Flt Permitted	0.950		0.167			
Satd. Flow (perm)	1770	1583	311	1863	1820	0
Satd. Flow (RTOR)		213			17	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)						
Lane Group Flow (vph)	45	592	277	128	610	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	13.5	22.0	22.0	56.5	34.5	
Total Split (%)	19.3%	31.4%	31.4%	80.7%	49.3%	
Maximum Green (s)	8.0	16.5	16.5	50.5	28.5	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	8.6	22.4	45.9	48.8	23.8	
Actuated g/C Ratio	0.15	0.38	0.78	0.83	0.41	
v/c Ratio	0.17	0.80	0.44	0.08	0.81	
Control Delay	29.5	19.8	7.2	2.7	27.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	29.5	19.8	7.2	2.7	27.3	
LOS	C	B	A	A	C	
Approach Delay	20.5			5.8	27.3	
Approach LOS	C			A	C	
Queue Length 50th (ft)	18	129	30	13	219	
Queue Length 95th (ft)	46	255	87	25	#396	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85				
Base Capacity (vph)	260	787	685	1552	961	
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	0.17	0.75	0.40	0.08	0.63	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 58.6

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 19.4

Intersection LOS: B

Intersection Capacity Utilization 74.3%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

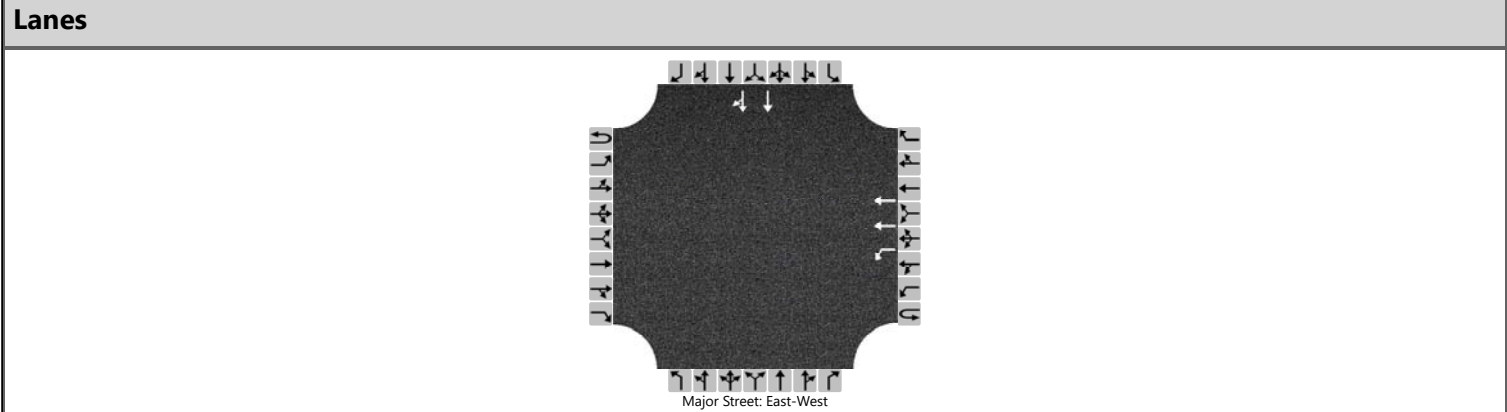
Queue shown is maximum after two cycles.

Splits and Phases: 12: Millertown Pike & Mill Road



HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	BJH			Intersection	N Mall Rd at East Towne W		
Agency/Co.	Cannon & Cannon, Inc.			Jurisdiction	City of Knoxville		
Date Performed	12/15/2020			East/West Street	North Mall Road		
Analysis Year	2022			North/South Street	East Towne Road (West)		
Time Analyzed	AM Peak			Peak Hour Factor	0.84		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Combined 2022 AM						



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	0	0	0	1	2	0		0	0	0		0	2	0
Configuration						L	T								T	TR
Volume (veh/h)						8	403								32	0
Percent Heavy Vehicles (%)						2									2	2
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						5.3									6.5	6.9
Critical Headway (sec)						0.00									6.54	6.94
Base Follow-Up Headway (sec)						3.1									4.0	3.3
Follow-Up Headway (sec)						3.12									4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						10									19	19
Capacity, c (veh/h)						1154									468	468
v/c Ratio						0.01									0.04	0.04
95% Queue Length, Q ₉₅ (veh)						0.0									0.1	0.1
Control Delay (s/veh)						8.1									13.0	13.0
Level of Service (LOS)						A									B	B
Approach Delay (s/veh)						0.2									13.0	
Approach LOS															B	

Intersection	
Intersection Delay, s/veh	10.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑↑				
Traffic Vol, veh/h	0	0	0	0	398	11	2	75	0	0	0	0
Future Vol, veh/h	0	0	0	0	398	11	2	75	0	0	0	0
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.63	0.72	0.72	0.72	0.72
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	553	15	3	119	0	0	0	0
Number of Lanes	0	0	0	0	2	0	0	2	0	0	0	0

Approach	WB	NB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NB	
Conflicting Lanes Left	2	0
Conflicting Approach Right		WB
Conflicting Lanes Right	0	2
HCM Control Delay	11.3	9.3
HCM LOS	B	A

Lane	NBLn1	NBLn2	WBLn1	WBLn2
Vol Left, %	7%	0%	0%	0%
Vol Thru, %	93%	100%	100%	92%
Vol Right, %	0%	0%	0%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	27	50	265	144
LT Vol	2	0	0	0
Through Vol	25	50	265	133
RT Vol	0	0	0	11
Lane Flow Rate	42	79	369	200
Geometry Grp	7	7	7	7
Degree of Util (X)	0.069	0.129	0.5	0.268
Departure Headway (Hd)	5.879	5.842	4.885	4.832
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	609	613	737	744
Service Time	3.613	3.576	2.609	2.556
HCM Lane V/C Ratio	0.069	0.129	0.501	0.269
HCM Control Delay	9.1	9.4	12.4	9.3
HCM Lane LOS	A	A	B	A
HCM 95th-tile Q	0.2	0.4	2.8	1.1

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑			↑
Traffic Vol, veh/h	0	0	416	75	0	6
Future Vol, veh/h	0	0	416	75	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	83	83	83	60	83	83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	501	125	0	7

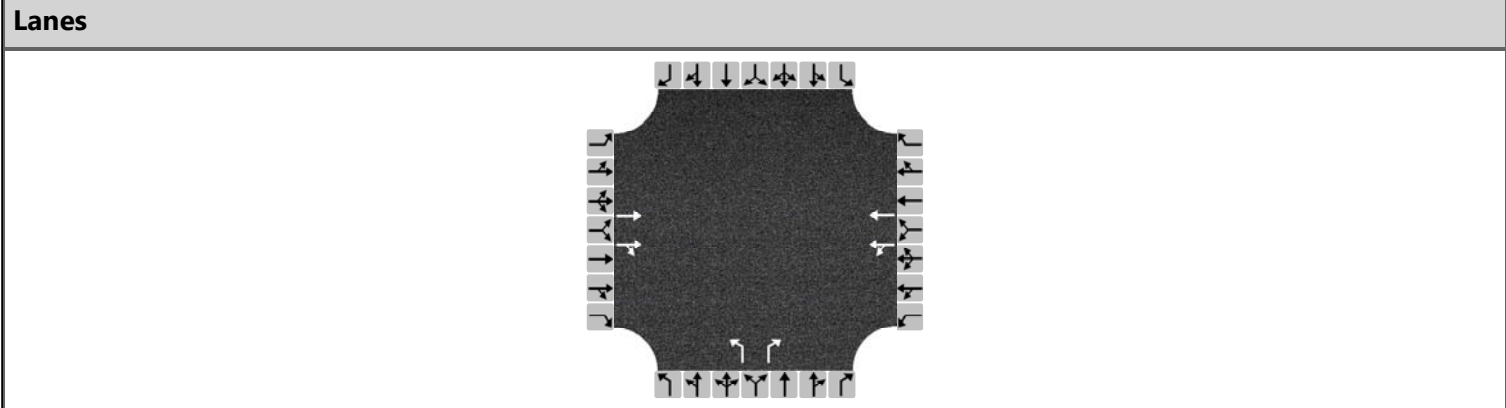
Major/Minor	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	0
Stage 1	-	0
Stage 2	-	0
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	10.3
HCM LOS		B

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	683
HCM Lane V/C Ratio	-	-	0.011
HCM Control Delay (s)	-	-	10.3
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	BJH	Intersection	Knoxville Ctr at E Towne
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	City of Knoxville
Date Performed	12/15/2020	East/West Street	Knoxville Center Drive
Analysis Year	2022	North/South Street	East Towne Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.75
Time Analyzed	AM Peak		
Project Description	Combined 2022 AM		



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume		12	250	18	8		15		152			
% Thrus in Shared Lane			50	50								
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	T	TR		LT	T		L	R				
Flow Rate, v (veh/h)	8	341		29	5		20	203				
Percent Heavy Vehicles	2	2		2	2		2	2				

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20				
Initial Degree of Utilization, x	0.007	0.303		0.026	0.005		0.018	0.180				
Final Departure Headway, hd (s)	5.14	4.45		5.82	5.40		5.89	4.69				
Final Degree of Utilization, x	0.011	0.422		0.047	0.008		0.033	0.264				
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3				
Service Time, ts (s)	2.84	2.15		3.52	3.10		3.59	2.39				

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	8	341		29	5		20	203				
Capacity	701	809		619	666		612	768				
95% Queue Length, Q ₉₅ (veh)	0.0	2.1		0.1	0.0		0.1	1.1				
Control Delay (s/veh)	7.9	10.4		8.8	8.1		8.8	9.1				
Level of Service, LOS	A	B		A	A		A	A				
Approach Delay (s/veh)	10.3			8.7			9.0					
Approach LOS	B			A			A					
Intersection Delay, s/veh LOS	9.7						A					

Intersection	
Intersection Delay, s/veh	8.5
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	↑
Traffic Vol, veh/h	112	2	5	24	59	19
Future Vol, veh/h	112	2	5	24	59	19
Peak Hour Factor	0.68	0.74	0.74	0.74	0.59	0.59
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	165	3	7	32	100	32
Number of Lanes	2	0	0	2	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	8.3	8	8.8
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	38%	0%
Vol Thru, %	0%	0%	100%	95%	62%	100%
Vol Right, %	0%	100%	0%	5%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	59	19	75	39	13	16
LT Vol	59	0	0	0	5	0
Through Vol	0	0	75	37	8	16
RT Vol	0	19	0	2	0	0
Lane Flow Rate	100	32	110	58	18	22
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.154	0.039	0.15	0.078	0.026	0.03
Departure Headway (Hd)	5.541	4.338	4.93	4.894	5.238	5.044
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	650	828	730	734	685	711
Service Time	3.255	2.052	2.645	2.609	2.956	2.763
HCM Lane V/C Ratio	0.154	0.039	0.151	0.079	0.026	0.031
HCM Control Delay	9.3	7.2	8.5	8	8.1	7.9
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0.5	0.1	0.5	0.3	0.1	0.1

Intersection	
Intersection Delay, s/veh	9.2
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↕↔			↕↔
Traffic Vol, veh/h	88	17	6	68	140	5
Future Vol, veh/h	88	17	6	68	140	5
Peak Hour Factor	0.76	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	116	20	7	79	163	6
Number of Lanes	1	1	2	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	9.4	7.6	9.9
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	100%	0%	99%	0%
Vol Thru, %	100%	3%	0%	0%	1%	100%
Vol Right, %	0%	97%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	4	70	88	17	142	3
LT Vol	0	0	88	0	140	0
Through Vol	4	2	0	0	2	3
RT Vol	0	68	0	17	0	0
Lane Flow Rate	5	81	116	20	165	4
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.007	0.1	0.183	0.025	0.251	0.005
Departure Headway (Hd)	5.086	4.402	5.684	4.48	5.484	4.987
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	704	814	632	799	656	718
Service Time	2.812	2.128	3.409	2.205	3.208	2.711
HCM Lane V/C Ratio	0.007	0.1	0.184	0.025	0.252	0.006
HCM Control Delay	7.8	7.6	9.7	7.3	10	7.7
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0	0.3	0.7	0.1	1	0

Intersection						
Int Delay, s/veh	2.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	0	74	12	4	206	2
Future Vol, veh/h	0	74	12	4	206	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	86	14	5	240	2

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	272	121	242	0	-	0
Stage 1	241	-	-	-	-	-
Stage 2	31	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	695	908	1322	-	-	-
Stage 1	776	-	-	-	-	-
Stage 2	987	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	687	908	1322	-	-	-
Mov Cap-2 Maneuver	687	-	-	-	-	-
Stage 1	767	-	-	-	-	-
Stage 2	987	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.4	5.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1322	-	908	-	-
HCM Lane V/C Ratio	0.011	-	0.095	-	-
HCM Control Delay (s)	7.8	0	9.4	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

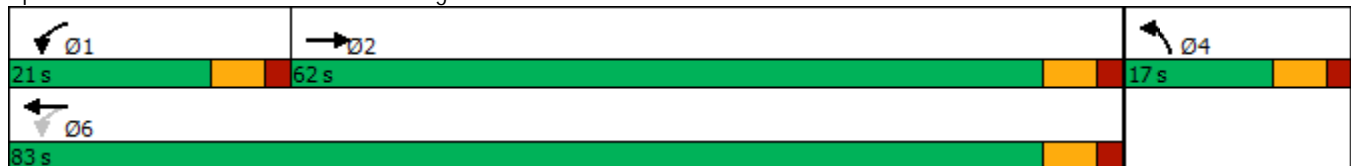
Lanes, Volumes, Timings
1: Mill Road & Washington Pike

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↖	↗	↖	↗
Traffic Volume (vph)	909	114	318	472	86	646
Future Volume (vph)	909	114	318	472	86	646
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.985					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1835	0	1770	1863	1770	1583
Flt Permitted			0.064		0.950	
Satd. Flow (perm)	1835	0	119	1863	1770	1583
Satd. Flow (RTOR)	10					424
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1077	0	335	497	91	680
Turn Type	NA		pm+pt	NA	Prot	Free
Protected Phases	2		1	6	4	
Permitted Phases			6			Free
Detector Phase	2		1	6	4	
Switch Phase						
Minimum Initial (s)	12.0		10.0	12.0	10.0	
Minimum Split (s)	19.0		17.0	19.0	17.0	
Total Split (s)	62.0		21.0	83.0	17.0	
Total Split (%)	62.0%		21.0%	83.0%	17.0%	
Maximum Green (s)	56.0		15.0	77.0	11.0	
Yellow Time (s)	4.0		4.0	4.0	4.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	6.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	Max		None	Max	None	
Act Effect Green (s)	56.3		77.4	78.8	10.5	96.3
Actuated g/C Ratio	0.58		0.80	0.82	0.11	1.00
v/c Ratio	1.00		0.95	0.33	0.47	0.43
Control Delay	50.1		65.8	3.8	50.5	0.9
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	50.1		65.8	3.8	50.5	0.9
LOS	D		E	A	D	A
Approach Delay	50.1			28.8	6.7	
Approach LOS	D			C	A	
Queue Length 50th (ft)	~738		162	77	55	0
Queue Length 95th (ft)	#997		#345	117	106	0
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200		100	
Base Capacity (vph)	1077		354	1525	203	1583
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	1.00		0.95	0.33	0.45	0.43

Intersection Summary

Cycle Length: 100	
Actuated Cycle Length: 96.3	
Natural Cycle: 100	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay: 31.0	Intersection LOS: C
Intersection Capacity Utilization 95.7%	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: Mill Road & Washington Pike



Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

Knoxville Center TIS
2022 Combined PM - Improvements



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	99	302	475	61	11	288	298	880	60	305	52
Future Volume (vph)	50	99	302	475	61	11	288	298	880	60	305	52
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	3539	1583
Flt Permitted	0.713			0.496			0.388			0.561		
Satd. Flow (perm)	1328	1863	1583	924	1863	1583	723	1863	1583	1045	3539	1583
Satd. Flow (RTOR)			114			232			734			245
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	56	110	336	528	68	12	320	331	978	67	339	58
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	7	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	14.0	20.0	21.0	17.0	23.0	23.0	21.0	29.0	29.0	14.0	22.0	22.0
Total Split (%)	17.5%	25.0%	26.3%	21.3%	28.8%	28.8%	26.3%	36.3%	36.3%	17.5%	27.5%	27.5%
Maximum Green (s)	9.0	14.0	16.0	12.0	17.0	17.0	16.0	24.0	24.0	9.0	17.0	17.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	C-Max	None	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	22.9	14.0	33.5	33.3	25.1	25.1	35.8	26.4	26.4	23.9	17.3	17.3
Actuated g/C Ratio	0.29	0.18	0.42	0.42	0.31	0.31	0.45	0.33	0.33	0.30	0.22	0.22
v/c Ratio	0.13	0.34	0.46	0.99	0.12	0.02	0.64	0.54	0.97	0.18	0.44	0.11
Control Delay	16.3	32.3	12.6	62.2	25.3	0.1	11.8	16.6	30.5	13.9	29.1	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.3	32.3	12.6	62.2	25.3	0.1	11.8	16.6	30.5	13.9	29.1	0.4
LOS	B	C	B	E	C	A	B	B	C	B	C	A
Approach Delay		17.3			56.8			24.0			23.3	
Approach LOS		B			E			C			C	
Queue Length 50th (ft)	17	49	73	~250	28	0	37	124	372	17	75	0
Queue Length 95th (ft)	39	95	134	#377	61	0	50	196	#444	38	117	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	335		170	160			150		75
Base Capacity (vph)	448	326	775	534	583	655	532	613	1013	425	811	551
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.34	0.43	0.99	0.12	0.02	0.60	0.54	0.97	0.16	0.42	0.11

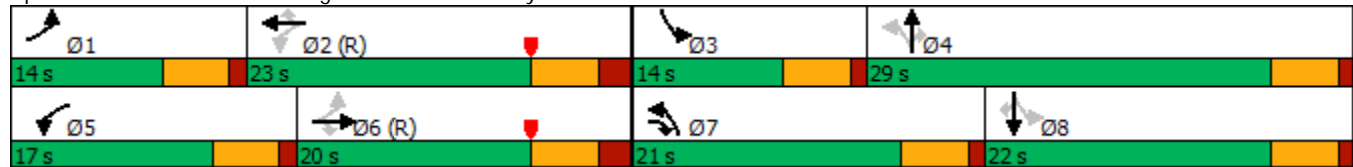
Timing Plan: PM Peak
Cannon & Cannon, Inc.

Synchro 10 Report
Page 3

Intersection Summary

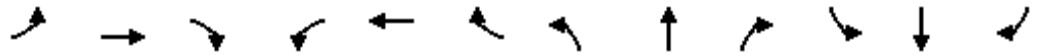
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 42 (53%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.99	
Intersection Signal Delay: 29.1	Intersection LOS: C
Intersection Capacity Utilization 81.2%	ICU Level of Service D
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: 2: Washington Pike & Greenway Drive



Lanes, Volumes, Timings

3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↕	↗	↙	↕			↕	↗
Traffic Volume (vph)	0	0	0	108	375	307	241	1178	0	0	568	493
Future Volume (vph)	0	0	0	108	375	307	241	1178	0	0	568	493
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1770	1863	1583	1770	3539	0	0	3539	1583
Flt Permitted				0.950			0.288					
Satd. Flow (perm)	0	0	0	1770	1863	1583	536	3539	0	0	3539	1583
Satd. Flow (RTOR)							109					371
Peak Hour Factor	0.92	0.92	0.92	0.92	0.86	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	117	436	334	262	1280	0	0	617	536
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Free
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					Free
Detector Phase				4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0			10.0	
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0			19.0	
Total Split (s)				34.0	34.0	34.0	19.0	46.0			27.0	
Total Split (%)				42.5%	42.5%	42.5%	23.8%	57.5%			33.8%	
Maximum Green (s)				28.0	28.0	28.0	14.0	40.0			21.0	
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5			4.5	
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5			1.5	
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	
Total Lost Time (s)				6.0	6.0	6.0	5.0	6.0			6.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			2.0	
Recall Mode				None	None	None	None	C-Max			C-Max	
Act Effect Green (s)				24.0	24.0	24.0	45.0	44.0			28.4	80.0
Actuated g/C Ratio				0.30	0.30	0.30	0.56	0.55			0.36	1.00
v/c Ratio				0.22	0.78	0.61	0.56	0.66			0.49	0.34
Control Delay				20.7	35.6	20.0	8.6	6.5			26.2	0.5
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				20.7	35.6	20.0	8.6	6.5			26.2	0.5
LOS				C	D	C	A	A			C	A
Approach Delay					27.8			6.9			14.2	
Approach LOS					C			A			B	
Queue Length 50th (ft)				42	190	89	10	21			164	0
Queue Length 95th (ft)				77	264	165	m38	173			m204	m0
Internal Link Dist (ft)		569			2042			923			673	
Turn Bay Length (ft)						475	105					100
Base Capacity (vph)				619	652	624	517	1947			1256	1583
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				0.19	0.67	0.54	0.51	0.66			0.49	0.34

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 73 (91%), Referenced to phase 2:SBT and 6:NBTL, Start of Yellow

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 14.4

Intersection LOS: B

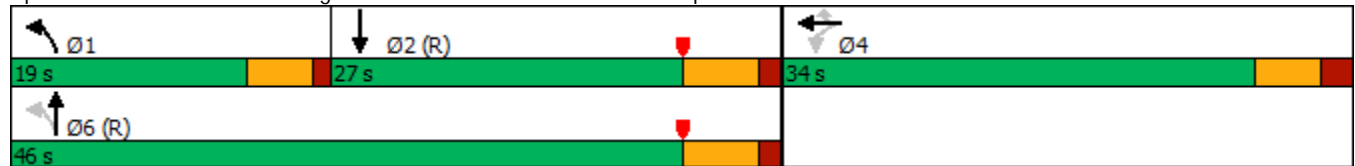
Intersection Capacity Utilization 69.6%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road























Lanes, Volumes, Timings

Knoxville Center TIS

4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road

2022 Combined PM - Improvements

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	862	533	358	0	0	0	0	549	55	327	348	0
Future Volume (vph)	862	533	358	0	0	0	0	549	55	327	348	0
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	3539	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.340		
Satd. Flow (perm)	3433	3539	1583	0	0	0	0	3539	1583	633	3539	0
Satd. Flow (RTOR)			377							95		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	907	561	377	0	0	0	0	578	58	344	366	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	32.0	32.0	32.0					27.0	27.0	21.0		
Total Split (%)	40.0%	40.0%	40.0%					33.8%	33.8%	26.3%		
Maximum Green (s)	27.0	27.0	27.0					21.0	21.0	16.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	26.8	26.8	26.8					24.4	24.4	38.2	42.2	
Actuated g/C Ratio	0.34	0.34	0.34					0.30	0.30	0.48	0.53	
v/c Ratio	0.79	0.47	0.48					0.54	0.11	0.71	0.20	
Control Delay	29.8	22.4	4.6					26.6	2.5	17.6	5.0	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	29.8	22.4	4.6					26.6	2.5	17.6	5.0	
LOS	C	C	A					C	A	B	A	
Approach Delay		22.4						24.4			11.1	
Approach LOS		C						C			B	
Queue Length 50th (ft)	199	110	0					133	0	56	18	
Queue Length 95th (ft)	277	161	56					187	12	78	35	
Internal Link Dist (ft)		2101			1667			717			923	
Turn Bay Length (ft)	400		265						150	120		
Base Capacity (vph)	1188	1225	794					1078	548	555	2007	
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	0.76	0.46	0.47					0.54	0.11	0.62	0.18	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 65 (81%), Referenced to phase 2:NBSB, Start of Yellow

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 20.3

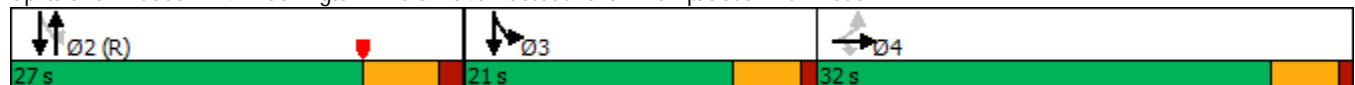
Intersection LOS: C

Intersection Capacity Utilization 69.6%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road



Intersection

Int Delay, s/veh 1.1

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	987	0	0	69	0
Future Vol, veh/h	0	987	0	0	69	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	81	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1061	0	0	85	0

Major/Minor Major1 Minor2

Conflicting Flow All	-	0	531	-
Stage 1	-	-	0	-
Stage 2	-	-	531	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	478	0
Stage 1	0	-	-	0
Stage 2	0	-	554	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	478	-
Mov Cap-2 Maneuver	-	-	478	-
Stage 1	-	-	-	-
Stage 2	-	-	554	-

Approach EB SB

HCM Control Delay, s	0	14.2
HCM LOS		B

Minor Lane/Major Mvmt EBT SBLn1

Capacity (veh/h)	-	478
HCM Lane V/C Ratio	-	0.178
HCM Control Delay (s)	-	14.2
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.6

Intersection												
Int Delay, s/veh	0.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↕						↗				
Traffic Vol, veh/h	244	795	25	0	0	0	0	5	29	0	0	0
Future Vol, veh/h	244	795	25	0	0	0	0	5	29	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	274	893	28	0	0	0	0	6	33	0	0	0

Major/Minor	Major1			Minor1		
Conflicting Flow All	0	0	0	-	1455	461
Stage 1	-	-	-	-	1455	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.14	-	-	-	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.22	-	-	-	4.02	3.32
Pot Cap-1 Maneuver	-	-	-	0	129	547
Stage 1	-	-	-	0	193	-
Stage 2	-	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	0	547
Mov Cap-2 Maneuver	-	-	-	-	0	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-

Approach	EB	NB
HCM Control Delay, s		12.1
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	547	-	-	-
HCM Lane V/C Ratio	0.07	-	-	-
HCM Control Delay (s)	12.1	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.2	-	-	-

Lanes, Volumes, Timings

7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

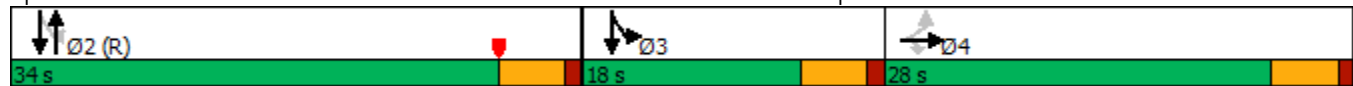


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	464	281	57	0	0	0	0	298	127	442	438	0
Future Volume (vph)	464	281	57	0	0	0	0	298	127	442	438	0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.987								0.950		
Satd. Flow (prot)	1681	1747	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.987								0.554		
Satd. Flow (perm)	1681	1747	1583	0	0	0	0	3539	1583	1032	3539	0
Satd. Flow (RTOR)			95							140		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Shared Lane Traffic (%)	21%											
Lane Group Flow (vph)	403	416	63	0	0	0	0	327	140	486	481	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	28.0	28.0	28.0					34.0	34.0	18.0		
Total Split (%)	35.0%	35.0%	35.0%					42.5%	42.5%	22.5%		
Maximum Green (s)	23.0	23.0	23.0					29.0	29.0	13.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	21.9	21.9	21.9					32.5	32.5	43.1	48.1	
Actuated g/C Ratio	0.27	0.27	0.27					0.41	0.41	0.54	0.60	
v/c Ratio	0.88	0.87	0.13					0.23	0.19	0.74	0.23	
Control Delay	39.9	38.5	0.9					17.1	4.1	15.3	4.3	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	39.9	38.5	0.9					17.1	4.1	15.3	4.3	
LOS	D	D	A					B	A	B	A	
Approach Delay		36.5						13.2			9.8	
Approach LOS		D						B			A	
Queue Length 50th (ft)	136	141	1					59	0	53	26	
Queue Length 95th (ft)	#347	#349	m3					90	35	93	33	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	491	510	529					1436	726	706	2233	
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	0.82	0.82	0.12					0.23	0.19	0.69	0.22	

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 51 (64%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.88
 Intersection Signal Delay: 20.7
 Intersection LOS: C
 Intersection Capacity Utilization 78.1%
 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.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

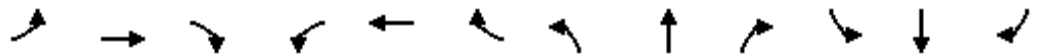


Lanes, Volumes, Timings

Knoxville Center TIS

8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp

2022 Combined PM - Improvements

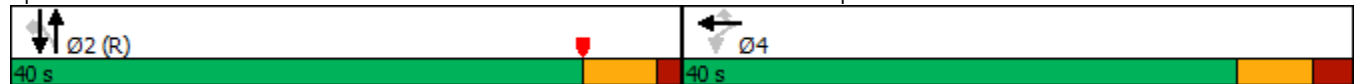


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↑			↑	↗
Traffic Volume (vph)	0	0	0	154	368	594	77	669	0	0	721	314
Future Volume (vph)	0	0	0	154	368	594	77	669	0	0	721	314
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.998		0.950					
Satd. Flow (prot)	0	0	0	1681	1766	2787	1770	3539	0	0	3539	1583
Flt Permitted				0.950	0.998		0.331					
Satd. Flow (perm)	0	0	0	1681	1766	2787	617	3539	0	0	3539	1583
Satd. Flow (RTOR)						236						317
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	0	140	388	600	78	676	0	0	728	317
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2			2	
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				40.0	40.0	40.0	40.0	40.0			40.0	40.0
Total Split (%)				50.0%	50.0%	50.0%	50.0%	50.0%			50.0%	50.0%
Maximum Green (s)				33.0	33.0	33.0	34.0	34.0			34.0	34.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)				7.0	7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)				26.6	26.6	26.6	40.4	40.4			40.4	40.4
Actuated g/C Ratio				0.33	0.33	0.33	0.50	0.50			0.50	0.50
v/c Ratio				0.25	0.66	0.55	0.25	0.38			0.41	0.33
Control Delay				18.9	27.8	13.9	7.8	6.4			12.9	4.8
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				18.9	27.8	13.9	7.8	6.4			12.9	4.8
LOS				B	C	B	A	A			B	A
Approach Delay					19.3			6.6			10.4	
Approach LOS					B			A			B	
Queue Length 50th (ft)				51	169	78	13	76			97	20
Queue Length 95th (ft)				85	235	115	m31	m133			111	m51
Internal Link Dist (ft)		1096			1137			650			484	
Turn Bay Length (ft)				450		800	95					
Base Capacity (vph)				693	728	1288	311	1788			1788	956
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				0.20	0.53	0.47	0.25	0.38			0.41	0.33

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 55 (69%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 50
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.66
 Intersection Signal Delay: 12.9
 Intersection LOS: B
 Intersection Capacity Utilization 78.1%
 ICU Level of Service D
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp



Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way

Knoxville Center TIS
2022 Combined PM - Improvements









Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	184	54	82	336	43	144	55	798	397	101	587	81
Future Volume (vph)	184	54	82	336	43	144	55	798	397	101	587	81
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.906				0.850			0.850			0.850
Flt Protected	0.950			0.950	0.963		0.950			0.950		
Satd. Flow (prot)	1770	1688	0	1681	1704	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950	0.963		0.393			0.950		
Satd. Flow (perm)	1770	1688	0	1681	1704	1583	732	3539	1583	1770	3539	1583
Satd. Flow (RTOR)		90				95			418			95
Peak Hour Factor	0.89	0.95	0.86	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				44%								
Lane Group Flow (vph)	207	152	0	198	201	152	58	840	418	106	618	85
Turn Type	Split	NA		Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4		3	3	1	5	2	3	1	6	4
Permitted Phases						3	2		2			6
Detector Phase	4	4		3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0		16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	18.0	18.0		18.0	18.0	14.0	14.0	30.0	18.0	14.0	30.0	18.0
Total Split (%)	22.5%	22.5%		22.5%	22.5%	17.5%	17.5%	37.5%	22.5%	17.5%	37.5%	22.5%
Maximum Green (s)	13.0	13.0		13.0	13.0	9.0	9.0	25.0	13.0	9.0	25.0	13.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)	12.3	12.3		12.3	12.3	20.4	33.7	27.3	44.6	8.1	33.4	47.7
Actuated g/C Ratio	0.15	0.15		0.15	0.15	0.26	0.42	0.34	0.56	0.10	0.42	0.60
v/c Ratio	0.76	0.46		0.76	0.77	0.32	0.15	0.70	0.39	0.59	0.42	0.09
Control Delay	52.1	18.6		53.0	53.0	7.0	8.4	20.2	3.4	42.2	29.6	4.4
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.1	18.6		53.0	53.0	7.0	8.4	20.2	3.4	42.2	29.6	4.4
LOS	D	B		D	D	A	A	C	A	D	C	A
Approach Delay		37.9			40.3			14.3			28.6	
Approach LOS		D			D			B			C	
Queue Length 50th (ft)	99	27		100	102	12	12	197	13	55	156	9
Queue Length 95th (ft)	#192	80		#202	#203	37	m27	178	40	m88	230	m20
Internal Link Dist (ft)		713			953			484			243	
Turn Bay Length (ft)	290			155		245	180		180	120		105
Base Capacity (vph)	287	349		273	276	491	448	1208	1078	199	1478	958
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.72	0.44		0.73	0.73	0.31	0.13	0.70	0.39	0.53	0.42	0.09

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 51 (64%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 25.6	Intersection LOS: C
Intersection Capacity Utilization 65.0%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 9: Millertown Pike & Kinzel Way

 Ø1 14 s	 Ø2 (R) 30 s	 Ø3 18 s	 Ø4 18 s
 Ø5 14 s	 Ø6 (R) 30 s		

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	37	44	11	1152	759	36
Future Vol, veh/h	37	44	11	1152	759	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	39	46	12	1213	799	38

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1449	818	837	0	-	0
Stage 1	818	-	-	-	-	-
Stage 2	631	-	-	-	-	-
Critical Hdwy	6.63	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	133	375	795	-	-	-
Stage 1	433	-	-	-	-	-
Stage 2	493	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	131	375	795	-	-	-
Mov Cap-2 Maneuver	131	-	-	-	-	-
Stage 1	427	-	-	-	-	-
Stage 2	493	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	28.6	0.1	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	795	-	131	375	-	-
HCM Lane V/C Ratio	0.015	-	0.297	0.124	-	-
HCM Control Delay (s)	9.6	-	43.7	15.9	-	-
HCM Lane LOS	A	-	E	C	-	-
HCM 95th %tile Q(veh)	0	-	1.2	0.4	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road

Knoxville Center TIS
2022 Combined PM - Improvements

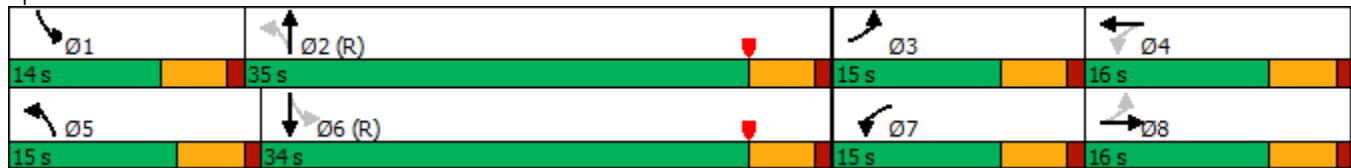


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	82	38	89	143	44	181	94	960	80	76	560	15
Future Volume (vph)	82	38	89	143	44	181	94	960	80	76	560	15
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt		0.895			0.879			0.988			0.996	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1667	0	1770	1637	0	1770	3497	0	1770	1855	0
Flt Permitted	0.429			0.502			0.202			0.148		
Satd. Flow (perm)	799	1667	0	935	1637	0	376	3497	0	276	1855	0
Satd. Flow (RTOR)		94			191			12			2	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	86	134	0	151	237	0	99	1095	0	80	605	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	15.0	16.0		15.0	16.0		15.0	24.0		14.0	24.0	
Total Split (s)	15.0	16.0		15.0	16.0		15.0	35.0		14.0	34.0	
Total Split (%)	18.8%	20.0%		18.8%	20.0%		18.8%	43.8%		17.5%	42.5%	
Maximum Green (s)	10.0	11.0		10.0	11.0		10.0	30.0		9.0	29.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effect Green (s)	16.9	8.7		19.9	12.1		44.0	37.6		41.9	36.5	
Actuated g/C Ratio	0.21	0.11		0.25	0.15		0.55	0.47		0.52	0.46	
v/c Ratio	0.32	0.51		0.46	0.58		0.29	0.66		0.30	0.71	
Control Delay	23.9	19.4		26.3	14.9		6.0	8.4		9.1	22.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	23.9	19.4		26.3	14.9		6.0	8.4		9.1	22.3	
LOS	C	B		C	B		A	A		A	C	
Approach Delay		21.1			19.3			8.2			20.8	
Approach LOS		C			B			A			C	
Queue Length 50th (ft)	32	19		58	21		9	87		9	261	
Queue Length 95th (ft)	62	68		101	89		m16	116		m19	#486	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)				175			200			65		
Base Capacity (vph)	308	310		338	420		388	1649		319	848	
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	0.28	0.43		0.45	0.56		0.26	0.66		0.25	0.71	

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 66 (83%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 14.5	Intersection LOS: B
Intersection Capacity Utilization 70.7%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 11: Millertown Pike & Loves Creek Road



Lanes, Volumes, Timings
12: Millertown Pike & Mill Road

Knoxville Center TIS
2022 Combined PM - Improvements

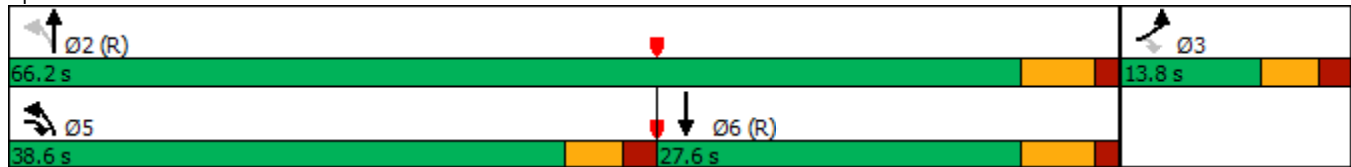


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	82	379	697	586	299	76
Future Volume (vph)	82	379	697	586	299	76
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.973	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1812	0
Flt Permitted	0.950		0.313			
Satd. Flow (perm)	1770	1583	583	1863	1812	0
Satd. Flow (RTOR)		238			16	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	86	399	734	617	395	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	13.8	38.6	38.6	66.2	27.6	
Total Split (%)	17.3%	48.3%	48.3%	82.8%	34.5%	
Maximum Green (s)	8.3	33.1	33.1	60.2	21.6	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	C-Min	C-Min	
Act Effect Green (s)	8.2	38.8	63.5	64.2	29.7	
Actuated g/C Ratio	0.10	0.48	0.79	0.80	0.37	
v/c Ratio	0.48	0.45	0.84	0.41	0.58	
Control Delay	43.3	5.2	10.9	1.4	27.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	43.3	5.2	10.9	1.4	27.9	
LOS	D	A	B	A	C	
Approach Delay	12.0			6.6	27.9	
Approach LOS	B			A	C	
Queue Length 50th (ft)	41	34	13	12	174	
Queue Length 95th (ft)	85	77	33	23	#315	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85				
Base Capacity (vph)	183	979	954	1495	682	
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	0.47	0.41	0.77	0.41	0.58	

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 7 (9%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 11.5	Intersection LOS: B
Intersection Capacity Utilization 79.8%	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.	

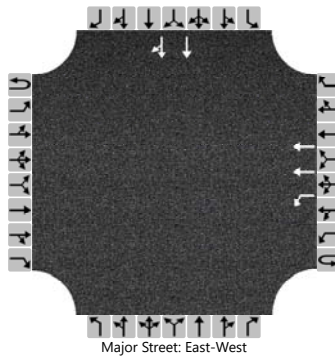
Splits and Phases: 12: Millertown Pike & Mill Road



HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	BJH			Intersection	N Mall Rd at East Towne W		
Agency/Co.	Cannon & Cannon, Inc.			Jurisdiction	City of Knoxville		
Date Performed	12/15/2020			East/West Street	North Mall Road		
Analysis Year	2022			North/South Street	East Towne Road (West)		
Time Analyzed	PM Peak			Peak Hour Factor	0.87		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Combined 2022 PM						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	0	0	0	1	2	0		0	0	0		0	2	0
Configuration						L	T								T	TR
Volume (veh/h)						21	663								33	0
Percent Heavy Vehicles (%)						2									2	2
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						5.3									6.5	6.9
Critical Headway (sec)						0.00									6.54	6.94
Base Follow-Up Headway (sec)						3.1									4.0	3.3
Follow-Up Headway (sec)						3.12									4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						24									19	19
Capacity, c (veh/h)						1154									306	306
v/c Ratio						0.02									0.06	0.06
95% Queue Length, Q ₉₅ (veh)						0.1									0.2	0.2
Control Delay (s/veh)						8.2									17.6	17.6
Level of Service (LOS)						A									C	C
Approach Delay (s/veh)					0.3								17.6			
Approach LOS													C			

Intersection	
Intersection Delay, s/veh	14.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑↑				
Traffic Vol, veh/h	0	0	0	0	663	23	1	242	0	0	0	0
Future Vol, veh/h	0	0	0	0	663	23	1	242	0	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.91	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	698	24	1	266	0	0	0	0
Number of Lanes	0	0	0	0	2	0	0	2	0	0	0	0

Approach	WB	NB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NB	
Conflicting Lanes Left	2	0
Conflicting Approach Right		WB
Conflicting Lanes Right	0	2
HCM Control Delay	16.2	11.3
HCM LOS	C	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2
Vol Left, %	1%	0%	0%	0%
Vol Thru, %	99%	100%	100%	91%
Vol Right, %	0%	0%	0%	9%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	82	161	442	244
LT Vol	1	0	0	0
Through Vol	81	161	442	221
RT Vol	0	0	0	23
Lane Flow Rate	90	177	465	257
Geometry Grp	7	7	7	7
Degree of Util (X)	0.155	0.306	0.686	0.374
Departure Headway (Hd)	6.219	6.212	5.31	5.244
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	572	574	675	681
Service Time	4.01	4.004	3.077	3.011
HCM Lane V/C Ratio	0.157	0.308	0.689	0.377
HCM Control Delay	10.2	11.8	19	11.1
HCM Lane LOS	B	B	C	B
HCM 95th-tile Q	0.5	1.3	5.4	1.7

Intersection

Int Delay, s/veh 0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑			↑
Traffic Vol, veh/h	0	0	695	131	0	52
Future Vol, veh/h	0	0	695	131	0	52
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	86	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	724	152	0	54

Major/Minor

	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	0
Stage 1	-	0
Stage 2	-	0
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach

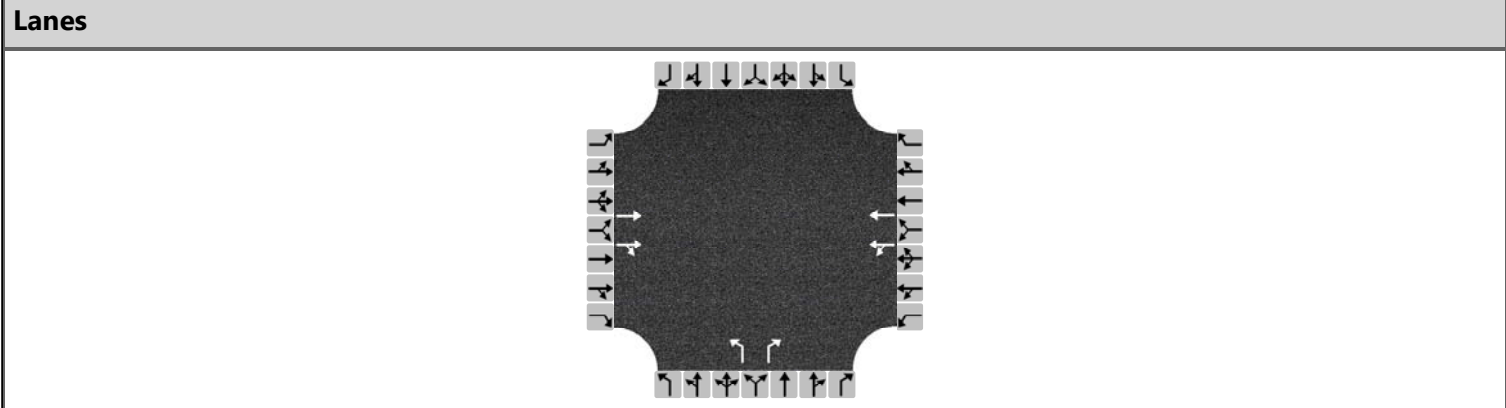
	WB	SB
HCM Control Delay, s	0	12
HCM LOS		B

Minor Lane/Major Mvmt

	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	567
HCM Lane V/C Ratio	-	-	0.096
HCM Control Delay (s)	-	-	12
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.3

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	BJH	Intersection	Knoxville Ctr at E Towne
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	City of Knoxville
Date Performed	12/15/2020	East/West Street	Knoxville Center Drive
Analysis Year	2022	North/South Street	East Towne Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.84
Time Analyzed	PM Peak		
Project Description	Combined 2022 PM		



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume		11	65	182	29		49		327			
% Thrus in Shared Lane			50	50								
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	T	TR		LT	T		L	R				
Flow Rate, v (veh/h)	7	84		234	17		58	389				
Percent Heavy Vehicles	2	2		2	2		2	2				

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20				
Initial Degree of Utilization, x	0.006	0.075		0.208	0.015		0.052	0.346				
Final Departure Headway, hd (s)	6.04	5.39		6.25	5.79		6.00	4.81				
Final Degree of Utilization, x	0.011	0.126		0.406	0.028		0.097	0.520				
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3				
Service Time, ts (s)	3.74	3.09		3.95	3.49		3.70	2.51				

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	7	84		234	17		58	389				
Capacity	596	668		576	622		600	749				
95% Queue Length, Q ₉₅ (veh)	0.0	0.4		2.0	0.1		0.3	3.0				
Control Delay (s/veh)	8.8	8.9		13.2	8.7		9.3	12.6				
Level of Service, LOS	A	A		B	A		A	B				
Approach Delay (s/veh)	8.9			12.9			12.2					
Approach LOS	A			B			B					
Intersection Delay, s/veh LOS	12.0						B					

Intersection	
Intersection Delay, s/veh	9.6
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	↑
Traffic Vol, veh/h	295	7	42	121	96	42
Future Vol, veh/h	295	7	42	121	96	42
Peak Hour Factor	0.93	0.93	0.75	0.93	0.89	0.81
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	317	8	56	130	108	52
Number of Lanes	2	0	0	2	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	9.7	9.2	9.8
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	51%	0%
Vol Thru, %	0%	0%	100%	93%	49%	100%
Vol Right, %	0%	100%	0%	7%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	96	42	197	105	82	81
LT Vol	96	0	0	0	42	0
Through Vol	0	0	197	98	40	81
RT Vol	0	42	0	7	0	0
Lane Flow Rate	108	52	211	113	99	87
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.187	0.073	0.305	0.162	0.154	0.128
Departure Headway (Hd)	6.249	5.042	5.186	5.139	5.573	5.316
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	572	706	692	695	641	671
Service Time	4.013	2.805	2.934	2.888	3.33	3.073
HCM Lane V/C Ratio	0.189	0.074	0.305	0.163	0.154	0.13
HCM Control Delay	10.5	8.2	10.2	8.9	9.4	8.9
HCM Lane LOS	B	A	B	A	A	A
HCM 95th-tile Q	0.7	0.2	1.3	0.6	0.5	0.4

Intersection	
Intersection Delay, s/veh	11.5
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	164	71	29	288	91	26
Future Vol, veh/h	164	71	29	288	91	26
Peak Hour Factor	0.86	0.86	0.86	0.81	0.78	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	191	83	34	356	117	30
Number of Lanes	1	1	2	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	11.3	12.1	10.5
HCM LOS	B	B	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	100%	0%	91%	0%
Vol Thru, %	100%	3%	0%	0%	9%	100%
Vol Right, %	0%	97%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	19	298	164	71	100	17
LT Vol	0	0	164	0	91	0
Through Vol	19	10	0	0	9	17
RT Vol	0	288	0	71	0	0
Lane Flow Rate	22	367	191	83	127	20
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.034	0.492	0.34	0.119	0.221	0.033
Departure Headway (Hd)	5.509	4.825	6.412	5.204	6.286	5.824
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	643	737	564	692	574	618
Service Time	3.3	2.616	4.12	2.911	3.986	3.524
HCM Lane V/C Ratio	0.034	0.498	0.339	0.12	0.221	0.032
HCM Control Delay	8.5	12.3	12.4	8.6	10.8	8.7
HCM Lane LOS	A	B	B	A	B	A
HCM 95th-tile Q	0.1	2.7	1.5	0.4	0.8	0.1

Intersection						
Int Delay, s/veh	5.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	5	61	74	2	28	15
Future Vol, veh/h	5	61	74	2	28	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	70	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	66	80	2	40	16

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	209	28	56	0	0
Stage 1	48	-	-	-	-
Stage 2	161	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-
Pot Cap-1 Maneuver	760	1041	1547	-	-
Stage 1	968	-	-	-	-
Stage 2	851	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	720	1041	1547	-	-
Mov Cap-2 Maneuver	720	-	-	-	-
Stage 1	918	-	-	-	-
Stage 2	851	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.8	7.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1547	-	1007	-	-
HCM Lane V/C Ratio	0.052	-	0.071	-	-
HCM Control Delay (s)	7.5	0	8.8	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	-	-

Lanes, Volumes, Timings
1: Mill Road & Washington Pike

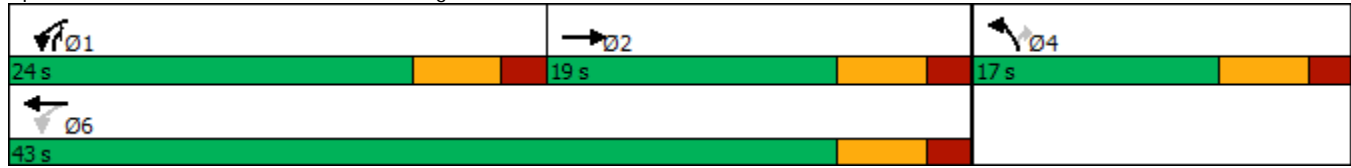
Knoxville Center TIS
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	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗↗
Traffic Volume (vph)	322	64	564	1152	54	322
Future Volume (vph)	322	64	564	1152	54	322
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	0.88
Frt	0.975					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3451	0	1770	3539	1770	2787
Flt Permitted			0.372		0.950	
Satd. Flow (perm)	3451	0	693	3539	1770	2787
Satd. Flow (RTOR)	35					211
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Shared Lane Traffic (%)						
Lane Group Flow (vph)	434	0	634	1294	61	362
Turn Type	NA		pm+pt	NA	Prot	pm+ov
Protected Phases	2		1	6	4	1
Permitted Phases			6			4
Detector Phase	2		1	6	4	1
Switch Phase						
Minimum Initial (s)	12.0		10.0	12.0	10.0	10.0
Minimum Split (s)	19.0		17.0	19.0	17.0	17.0
Total Split (s)	19.0		24.0	43.0	17.0	24.0
Total Split (%)	31.7%		40.0%	71.7%	28.3%	40.0%
Maximum Green (s)	13.0		18.0	37.0	11.0	18.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
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)	6.0		6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	Max		None	Max	None	None
Act Effect Green (s)	17.2		37.9	40.8	10.2	23.1
Actuated g/C Ratio	0.33		0.72	0.78	0.19	0.44
v/c Ratio	0.38		0.80	0.47	0.18	0.27
Control Delay	17.1		15.9	5.4	22.1	3.4
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	17.1		15.9	5.4	22.1	3.4
LOS	B		B	A	C	A
Approach Delay	17.1			8.9	6.1	
Approach LOS	B			A	A	
Queue Length 50th (ft)	65		110	119	19	11
Queue Length 95th (ft)	104		#272	164	47	27
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200		100	100
Base Capacity (vph)	1153		877	2747	379	1533
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	0.38		0.72	0.47	0.16	0.24

Intersection Summary

Cycle Length: 60	
Actuated Cycle Length: 52.6	
Natural Cycle: 60	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 9.7	Intersection LOS: A
Intersection Capacity Utilization 65.5%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 1: Mill Road & Washington Pike



Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

Knoxville Center TIS
2027 Combined AM - Improvements

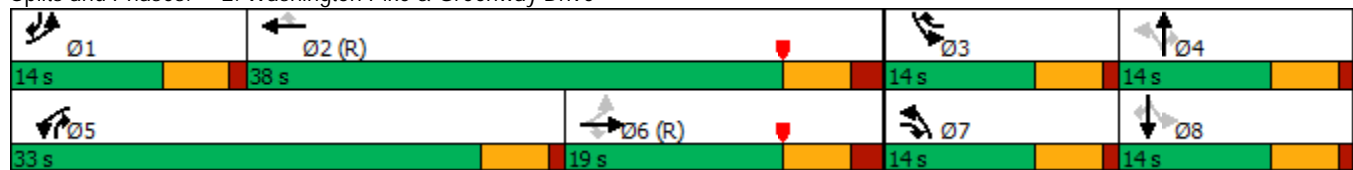


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	57	333	1151	101	5	123	44	363	2	16	2
Future Volume (vph)	6	57	333	1151	101	5	123	44	363	2	16	2
Lane Util. Factor	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	3433	1863	1583	1770	1863	2787	1770	3539	1583
Flt Permitted	0.686			0.950			0.645					
Satd. Flow (perm)	1278	3539	1583	3433	1863	1583	1201	1863	2787	1863	3539	1583
Satd. Flow (RTOR)			259			95			395			177
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	62	362	1251	110	5	134	48	395	2	17	2
Turn Type	pm+pt	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	1	6	7	5	2	3	7	4	5	3	8	1
Permitted Phases	6		6			2	4		4	8		8
Detector Phase	1	6	7	5	2	3	7	4	5	3	8	1
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	14.0	19.0	14.0	33.0	38.0	14.0	14.0	14.0	33.0	14.0	14.0	14.0
Total Split (%)	17.5%	23.8%	17.5%	41.3%	47.5%	17.5%	17.5%	17.5%	41.3%	17.5%	17.5%	17.5%
Maximum Green (s)	9.0	13.0	9.0	28.0	32.0	9.0	9.0	9.0	28.0	9.0	9.0	9.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	4.0	2.0	2.0	4.0
Recall Mode	None	C-Max	None	None	C-Max	None	None	None	None	None	None	None
Act Effect Green (s)	21.6	14.0	28.3	39.5	56.1	69.1	10.1	8.3	52.8	7.2	6.0	8.8
Actuated g/C Ratio	0.27	0.18	0.35	0.49	0.70	0.86	0.13	0.10	0.66	0.09	0.08	0.11
v/c Ratio	0.02	0.10	0.50	0.74	0.08	0.00	0.64	0.25	0.20	0.01	0.06	0.01
Control Delay	11.8	29.1	8.8	20.9	6.5	0.0	40.6	31.5	2.7	27.5	35.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.8	29.1	8.8	20.9	6.5	0.0	40.6	31.5	2.7	27.5	35.1	0.0
LOS	B	C	A	C	A	A	D	C	A	C	D	A
Approach Delay		11.7			19.6			13.9			31.0	
Approach LOS		B			B			B			C	
Queue Length 50th (ft)	2	14	35	225	11	0	71	25	0	1	4	0
Queue Length 95th (ft)	5	31	105	#442	59	0	118	57	27	6	14	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	300		170	160		160	150		75
Base Capacity (vph)	437	617	738	1696	1306	1454	226	209	1974	227	398	374
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.10	0.49	0.74	0.08	0.00	0.59	0.23	0.20	0.01	0.04	0.01

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 13 (16%), Referenced to phase 2:WBT and 6:EBTL, Start of Yellow
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.74
 Intersection Signal Delay: 16.9
 Intersection LOS: B
 Intersection Capacity Utilization 71.0%
 ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 2: Washington Pike & Greenway Drive



Lanes, Volumes, Timings

Knoxville Center TIS

3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road

2027 Combined AM - Improvements



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↖	↗	↖	↖	↗			↗	↖
Traffic Volume (vph)	0	0	0	26	350	125	319	427	0	0	343	1162
Future Volume (vph)	0	0	0	26	350	125	319	427	0	0	343	1162
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1770	1863	1583	1770	3539	0	0	3539	1583
Flt Permitted				0.950			0.459					
Satd. Flow (perm)	0	0	0	1770	1863	1583	855	3539	0	0	3539	1583
Satd. Flow (RTOR)							132					386
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	27	368	132	336	449	0	0	361	1223
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Free
Protected Phases					4		1	6				2
Permitted Phases				4		4	6					Free
Detector Phase				4	4	4	1	6				2
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0				10.0
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0				19.0
Total Split (s)				33.0	33.0	33.0	24.0	47.0				23.0
Total Split (%)				41.3%	41.3%	41.3%	30.0%	58.8%				28.8%
Maximum Green (s)				27.0	27.0	27.0	19.0	41.0				17.0
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5				4.5
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5				1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0				0.0
Total Lost Time (s)				6.0	6.0	6.0	5.0	6.0				6.0
Lead/Lag							Lead					Lag
Lead-Lag Optimize?							Yes					Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0				2.0
Recall Mode				None	None	None	None	C-Max				C-Max
Act Effect Green (s)				21.0	21.0	21.0	48.0	47.0				29.5
Actuated g/C Ratio				0.26	0.26	0.26	0.60	0.59				0.37
v/c Ratio				0.06	0.75	0.26	0.51	0.22				0.28
Control Delay				20.0	36.9	5.2	10.9	4.8				10.9
Queue Delay				0.0	0.0	0.0	0.0	0.0				0.0
Total Delay				20.0	36.9	5.2	10.9	4.8				10.9
LOS				B	D	A	B	A				B
Approach Delay					28.1			7.4				12.7
Approach LOS					C			A				B
Queue Length 50th (ft)				10	169	0	38	27				48
Queue Length 95th (ft)				26	237	35	100	37				m87
Internal Link Dist (ft)		569			2042			923				673
Turn Bay Length (ft)						475	105					100
Base Capacity (vph)				597	628	621	730	2080				1305
Starvation Cap Reductn				0	0	0	0	0				0
Spillback Cap Reductn				0	0	0	0	0				0
Storage Cap Reductn				0	0	0	0	0				0
Reduced v/c Ratio				0.05	0.59	0.21	0.46	0.22				0.28

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 9 (11%), Referenced to phase 2:SBT and 6:NBTL, Start of Yellow	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 14.1	Intersection LOS: B
Intersection Capacity Utilization 59.7%	ICU Level of Service B
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road



Lanes, Volumes, Timings

Knoxville Center TIS

4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road

2027 Combined AM - Improvements



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↕↕	↕↕	↕					↕↕	↕	↕	↕↕	
Traffic Volume (vph)	276	208	226	0	0	0	0	449	39	136	257	0
Future Volume (vph)	276	208	226	0	0	0	0	449	39	136	257	0
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	3539	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.468		
Satd. Flow (perm)	3433	3539	1583	0	0	0	0	3539	1583	872	3539	0
Satd. Flow (RTOR)			251							95		
Peak Hour Factor	0.90	0.78	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	307	267	251	0	0	0	0	499	43	151	286	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	28.0	28.0	28.0					33.0	33.0	19.0		
Total Split (%)	35.0%	35.0%	35.0%					41.3%	41.3%	23.8%		
Maximum Green (s)	23.0	23.0	23.0					27.0	27.0	14.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	13.4	13.4	13.4					44.1	44.1	51.6	55.6	
Actuated g/C Ratio	0.17	0.17	0.17					0.55	0.55	0.64	0.70	
v/c Ratio	0.53	0.45	0.53					0.26	0.05	0.24	0.12	
Control Delay	33.1	31.5	8.2					10.7	0.3	4.8	1.8	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	33.1	31.5	8.2					10.7	0.3	4.8	1.8	
LOS	C	C	A					B	A	A	A	
Approach Delay		25.0						9.8			2.9	
Approach LOS		C						A			A	
Queue Length 50th (ft)	73	64	0					62	0	7	7	
Queue Length 95th (ft)	101	77	55					110	2	26	12	
Internal Link Dist (ft)		2101			1667			717			923	
Turn Bay Length (ft)	400		265						150	120		
Base Capacity (vph)	986	1017	633					1950	915	800	2790	
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	0.31	0.26	0.40					0.26	0.05	0.19	0.10	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 19 (24%), Referenced to phase 2:NBSB, Start of Yellow

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.53

Intersection Signal Delay: 15.1

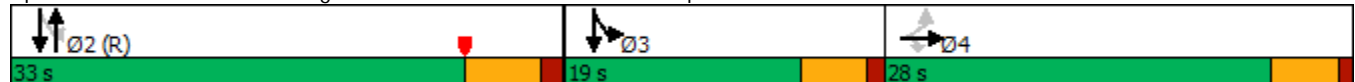
Intersection LOS: B

Intersection Capacity Utilization 59.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road



Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↑	
Traffic Vol, veh/h	6	435	0	0	0	0
Future Vol, veh/h	6	435	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16979	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	518	0	0	0	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	0	0	273	-
Stage 1	-	-	0	-
Stage 2	-	-	273	-
Critical Hdwy	4.14	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	2.22	-	3.52	-
Pot Cap-1 Maneuver	-	-	694	0
Stage 1	-	-	-	0
Stage 2	-	-	748	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	694	-
Mov Cap-2 Maneuver	-	-	694	-
Stage 1	-	-	-	-
Stage 2	-	-	748	-

Approach	EB	SB
HCM Control Delay, s		0
HCM LOS		A

Minor Lane/Major Mvmt	EBL	EBT	SBLn1
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	-	0
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	0.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕↔						↕				
Traffic Vol, veh/h	87	370	15	0	0	0	0	0	7	0	0	0
Future Vol, veh/h	87	370	15	0	0	0	0	0	7	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	69	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	126	430	17	0	0	0	0	0	8	0	0	0

Major/Minor	Major1			Minor1		
Conflicting Flow All	0	0	0	-	691	224
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.14	-	-	-	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.22	-	-	-	4.02	3.32
Pot Cap-1 Maneuver	-	-	-	0	366	779
Stage 1	-	-	-	0	444	-
Stage 2	-	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	0	779
Mov Cap-2 Maneuver	-	-	-	-	0	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-

Approach	EB	NB
HCM Control Delay, s		9.7
HCM LOS		A

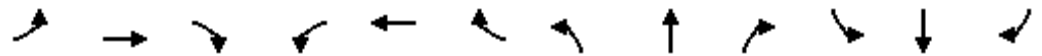
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	779	-	-	-
HCM Lane V/C Ratio	0.01	-	-	-
HCM Control Delay (s)	9.7	-	-	-
HCM Lane LOS	A	-	-	-
HCM 95th %tile Q(veh)	0	-	-	-

Lanes, Volumes, Timings

Knoxville Center TIS

7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

2027 Combined AM - Improvements



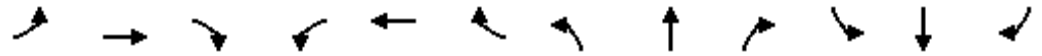
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	138	151	28	0	0	0	0	101	110	696	261	0
Future Volume (vph)	138	151	28	0	0	0	0	101	110	696	261	0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.996								0.950		
Satd. Flow (prot)	1681	1763	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.996								0.683		
Satd. Flow (perm)	1681	1763	1583	0	0	0	0	3539	1583	1272	3539	0
Satd. Flow (RTOR)			95							118		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)	10%											
Lane Group Flow (vph)	133	177	30	0	0	0	0	109	118	748	281	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	17.0	17.0	17.0					35.0	35.0	28.0		
Total Split (%)	21.3%	21.3%	21.3%					43.8%	43.8%	35.0%		
Maximum Green (s)	12.0	12.0	12.0					30.0	30.0	23.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	11.1	11.1	11.1					36.2	36.2	53.9	58.9	
Actuated g/C Ratio	0.14	0.14	0.14					0.45	0.45	0.67	0.74	
v/c Ratio	0.57	0.73	0.10					0.07	0.15	0.77	0.11	
Control Delay	35.1	44.5	0.9					15.0	4.1	11.1	1.5	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	35.1	44.5	0.9					15.0	4.1	11.1	1.5	
LOS	D	D	A					B	A	B	A	
Approach Delay		37.0						9.3			8.5	
Approach LOS		D						A			A	
Queue Length 50th (ft)	47	75	1					17	0	51	10	
Queue Length 95th (ft)	126	#181	0					34	31	267	10	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	255	267	321					1603	781	1084	2841	
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	0.52	0.66	0.09					0.07	0.15	0.69	0.10	

Lanes, Volumes, Timings

Knoxville Center TIS

8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp

2027 Combined AM - Improvements



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↕			↕	↘
Traffic Volume (vph)	0	0	0	92	145	324	26	211	0	0	857	332
Future Volume (vph)	0	0	0	92	145	324	26	211	0	0	857	332
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.997		0.950					
Satd. Flow (prot)	0	0	0	1681	1764	2787	1770	3539	0	0	3539	1583
Flt Permitted				0.950	0.997		0.273					
Satd. Flow (perm)	0	0	0	1681	1764	2787	509	3539	0	0	3539	1583
Satd. Flow (RTOR)						360						369
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	0	92	171	360	29	234	0	0	952	369
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2			2	
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				30.0	30.0	30.0	50.0	50.0			50.0	50.0
Total Split (%)				37.5%	37.5%	37.5%	62.5%	62.5%			62.5%	62.5%
Maximum Green (s)				23.0	23.0	23.0	44.0	44.0			44.0	44.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)				7.0	7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)				14.8	14.8	14.8	52.2	52.2			52.2	52.2
Actuated g/C Ratio				0.18	0.18	0.18	0.65	0.65			0.65	0.65
v/c Ratio				0.30	0.53	0.45	0.09	0.10			0.41	0.32
Control Delay				29.2	34.5	4.8	1.5	1.2			4.4	1.2
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				29.2	34.5	4.8	1.5	1.2			4.4	1.2
LOS				C	C	A	A	A			A	A
Approach Delay					16.6			1.2			3.5	
Approach LOS					B			A			A	
Queue Length 50th (ft)				43	83	0	0	0			46	0
Queue Length 95th (ft)				76	130	33	m0	m1			59	8
Internal Link Dist (ft)		1096			1137			650			484	
Turn Bay Length (ft)				450		800	95					
Base Capacity (vph)				483	507	1057	332	2311			2311	1161
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				0.19	0.34	0.34	0.09	0.10			0.41	0.32

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 14 (18%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.53	
Intersection Signal Delay: 6.9	Intersection LOS: A
Intersection Capacity Utilization 74.4%	ICU Level of Service D
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp



Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way

Knoxville Center TIS
2027 Combined AM - Improvements



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	21	11	175	15	60	13	358	130	67	990	30
Future Volume (vph)	23	21	11	175	15	60	13	358	130	67	990	30
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.942				0.850			0.850			0.850
Flt Protected	0.950			0.950	0.960		0.950			0.950		
Satd. Flow (prot)	1770	1755	0	1681	1699	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950	0.960		0.234			0.950		
Satd. Flow (perm)	1770	1755	0	1681	1699	1583	436	3539	1583	1770	3539	1583
Satd. Flow (RTOR)		14				95			137			95
Peak Hour Factor	0.79	0.95	0.78	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	29	36	0	99	101	63	14	377	137	71	1042	32
Turn Type	Split	NA		Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4		3	3	1	5	2	3	1	6	4
Permitted Phases						3	2		2			6
Detector Phase	4	4		3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0		16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	16.0	16.0		16.0	16.0	14.0	14.0	34.0	16.0	14.0	34.0	16.0
Total Split (%)	20.0%	20.0%		20.0%	20.0%	17.5%	17.5%	42.5%	20.0%	17.5%	42.5%	20.0%
Maximum Green (s)	11.0	11.0		11.0	11.0	9.0	9.0	29.0	11.0	9.0	29.0	11.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)	7.4	7.4		9.5	9.5	18.4	44.6	39.8	55.3	7.9	48.3	57.3
Actuated g/C Ratio	0.09	0.09		0.12	0.12	0.23	0.56	0.50	0.69	0.10	0.60	0.72
v/c Ratio	0.18	0.20		0.50	0.50	0.14	0.04	0.21	0.12	0.41	0.49	0.03
Control Delay	35.8	26.5		41.5	41.7	2.1	5.8	10.6	1.7	51.2	4.7	0.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.8	26.5		41.5	41.7	2.1	5.8	10.6	1.7	51.2	4.7	0.0
LOS	D	C		D	D	A	A	B	A	D	A	A
Approach Delay		30.6			32.1			8.2			7.4	
Approach LOS		C			C			A			A	
Queue Length 50th (ft)	14	10		49	50	0	2	38	0	32	33	0
Queue Length 95th (ft)	33	37		97	98	10	m8	75	19	m51	m46	m0
Internal Link Dist (ft)		713			953			484			243	
Turn Bay Length (ft)	290			155		245	180		180	120		105
Base Capacity (vph)	243	253		231	233	463	406	1759	1145	206	2135	1156
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.14		0.43	0.43	0.14	0.03	0.21	0.12	0.34	0.49	0.03

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 5 (6%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.50
 Intersection Signal Delay: 11.6
 Intersection LOS: B
 Intersection Capacity Utilization 56.8%
 ICU Level of Service B
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Millertown Pike & Kinzel Way



Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	2	6	449	1097	9
Future Vol, veh/h	0	2	6	449	1097	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	2	7	493	1205	10

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1471	1210	1215	0	-	0
Stage 1	1210	-	-	-	-	-
Stage 2	261	-	-	-	-	-
Critical Hdwy	6.63	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	128	222	572	-	-	-
Stage 1	281	-	-	-	-	-
Stage 2	760	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	126	222	572	-	-	-
Mov Cap-2 Maneuver	126	-	-	-	-	-
Stage 1	278	-	-	-	-	-
Stage 2	760	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.4	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	572	-	-	222	-	-
HCM Lane V/C Ratio	0.012	-	-	0.01	-	-
HCM Control Delay (s)	11.4	-	0	21.4	-	-
HCM Lane LOS	B	-	A	C	-	-
HCM 95th %tile Q(veh)	0	-	-	0	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road

Knoxville Center TIS
2027 Combined AM - Improvements

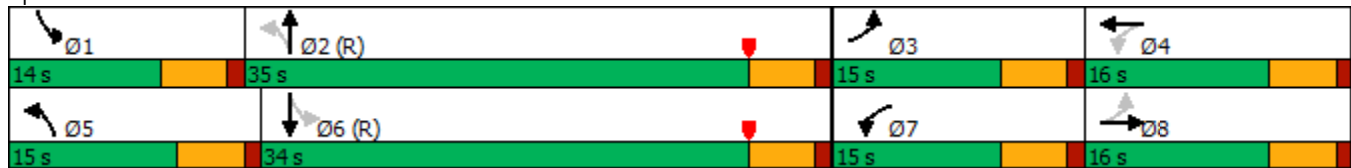


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	2	33	95	14	85	22	338	48	136	979	2
Future Volume (vph)	7	2	33	95	14	85	22	338	48	136	979	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt		0.858			0.872			0.981				
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1598	0	1770	1624	0	1770	3472	0	1770	1863	0
Flt Permitted	0.690			0.420			0.105			0.447		
Satd. Flow (perm)	1285	1598	0	782	1624	0	196	3472	0	833	1863	0
Satd. Flow (RTOR)		35			89			23				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	37	0	100	104	0	23	407	0	143	1033	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	15.0	16.0		15.0	16.0		15.0	24.0		14.0	24.0	
Total Split (s)	15.0	16.0		15.0	16.0		15.0	35.0		14.0	34.0	
Total Split (%)	18.8%	20.0%		18.8%	20.0%		18.8%	43.8%		17.5%	42.5%	
Maximum Green (s)	10.0	11.0		10.0	11.0		10.0	30.0		9.0	29.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effect Green (s)	10.7	7.2		16.2	14.3		49.4	43.2		54.8	52.2	
Actuated g/C Ratio	0.13	0.09		0.20	0.18		0.62	0.54		0.68	0.65	
v/c Ratio	0.03	0.21		0.37	0.29		0.10	0.22		0.22	0.85	
Control Delay	21.1	15.7		28.0	10.7		18.1	21.9		6.0	23.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	21.1	15.7		28.0	10.7		18.1	21.9		6.0	23.2	
LOS	C	B		C	B		B	C		A	C	
Approach Delay		16.5			19.2			21.7			21.1	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	3	1		39	6		5	55		20	366	
Queue Length 95th (ft)	11	28		73	48		30	149		m35	m#847	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)				175			200			65		
Base Capacity (vph)	295	249		292	390		327	1887		680	1214	
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	0.02	0.15		0.34	0.27		0.07	0.22		0.21	0.85	

Intersection Summary













Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 69 (86%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow	
Natural Cycle: 110	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.85	
Intersection Signal Delay: 20.9	Intersection LOS: C
Intersection Capacity Utilization 81.1%	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.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 11: Millertown Pike & Loves Creek Road



Lanes, Volumes, Timings
12: Millertown Pike & Mill Road

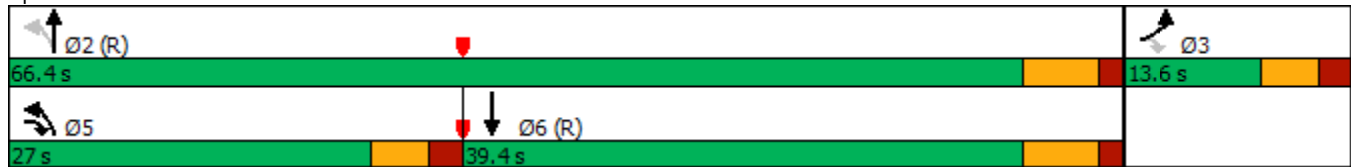
Knoxville Center TIS
2027 Combined AM - Improvements

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	46	609	285	131	522	105
Future Volume (vph)	46	609	285	131	522	105
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.977	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1820	0
Flt Permitted	0.950		0.152			
Satd. Flow (perm)	1770	1583	283	1863	1820	0
Satd. Flow (RTOR)		187			16	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)						
Lane Group Flow (vph)	49	655	306	141	674	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	13.6	27.0	27.0	66.4	39.4	
Total Split (%)	17.0%	33.8%	33.8%	83.0%	49.3%	
Maximum Green (s)	8.1	21.5	21.5	60.4	33.4	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	C-Min	C-Min	
Act Effect Green (s)	8.0	30.6	66.4	68.3	37.9	
Actuated g/C Ratio	0.10	0.38	0.83	0.85	0.47	
v/c Ratio	0.28	0.91	0.47	0.09	0.77	
Control Delay	37.7	34.3	7.1	0.7	26.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	37.7	34.3	7.1	0.7	26.8	
LOS	D	C	A	A	C	
Approach Delay	34.5			5.0	26.8	
Approach LOS	C			A	C	
Queue Length 50th (ft)	23	203	26	3	294	
Queue Length 95th (ft)	55	#411	26	7	#504	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85				
Base Capacity (vph)	179	724	656	1589	871	
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	0.27	0.90	0.47	0.09	0.77	

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 72 (90%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.91	
Intersection Signal Delay: 24.4	Intersection LOS: C
Intersection Capacity Utilization 81.1%	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.	

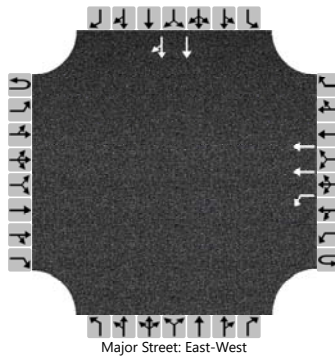
Splits and Phases: 12: Millertown Pike & Mill Road



HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	BJH			Intersection	N Mall Rd at East Towne W		
Agency/Co.	Cannon & Cannon, Inc.			Jurisdiction	City of Knoxville		
Date Performed	12/15/2020			East/West Street	North Mall Road		
Analysis Year	2027			North/South Street	East Towne Road (West)		
Time Analyzed	AM Peak			Peak Hour Factor	0.84		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Combined 2027 AM						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	0	0	0	1	2	0		0	0	0		0	2	0
Configuration						L	T								T	TR
Volume (veh/h)						9	444								36	0
Percent Heavy Vehicles (%)						2									2	2
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						5.3									6.5	6.9
Critical Headway (sec)						0.00									6.54	6.94
Base Follow-Up Headway (sec)						3.1									4.0	3.3
Follow-Up Headway (sec)						3.12									4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						11									21	21
Capacity, c (veh/h)						1154									437	437
v/c Ratio						0.01									0.05	0.05
95% Queue Length, Q ₉₅ (veh)						0.0									0.2	0.2
Control Delay (s/veh)						8.1									13.7	13.7
Level of Service (LOS)						A									B	B
Approach Delay (s/veh)						0.2									13.7	
Approach LOS															B	

Intersection	
Intersection Delay, s/veh	11.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			←↑				
Traffic Vol, veh/h	0	0	0	0	440	13	2	83	0	0	0	0
Future Vol, veh/h	0	0	0	0	440	13	2	83	0	0	0	0
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.63	0.72	0.72	0.72	0.72
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	611	18	3	132	0	0	0	0
Number of Lanes	0	0	0	0	2	0	0	2	0	0	0	0

Approach	WB	NB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NB	
Conflicting Lanes Left	2	0
Conflicting Approach Right		WB
Conflicting Lanes Right	0	2
HCM Control Delay	12.3	9.6
HCM LOS	B	A

Lane	NBLn1	NBLn2	WBLn1	WBLn2
Vol Left, %	7%	0%	0%	0%
Vol Thru, %	93%	100%	100%	92%
Vol Right, %	0%	0%	0%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	30	55	293	160
LT Vol	2	0	0	0
Through Vol	28	55	293	147
RT Vol	0	0	0	13
Lane Flow Rate	47	88	407	222
Geometry Grp	7	7	7	7
Degree of Util (X)	0.078	0.146	0.557	0.3
Departure Headway (Hd)	6.003	5.969	4.926	4.869
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	596	600	733	738
Service Time	3.745	3.711	2.657	2.6
HCM Lane V/C Ratio	0.079	0.147	0.555	0.301
HCM Control Delay	9.3	9.7	13.7	9.7
HCM Lane LOS	A	A	B	A
HCM 95th-tile Q	0.3	0.5	3.5	1.3

Intersection

Int Delay, s/veh 0.1

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations			↑↑			↑
Traffic Vol, veh/h	0	0	459	76	0	7
Future Vol, veh/h	0	0	459	76	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	83	83	83	59	83	83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	553	129	0	8

Major/Minor Major2 Minor2

Conflicting Flow All	-	0	-	341
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	655
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	655
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach WB SB

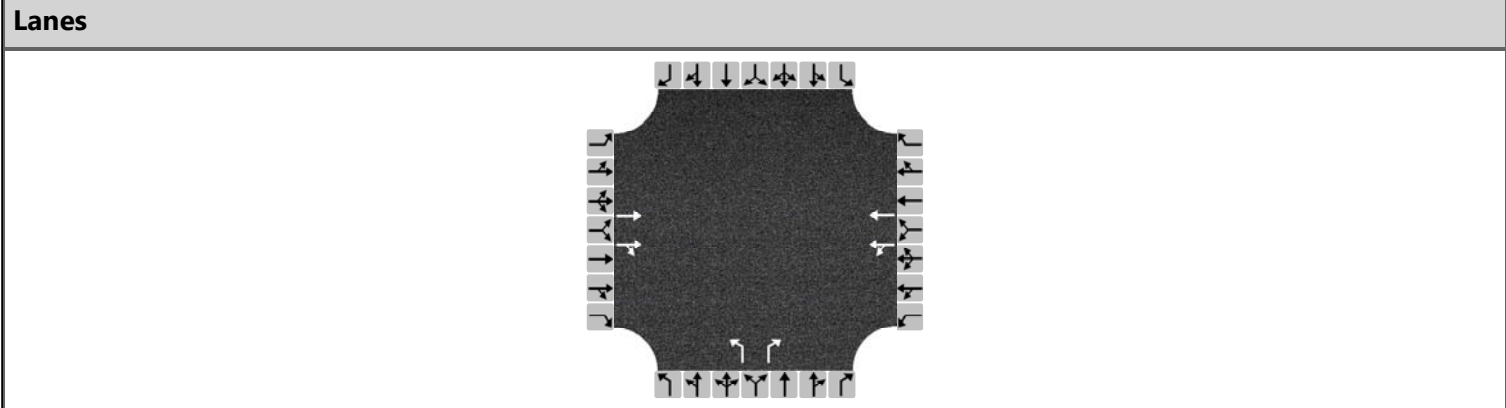
HCM Control Delay, s	0	10.6
HCM LOS		B

Minor Lane/Major Mvmt WBT WBR SBLn1

Capacity (veh/h)	-	-	655
HCM Lane V/C Ratio	-	-	0.013
HCM Control Delay (s)	-	-	10.6
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	BJH	Intersection	Knoxville Ctr at E Towne
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	City of Knoxville
Date Performed	12/15/2020	East/West Street	Knoxville Center Drive
Analysis Year	2027	North/South Street	East Towne Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.75
Time Analyzed	AM Peak		
Project Description	Combined 2027 AM		



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume		14	255	20	9		16		159			
% Thrus in Shared Lane			50	50								
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	T	TR		LT	T		L	R				
Flow Rate, v (veh/h)	9	349		33	6		21	212				
Percent Heavy Vehicles	2	2		2	2		2	2				

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20				
Initial Degree of Utilization, x	0.008	0.311		0.029	0.005		0.019	0.188				
Final Departure Headway, hd (s)	5.17	4.49		5.86	5.45		5.92	4.73				
Final Degree of Utilization, x	0.013	0.435		0.053	0.009		0.035	0.278				
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3				
Service Time, ts (s)	2.87	2.19		3.56	3.15		3.62	2.43				

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	9	349		33	6		21	212				
Capacity	696	802		614	660		608	762				
95% Queue Length, Q ₉₅ (veh)	0.0	2.2		0.2	0.0		0.1	1.1				
Control Delay (s/veh)	7.9	10.6		8.9	8.2		8.8	9.2				
Level of Service, LOS	A	B		A	A		A	A				
Approach Delay (s/veh)	10.5			8.8			9.2					
Approach LOS	B			A			A					
Intersection Delay, s/veh LOS	9.9						A					

Intersection	
Intersection Delay, s/veh	8.5
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	↑
Traffic Vol, veh/h	120	2	6	26	61	19
Future Vol, veh/h	120	2	6	26	61	19
Peak Hour Factor	0.68	0.74	0.74	0.74	0.61	0.59
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	176	3	8	35	100	32
Number of Lanes	2	0	0	2	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	8.4	8	8.8
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	41%	0%
Vol Thru, %	0%	0%	100%	95%	59%	100%
Vol Right, %	0%	100%	0%	5%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	61	19	80	42	15	17
LT Vol	61	0	0	0	6	0
Through Vol	0	0	80	40	9	17
RT Vol	0	19	0	2	0	0
Lane Flow Rate	100	32	118	62	20	23
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.155	0.039	0.161	0.084	0.029	0.033
Departure Headway (Hd)	5.578	4.375	4.938	4.904	5.264	5.059
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	645	820	729	733	682	709
Service Time	3.295	2.092	2.651	2.617	2.982	2.777
HCM Lane V/C Ratio	0.155	0.039	0.162	0.085	0.029	0.032
HCM Control Delay	9.3	7.3	8.6	8.1	8.1	8
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0.5	0.1	0.6	0.3	0.1	0.1

Intersection	
Intersection Delay, s/veh	9.3
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	95	18	7	75	141	6
Future Vol, veh/h	95	18	7	75	141	6
Peak Hour Factor	0.74	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	128	21	8	87	164	7
Number of Lanes	1	1	2	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	9.5	7.7	10.1
HCM LOS	A	A	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	100%	0%	99%	0%
Vol Thru, %	100%	3%	0%	0%	1%	100%
Vol Right, %	0%	97%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	5	77	95	18	143	4
LT Vol	0	0	95	0	141	0
Through Vol	5	2	0	0	2	4
RT Vol	0	75	0	18	0	0
Lane Flow Rate	5	90	128	21	166	5
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.008	0.111	0.204	0.026	0.256	0.007
Departure Headway (Hd)	5.136	4.453	5.712	4.508	5.534	5.039
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	697	805	629	794	650	711
Service Time	2.864	2.181	3.442	2.238	3.259	2.764
HCM Lane V/C Ratio	0.007	0.112	0.203	0.026	0.255	0.007
HCM Control Delay	7.9	7.7	9.9	7.4	10.2	7.8
HCM Lane LOS	A	A	A	A	B	A
HCM 95th-tile Q	0	0.4	0.8	0.1	1	0

Intersection						
Int Delay, s/veh	2.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	0	82	14	5	207	2
Future Vol, veh/h	0	82	14	5	207	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	95	16	6	241	2

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	277	122	243	0	-	0
Stage 1	242	-	-	-	-	-
Stage 2	35	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	690	906	1320	-	-	-
Stage 1	776	-	-	-	-	-
Stage 2	983	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	682	906	1320	-	-	-
Mov Cap-2 Maneuver	682	-	-	-	-	-
Stage 1	767	-	-	-	-	-
Stage 2	983	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.4	5.7	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1320	-	906	-	-
HCM Lane V/C Ratio	0.012	-	0.105	-	-
HCM Control Delay (s)	7.8	0	9.4	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Lanes, Volumes, Timings
1: Mill Road & Washington Pike

Knoxville Center TIS
2027 Combined PM - Improvements

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↖	↗↗
Traffic Volume (vph)	1004	126	351	522	95	712
Future Volume (vph)	1004	126	351	522	95	712
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	0.88
Frt	0.983					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3479	0	1770	3539	1770	2787
Flt Permitted			0.149		0.950	
Satd. Flow (perm)	3479	0	278	3539	1770	2787
Satd. Flow (RTOR)	13					104
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1190	0	369	549	100	749
Turn Type	NA		pm+pt	NA	Prot	pm+ov
Protected Phases	2		1	6	4	1
Permitted Phases			6			4
Detector Phase	2		1	6	4	1
Switch Phase						
Minimum Initial (s)	12.0		10.0	12.0	10.0	10.0
Minimum Split (s)	19.0		17.0	19.0	17.0	17.0
Total Split (s)	74.0		45.0	119.0	21.0	45.0
Total Split (%)	52.9%		32.1%	85.0%	15.0%	32.1%
Maximum Green (s)	68.0		39.0	113.0	15.0	39.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
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)	6.0		6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	Max		None	Max	None	None
Act Effect Green (s)	78.8		113.0	113.0	12.8	47.0
Actuated g/C Ratio	0.57		0.82	0.82	0.09	0.34
v/c Ratio	0.60		0.69	0.19	0.61	0.74
Control Delay	21.7		22.4	2.9	76.3	38.1
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	21.7		22.4	2.9	76.3	38.1
LOS	C		C	A	E	D
Approach Delay	21.7			10.7	42.6	
Approach LOS	C			B	D	
Queue Length 50th (ft)	342		130	45	88	294
Queue Length 95th (ft)	500		238	63	150	334
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200		100	100
Base Capacity (vph)	1994		650	2902	192	1228
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	0.60		0.57	0.19	0.52	0.61

Intersection Summary

























Cycle Length: 140	
Actuated Cycle Length: 137.8	
Natural Cycle: 60	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.74	
Intersection Signal Delay: 24.3	Intersection LOS: C
Intersection Capacity Utilization 74.5%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 1: Mill Road & Washington Pike



Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

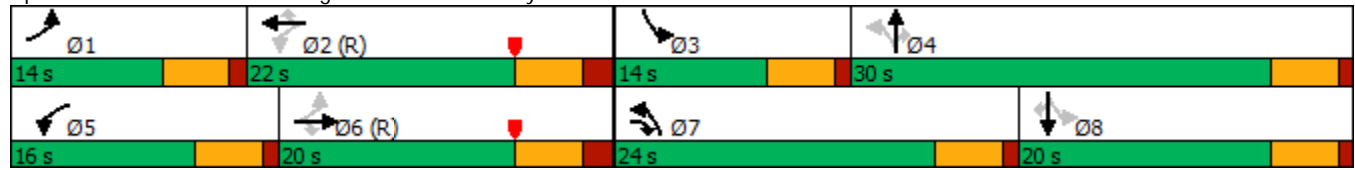
Knoxville Center TIS
2027 Combined PM - Improvements

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	109	333	525	68	13	317	329	972	67	337	57
Future Volume (vph)	55	109	333	525	68	13	317	329	972	67	337	57
Lane Util. Factor	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	3433	1863	1583	1770	1863	2787	1770	3539	1583
Flt Permitted	0.708			0.520			0.307			0.543		
Satd. Flow (perm)	1319	3539	1583	1879	1863	1583	572	1863	2787	1011	3539	1583
Satd. Flow (RTOR)			95			232			1080			245
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	121	370	583	76	14	352	366	1080	74	374	63
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	7	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	14.0	20.0	24.0	16.0	22.0	22.0	24.0	30.0	30.0	14.0	20.0	20.0
Total Split (%)	17.5%	25.0%	30.0%	20.0%	27.5%	27.5%	30.0%	37.5%	37.5%	17.5%	25.0%	25.0%
Maximum Green (s)	9.0	14.0	19.0	11.0	16.0	16.0	19.0	25.0	25.0	9.0	15.0	15.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	C-Max	None	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	26.6	17.7	39.3	34.8	26.8	26.8	34.0	24.4	24.4	20.1	13.3	13.3
Actuated g/C Ratio	0.33	0.22	0.49	0.44	0.34	0.34	0.42	0.30	0.30	0.25	0.17	0.17
v/c Ratio	0.13	0.15	0.45	0.55	0.12	0.02	0.74	0.64	0.67	0.23	0.63	0.13
Control Delay	15.9	27.8	12.1	18.3	24.9	0.1	16.5	20.9	5.7	15.6	35.9	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.9	27.8	12.1	18.3	24.9	0.1	16.5	20.9	5.7	15.6	35.9	0.6
LOS	B	C	B	B	C	A	B	C	A	B	D	A
Approach Delay		16.0			18.7			10.9			28.6	
Approach LOS		B			B			B			C	
Queue Length 50th (ft)	17	27	90	97	29	0	65	145	102	21	92	0
Queue Length 95th (ft)	43	51	150	151	68	0	m91	m228	137	40	133	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	300		170	160		160	150		75
Base Capacity (vph)	507	782	888	1058	624	685	527	602	1632	367	680	501
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.15	0.42	0.55	0.12	0.02	0.67	0.61	0.66	0.20	0.55	0.13

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 19 (24%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.74
 Intersection Signal Delay: 15.7
 Intersection LOS: B
 Intersection Capacity Utilization 61.9%
 ICU Level of Service B
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Washington Pike & Greenway Drive

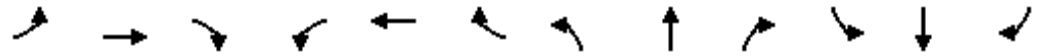


Lanes, Volumes, Timings

Knoxville Center TIS

3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road

2027 Combined PM - Improvements



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↕	↗	↙	↕			↕	↗
Traffic Volume (vph)	0	0	0	119	411	338	266	1300	0	0	627	544
Future Volume (vph)	0	0	0	119	411	338	266	1300	0	0	627	544
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1770	1863	1583	1770	3539	0	0	3539	1583
Flt Permitted				0.950			0.241					
Satd. Flow (perm)	0	0	0	1770	1863	1583	449	3539	0	0	3539	1583
Satd. Flow (RTOR)							109					370
Peak Hour Factor	0.92	0.92	0.92	0.92	0.86	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	129	478	367	289	1413	0	0	682	591
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Free
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					Free
Detector Phase				4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0			10.0	
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0			19.0	
Total Split (s)				34.0	34.0	34.0	18.0	46.0			28.0	
Total Split (%)				42.5%	42.5%	42.5%	22.5%	57.5%			35.0%	
Maximum Green (s)				28.0	28.0	28.0	13.0	40.0			22.0	
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5			4.5	
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5			1.5	
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	
Total Lost Time (s)				6.0	6.0	6.0	5.0	6.0			6.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			2.0	
Recall Mode				None	None	None	None	C-Max			C-Max	
Act Effect Green (s)				25.1	25.1	25.1	43.9	42.9			26.8	80.0
Actuated g/C Ratio				0.31	0.31	0.31	0.55	0.54			0.34	1.00
v/c Ratio				0.23	0.82	0.64	0.68	0.74			0.58	0.37
Control Delay				20.4	37.3	21.3	13.7	8.1			26.9	0.6
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				20.4	37.3	21.3	13.7	8.1			26.9	0.6
LOS				C	D	C	B	A			C	A
Approach Delay					29.0			9.1			14.7	
Approach LOS					C			A			B	
Queue Length 50th (ft)				45	207	102	23	57			187	1
Queue Length 95th (ft)				84	295	189	m61	314			247	0
Internal Link Dist (ft)		569			2042			923			673	
Turn Bay Length (ft)						475	105					100
Base Capacity (vph)				619	652	624	460	1897			1186	1583
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				0.21	0.73	0.59	0.63	0.74			0.58	0.37

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 46 (58%), Referenced to phase 2:SBT and 6:NBTL, Start of Yellow

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 15.8

Intersection LOS: B

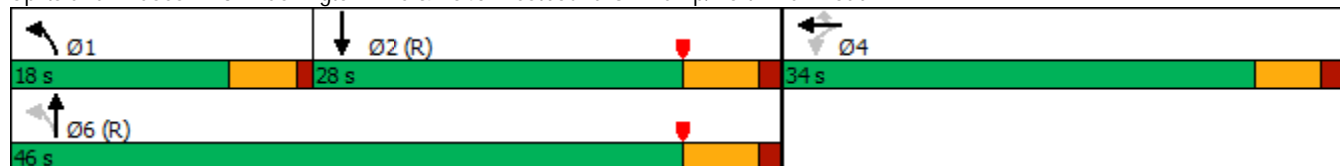
Intersection Capacity Utilization 75.4%

ICU Level of Service D

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road



Lanes, Volumes, Timings

Knoxville Center TIS

4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road

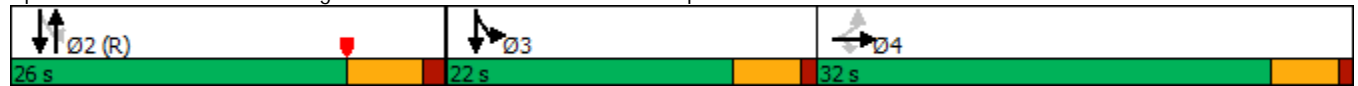
2027 Combined PM - Improvements

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	952	588	395	0	0	0	0	607	61	361	384	0
Future Volume (vph)	952	588	395	0	0	0	0	607	61	361	384	0
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	3539	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.288		
Satd. Flow (perm)	3433	3539	1583	0	0	0	0	3539	1583	536	3539	0
Satd. Flow (RTOR)			403							95		
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)	971	600	403	0	0	0	0	619	62	368	392	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	32.0	32.0	32.0					26.0	26.0	22.0		
Total Split (%)	40.0%	40.0%	40.0%					32.5%	32.5%	27.5%		
Maximum Green (s)	27.0	27.0	27.0					20.0	20.0	17.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	27.2	27.2	27.2					22.0	22.0	37.8	41.8	
Actuated g/C Ratio	0.34	0.34	0.34					0.28	0.28	0.47	0.52	
v/c Ratio	0.83	0.50	0.50					0.64	0.12	0.77	0.21	
Control Delay	32.0	22.7	4.7					29.8	3.0	18.1	5.8	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	32.0	22.7	4.7					29.8	3.0	18.1	5.8	
LOS	C	C	A					C	A	B	A	
Approach Delay		23.6						27.3			11.8	
Approach LOS		C						C			B	
Queue Length 50th (ft)	228	124	0					147	0	34	18	
Queue Length 95th (ft)	#314	172	58					205	15	#80	48	
Internal Link Dist (ft)		2101			1667			717			923	
Turn Bay Length (ft)	400		265						150	120		
Base Capacity (vph)	1185	1221	810					973	504	530	1946	
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	0.82	0.49	0.50					0.64	0.12	0.69	0.20	

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 36 (45%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.83	
Intersection Signal Delay: 21.7	Intersection LOS: C
Intersection Capacity Utilization 75.4%	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: 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road



Intersection

Int Delay, s/veh 0

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1090	0	0	0	0
Future Vol, veh/h	0	1090	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	16983	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	81	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1172	0	0	0	0

Major/Minor Major1 Minor2

Conflicting Flow All	-	0	586	-
Stage 1	-	-	0	-
Stage 2	-	-	586	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	441	0
Stage 1	0	-	-	0
Stage 2	0	-	519	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	441	-
Mov Cap-2 Maneuver	-	-	441	-
Stage 1	-	-	-	-
Stage 2	-	-	519	-

Approach EB SB

HCM Control Delay, s	0	0
HCM LOS		A

Minor Lane/Major Mvmt EBT SBLn1

Capacity (veh/h)	-	-
HCM Lane V/C Ratio	-	-
HCM Control Delay (s)	-	0
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	-

Intersection												
Int Delay, s/veh	0.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗						↘				
Traffic Vol, veh/h	270	877	28	0	0	0	0	6	32	0	0	0
Future Vol, veh/h	270	877	28	0	0	0	0	6	32	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	16979	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	303	985	31	0	0	0	0	7	36	0	0	0

Major/Minor	Major1			Minor1		
Conflicting Flow All	0	0	0	-	1607	508
Stage 1	-	-	-	-	1607	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.14	-	-	-	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.22	-	-	-	4.02	3.32
Pot Cap-1 Maneuver	-	-	-	0	104	510
Stage 1	-	-	-	0	163	-
Stage 2	-	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	0	510
Mov Cap-2 Maneuver	-	-	-	-	0	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-

Approach	EB	NB
HCM Control Delay, s		12.7
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	510	-	-	-
HCM Lane V/C Ratio	0.084	-	-	-
HCM Control Delay (s)	12.7	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.3	-	-	-

Lanes, Volumes, Timings

Knoxville Center TIS

7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp

2027 Combined PM - Improvements



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	512	310	63	0	0	0	0	329	140	487	483	0
Future Volume (vph)	512	310	63	0	0	0	0	329	140	487	483	0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.987								0.950		
Satd. Flow (prot)	1681	1747	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.987								0.508		
Satd. Flow (perm)	1681	1747	1583	0	0	0	0	3539	1583	946	3539	0
Satd. Flow (RTOR)			85							154		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Shared Lane Traffic (%)	21%											
Lane Group Flow (vph)	445	459	69	0	0	0	0	362	154	535	531	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	34.0	34.0	34.0					34.0	34.0	22.0		
Total Split (%)	37.8%	37.8%	37.8%					37.8%	37.8%	24.4%		
Maximum Green (s)	29.0	29.0	29.0					29.0	29.0	17.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	26.7	26.7	26.7					33.5	33.5	48.3	53.3	
Actuated g/C Ratio	0.30	0.30	0.30					0.37	0.37	0.54	0.59	
v/c Ratio	0.90	0.89	0.13					0.28	0.22	0.83	0.25	
Control Delay	52.1	50.6	4.4					21.9	4.8	23.1	4.9	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	52.1	50.6	4.4					21.9	4.8	23.1	4.9	
LOS	D	D	A					C	A	C	A	
Approach Delay		48.0						16.8			14.0	
Approach LOS		D						B			B	
Queue Length 50th (ft)	244	251	0					81	0	103	31	
Queue Length 95th (ft)	#415	#421	m22					118	41	#268	40	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	541	562	567					1316	685	686	2181	
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	0.82	0.82	0.12					0.28	0.22	0.78	0.24	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 68 (76%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 27.5	Intersection LOS: C
Intersection Capacity Utilization 82.6%	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.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp



Lanes, Volumes, Timings

Knoxville Center TIS

8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp

2027 Combined PM - Improvements

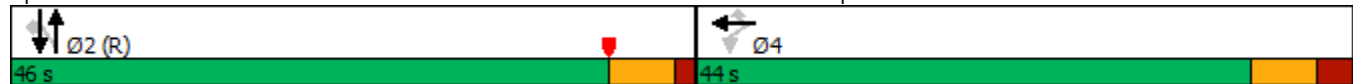


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↕			↕	↘
Traffic Volume (vph)	0	0	0	170	406	656	85	739	0	0	795	347
Future Volume (vph)	0	0	0	170	406	656	85	739	0	0	795	347
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.998		0.950					
Satd. Flow (prot)	0	0	0	1681	1766	2787	1770	3539	0	0	3539	1583
Flt Permitted				0.950	0.998		0.273					
Satd. Flow (perm)	0	0	0	1681	1766	2787	509	3539	0	0	3539	1583
Satd. Flow (RTOR)						189						283
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	0	161	445	691	89	778	0	0	837	365
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2			2	
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				44.0	44.0	44.0	46.0	46.0			46.0	46.0
Total Split (%)				48.9%	48.9%	48.9%	51.1%	51.1%			51.1%	51.1%
Maximum Green (s)				37.0	37.0	37.0	40.0	40.0			40.0	40.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)				7.0	7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)				31.8	31.8	31.8	45.2	45.2			45.2	45.2
Actuated g/C Ratio				0.35	0.35	0.35	0.50	0.50			0.50	0.50
v/c Ratio				0.27	0.71	0.62	0.35	0.44			0.47	0.39
Control Delay				20.7	31.3	19.1	11.7	8.8			15.7	7.0
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				20.7	31.3	19.1	11.7	8.8			15.7	7.0
LOS				C	C	B	B	A			B	A
Approach Delay					23.5			9.1			13.0	
Approach LOS					C			A			B	
Queue Length 50th (ft)				65	218	126	28	147			113	40
Queue Length 95th (ft)				107	310	176	m51	m194			142	m75
Internal Link Dist (ft)		1096			1137			650			484	
Turn Bay Length (ft)				450		800	95					
Base Capacity (vph)				691	726	1257	255	1776			1776	935
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				0.23	0.61	0.55	0.35	0.44			0.47	0.39

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 78 (87%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 16.0	Intersection LOS: B
Intersection Capacity Utilization 82.6%	ICU Level of Service E
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp



Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way

Knoxville Center TIS
2027 Combined PM - Improvements









Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	201	59	89	371	47	159	61	881	439	111	648	90
Future Volume (vph)	201	59	89	371	47	159	61	881	439	111	648	90
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.906				0.850			0.850			0.850
Flt Protected	0.950			0.950	0.963		0.950			0.950		
Satd. Flow (prot)	1770	1688	0	1681	1704	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950	0.963		0.322			0.950		
Satd. Flow (perm)	1770	1688	0	1681	1704	1583	600	3539	1583	1770	3539	1583
Satd. Flow (RTOR)		82				98			462			95
Peak Hour Factor	0.89	0.95	0.86	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				44%								
Lane Group Flow (vph)	226	165	0	219	221	167	64	927	462	117	682	95
Turn Type	Split	NA		Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4		3	3	1	5	2	3	1	6	4
Permitted Phases						3	2		2			6
Detector Phase	4	4		3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0		16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	22.0	22.0		21.0	21.0	15.0	15.0	32.0	21.0	15.0	32.0	22.0
Total Split (%)	24.4%	24.4%		23.3%	23.3%	16.7%	16.7%	35.6%	23.3%	16.7%	35.6%	24.4%
Maximum Green (s)	17.0	17.0		16.0	16.0	10.0	10.0	27.0	16.0	10.0	27.0	17.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)	15.2	15.2		15.2	15.2	24.1	37.4	30.6	50.9	8.9	35.0	51.3
Actuated g/C Ratio	0.17	0.17		0.17	0.17	0.27	0.42	0.34	0.57	0.10	0.39	0.57
v/c Ratio	0.76	0.47		0.77	0.77	0.34	0.19	0.77	0.42	0.67	0.50	0.10
Control Delay	52.0	21.6		54.9	54.4	7.7	10.0	23.9	3.9	51.8	29.2	4.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.0	21.6		54.9	54.4	7.7	10.0	23.9	3.9	51.8	29.2	4.0
LOS	D	C		D	D	A	A	C	A	D	C	A
Approach Delay		39.2			41.7			16.9			29.5	
Approach LOS		D			D			B			C	
Queue Length 50th (ft)	121	41		125	126	16	15	221	29	68	164	9
Queue Length 95th (ft)	#200	100		#234	#234	42	m34	#356	59	m100	235	m22
Internal Link Dist (ft)		713			953			484			243	
Turn Bay Length (ft)	290			155		245	180		180	120		105
Base Capacity (vph)	334	385		298	302	514	400	1204	1104	196	1377	951
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.43		0.73	0.73	0.32	0.16	0.77	0.42	0.60	0.50	0.10

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 69 (77%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 27.4	Intersection LOS: C
Intersection Capacity Utilization 69.8%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 9: Millertown Pike & Kinzel Way

 Ø1 15 s	 Ø2 (R) 32 s	 Ø3 21 s	 Ø4 22 s
 Ø5 15 s	 Ø6 (R) 32 s		

Intersection						
Int Delay, s/veh	1.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	41	48	13	1270	839	40
Future Vol, veh/h	41	48	13	1270	839	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	42	49	13	1309	865	41

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1567	886	906	0	-	0
Stage 1	886	-	-	-	-	-
Stage 2	681	-	-	-	-	-
Critical Hdwy	6.63	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	112	343	749	-	-	-
Stage 1	402	-	-	-	-	-
Stage 2	465	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	110	343	749	-	-	-
Mov Cap-2 Maneuver	110	-	-	-	-	-
Stage 1	395	-	-	-	-	-
Stage 2	465	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	35.5	0.1	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	749	-	110	343	-	-
HCM Lane V/C Ratio	0.018	-	0.384	0.144	-	-
HCM Control Delay (s)	9.9	-	56.8	17.3	-	-
HCM Lane LOS	A	-	F	C	-	-
HCM 95th %tile Q(veh)	0.1	-	1.6	0.5	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road

Knoxville Center TIS
2027 Combined PM - Improvements










Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	91	43	99	157	48	200	103	1058	88	84	618	16
Future Volume (vph)	91	43	99	157	48	200	103	1058	88	84	618	16
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt		0.895			0.879			0.988				0.996
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1667	0	1770	1637	0	1770	3497	0	1770	1855	0
Flt Permitted	0.396			0.421			0.195			0.134		
Satd. Flow (perm)	738	1667	0	784	1637	0	363	3497	0	250	1855	0
Satd. Flow (RTOR)		104			189			12			2	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	96	149	0	165	262	0	108	1207	0	88	668	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	15.0	16.0		15.0	16.0		15.0	24.0		14.0	24.0	
Total Split (s)	15.0	16.0		15.0	16.0		15.0	45.0		14.0	44.0	
Total Split (%)	16.7%	17.8%		16.7%	17.8%		16.7%	50.0%		15.6%	48.9%	
Maximum Green (s)	10.0	11.0		10.0	11.0		10.0	40.0		9.0	39.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effect Green (s)	17.8	9.1		20.4	12.4		53.3	46.7		51.1	45.6	
Actuated g/C Ratio	0.20	0.10		0.23	0.14		0.59	0.52		0.57	0.51	
v/c Ratio	0.39	0.57		0.58	0.68		0.32	0.66		0.35	0.71	
Control Delay	30.1	22.7		35.5	22.0		5.8	7.2		9.6	20.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	30.1	22.7		35.5	22.0		5.8	7.2		9.6	20.9	
LOS	C	C		D	C		A	A		A	C	
Approach Delay		25.6			27.2			7.0			19.6	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)	41	24		74	39		9	107		11	307	
Queue Length 95th (ft)	80	81		128	#141		m13	135		m18	#534	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)				175			200			65		
Base Capacity (vph)	271	295		286	395		376	1819		298	940	
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	0.35	0.51		0.58	0.66		0.29	0.66		0.30	0.71	

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 84 (93%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.71
 Intersection Signal Delay: 15.3
 Intersection LOS: B
 Intersection Capacity Utilization 75.8%
 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.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: Millertown Pike & Loves Creek Road

 Ø1 14 s	 Ø2 (R) 45 s	 Ø3 15 s	 Ø4 16 s
 Ø5 15 s	 Ø6 (R) 44 s	 Ø7 15 s	 Ø8 16 s

Lanes, Volumes, Timings
12: Millertown Pike & Mill Road

Knoxville Center TIS
2027 Combined PM - Improvements

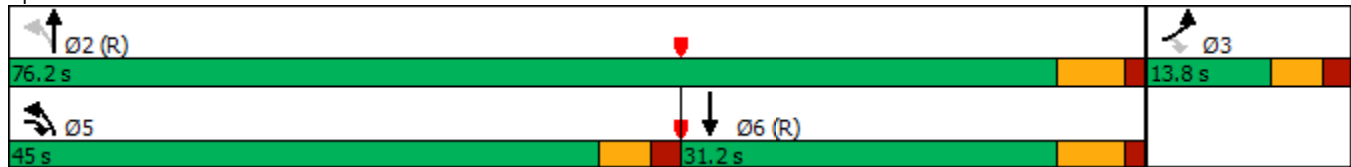


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	91	418	768	646	330	84
Future Volume (vph)	91	418	768	646	330	84
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.973	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1812	0
Flt Permitted	0.950		0.240			
Satd. Flow (perm)	1770	1583	447	1863	1812	0
Satd. Flow (RTOR)		216			14	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	96	440	808	680	435	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	13.8	45.0	45.0	76.2	31.2	
Total Split (%)	15.3%	50.0%	50.0%	84.7%	34.7%	
Maximum Green (s)	8.3	39.5	39.5	70.2	25.2	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	C-Min	C-Min	
Act Effect Green (s)	8.3	47.6	73.4	74.1	30.9	
Actuated g/C Ratio	0.09	0.53	0.82	0.82	0.34	
v/c Ratio	0.59	0.47	0.90	0.44	0.69	
Control Delay	54.8	6.9	17.6	1.6	34.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	54.8	6.9	17.6	1.6	34.7	
LOS	D	A	B	A	C	
Approach Delay	15.5			10.3	34.7	
Approach LOS	B			B	C	
Queue Length 50th (ft)	53	56	15	12	226	
Queue Length 95th (ft)	#115	114	#518	19	#388	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85				
Base Capacity (vph)	165	984	944	1535	631	
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	0.58	0.45	0.86	0.44	0.69	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 14 (16%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 15.7	Intersection LOS: B
Intersection Capacity Utilization 85.9%	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.	

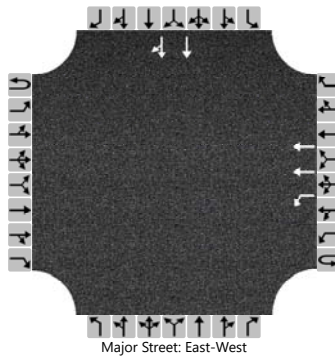
Splits and Phases: 12: Millertown Pike & Mill Road



HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	BJH			Intersection	N Mall Rd at East Towne W		
Agency/Co.	Cannon & Cannon, Inc.			Jurisdiction	City of Knoxville		
Date Performed	12/15/2020			East/West Street	North Mall Road		
Analysis Year	2027			North/South Street	East Towne Road (West)		
Time Analyzed	PM Peak			Peak Hour Factor	0.88		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Combined 2027 PM						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	0	0	0	1	2	0		0	0	0		0	2	0
Configuration						L	T								T	TR
Volume (veh/h)						23	732								35	0
Percent Heavy Vehicles (%)						2									2	2
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						5.3									6.5	6.9
Critical Headway (sec)						0.00									6.54	6.94
Base Follow-Up Headway (sec)						3.1									4.0	3.3
Follow-Up Headway (sec)						3.12									4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					26										20	20
Capacity, c (veh/h)					1154										276	276
v/c Ratio					0.02										0.07	0.07
95% Queue Length, Q ₉₅ (veh)					0.1										0.2	0.2
Control Delay (s/veh)					8.2										19.0	19.0
Level of Service (LOS)					A										C	C
Approach Delay (s/veh)						0.2									19.0	
Approach LOS															C	

Intersection	
Intersection Delay, s/veh	17.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑↑				
Traffic Vol, veh/h	0	0	0	0	732	25	1	267	0	0	0	0
Future Vol, veh/h	0	0	0	0	732	25	1	267	0	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.91	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	771	26	1	293	0	0	0	0
Number of Lanes	0	0	0	0	2	0	0	2	0	0	0	0

Approach	WB	NB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NB	
Conflicting Lanes Left	2	0
Conflicting Approach Right		WB
Conflicting Lanes Right	0	2
HCM Control Delay	19.8	12
HCM LOS	C	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2
Vol Left, %	1%	0%	0%	0%
Vol Thru, %	99%	100%	100%	91%
Vol Right, %	0%	0%	0%	9%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	90	178	488	269
LT Vol	1	0	0	0
Through Vol	89	178	488	244
RT Vol	0	0	0	25
Lane Flow Rate	99	196	514	283
Geometry Grp	7	7	7	7
Degree of Util (X)	0.178	0.352	0.77	0.419
Departure Headway (Hd)	6.485	6.479	5.398	5.332
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	557	559	663	668
Service Time	4.185	4.179	3.194	3.129
HCM Lane V/C Ratio	0.178	0.351	0.775	0.424
HCM Control Delay	10.6	12.7	24.1	12
HCM Lane LOS	B	B	C	B
HCM 95th-tile Q	0.6	1.6	7.3	2.1

Intersection

Int Delay, s/veh 0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↓			↑
Traffic Vol, veh/h	0	0	767	135	0	55
Future Vol, veh/h	0	0	767	135	0	55
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	87	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	799	155	0	57

Major/Minor

	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	0
Stage 1	-	0
Stage 2	-	0
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach

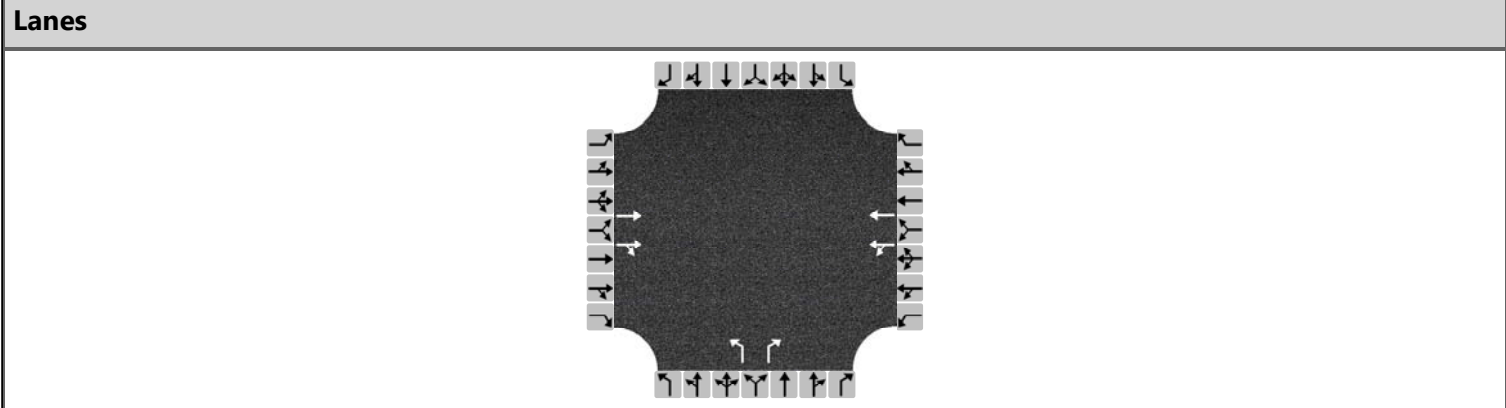
	WB	SB
HCM Control Delay, s	0	12.6
HCM LOS		B

Minor Lane/Major Mvmt

	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	534
HCM Lane V/C Ratio	-	-	0.107
HCM Control Delay (s)	-	-	12.6
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.4

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	BJH	Intersection	Knoxville Ctr at E Towne
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	City of Knoxville
Date Performed	12/15/2020	East/West Street	Knoxville Center Drive
Analysis Year	2027	North/South Street	East Towne Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.85
Time Analyzed	PM Peak		
Project Description	Combined 2027 PM		



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume		13	69	192	32		54		350			
% Thrus in Shared Lane			50	50								
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	T	TR		LT	T		L	R				
Flow Rate, v (veh/h)	8	89		245	19		64	412				
Percent Heavy Vehicles	2	2		2	2		2	2				

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20				
Initial Degree of Utilization, x	0.007	0.079		0.218	0.017		0.056	0.366				
Final Departure Headway, hd (s)	6.16	5.52		6.34	5.88		6.08	4.88				
Final Degree of Utilization, x	0.013	0.136		0.431	0.031		0.107	0.559				
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3				
Service Time, ts (s)	3.86	3.22		4.04	3.58		3.78	2.58				

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	8	89		245	19		64	412				
Capacity	584	653		567	612		592	737				
95% Queue Length, Q ₉₅ (veh)	0.0	0.5		2.2	0.1		0.4	3.5				
Control Delay (s/veh)	8.9	9.1		13.8	8.8		9.5	13.6				
Level of Service, LOS	A	A		B	A		A	B				
Approach Delay (s/veh)	9.1			13.4			13.0					
Approach LOS	A			B			B					
Intersection Delay, s/veh LOS	12.7						B					

Intersection	
Intersection Delay, s/veh	9.8
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	↑
Traffic Vol, veh/h	318	8	44	131	100	43
Future Vol, veh/h	318	8	44	131	100	43
Peak Hour Factor	0.93	0.93	0.73	0.93	0.89	0.83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	342	9	60	141	112	52
Number of Lanes	2	0	0	2	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	10	9.3	9.9
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	50%	0%
Vol Thru, %	0%	0%	100%	93%	50%	100%
Vol Right, %	0%	100%	0%	7%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	100	43	212	114	88	87
LT Vol	100	0	0	0	44	0
Through Vol	0	0	212	106	44	87
RT Vol	0	43	0	8	0	0
Lane Flow Rate	112	52	228	123	107	94
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.198	0.074	0.331	0.176	0.167	0.14
Departure Headway (Hd)	6.339	5.13	5.223	5.174	5.618	5.365
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	563	693	686	690	635	665
Service Time	4.11	2.901	2.977	2.928	3.382	3.129
HCM Lane V/C Ratio	0.199	0.075	0.332	0.178	0.169	0.141
HCM Control Delay	10.7	8.3	10.6	9	9.5	9
HCM Lane LOS	B	A	B	A	A	A
HCM 95th-tile Q	0.7	0.2	1.4	0.6	0.6	0.5

Intersection	
Intersection Delay, s/veh	12.5
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	177	78	32	312	97	29
Future Vol, veh/h	177	78	32	312	97	29
Peak Hour Factor	0.86	0.86	0.86	0.81	0.78	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	206	91	37	385	124	34
Number of Lanes	1	1	2	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	11.8	13.5	10.9
HCM LOS	B	B	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	0%	100%	0%	91%	0%
Vol Thru, %	100%	3%	0%	0%	9%	100%
Vol Right, %	0%	97%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	21	323	177	78	107	19
LT Vol	0	0	177	0	97	0
Through Vol	21	11	0	0	10	19
RT Vol	0	312	0	78	0	0
Lane Flow Rate	25	398	206	91	136	22
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.039	0.555	0.374	0.134	0.241	0.037
Departure Headway (Hd)	5.711	5.027	6.543	5.333	6.41	5.948
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	631	724	552	673	561	602
Service Time	3.411	2.727	4.271	3.06	4.14	3.678
HCM Lane V/C Ratio	0.04	0.55	0.373	0.135	0.242	0.037
HCM Control Delay	8.6	13.8	13.1	8.9	11.2	8.9
HCM Lane LOS	A	B	B	A	B	A
HCM 95th-tile Q	0.1	3.4	1.7	0.5	0.9	0.1

Intersection						
Int Delay, s/veh	5.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	6	68	82	2	29	16
Future Vol, veh/h	6	68	82	2	29	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	66	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	74	89	2	44	17

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	232	31	61	0	0
Stage 1	53	-	-	-	-
Stage 2	179	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-
Pot Cap-1 Maneuver	736	1036	1540	-	-
Stage 1	963	-	-	-	-
Stage 2	834	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	693	1036	1540	-	-
Mov Cap-2 Maneuver	693	-	-	-	-
Stage 1	907	-	-	-	-
Stage 2	834	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.9	7.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1540	-	996	-	-
HCM Lane V/C Ratio	0.058	-	0.081	-	-
HCM Control Delay (s)	7.5	0	8.9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.3	-	-

APPENDIX G | ANALYSES FOR PEAK HOUR OF THE GENERATOR

- FIGURE G-1 – 2020 Existing Volumes
- FIGURE G-2 – 2022 Background Volumes
- FIGURE G-3A / G-3B – Trip Distribution for Employees
- FIGURE G-4A / G-4B – Trip Distribution for Service Vehicles
- FIGURE G-5A / G-5B – Generated Trips
- FIGURE G-6 – 2022 Combined Volumes
- FIGURE G-7 – 2022 Capacity Analysis Results
- FIGURE G-8 – 2027 Background Volumes
- FIGURE G-9 – 2027 Combined Volumes
- FIGURE G-10 – 2027 Capacity Analysis Results

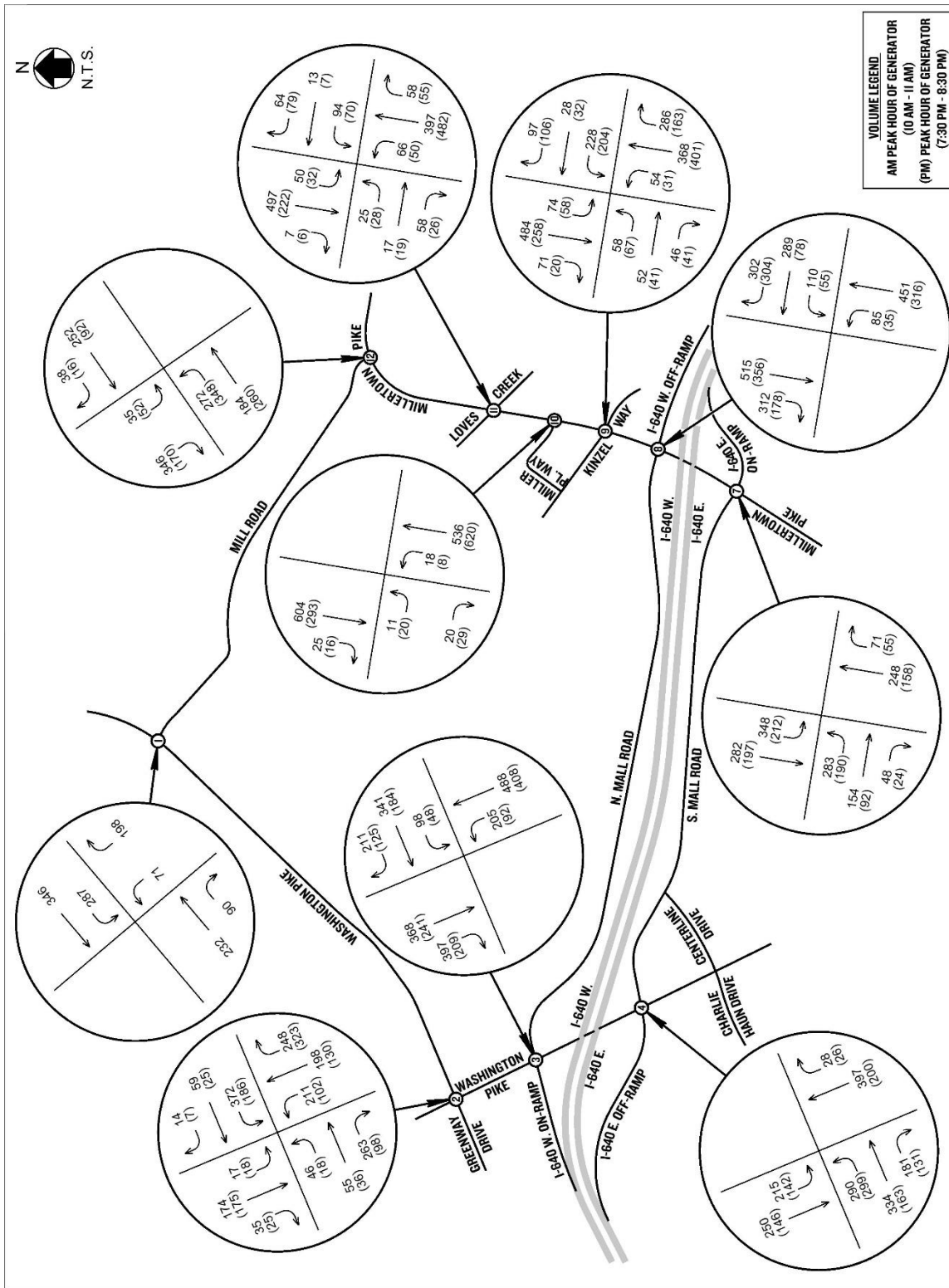


FIGURE G-1
 2020 EXISTING VOLUMES (STUDY AREA)

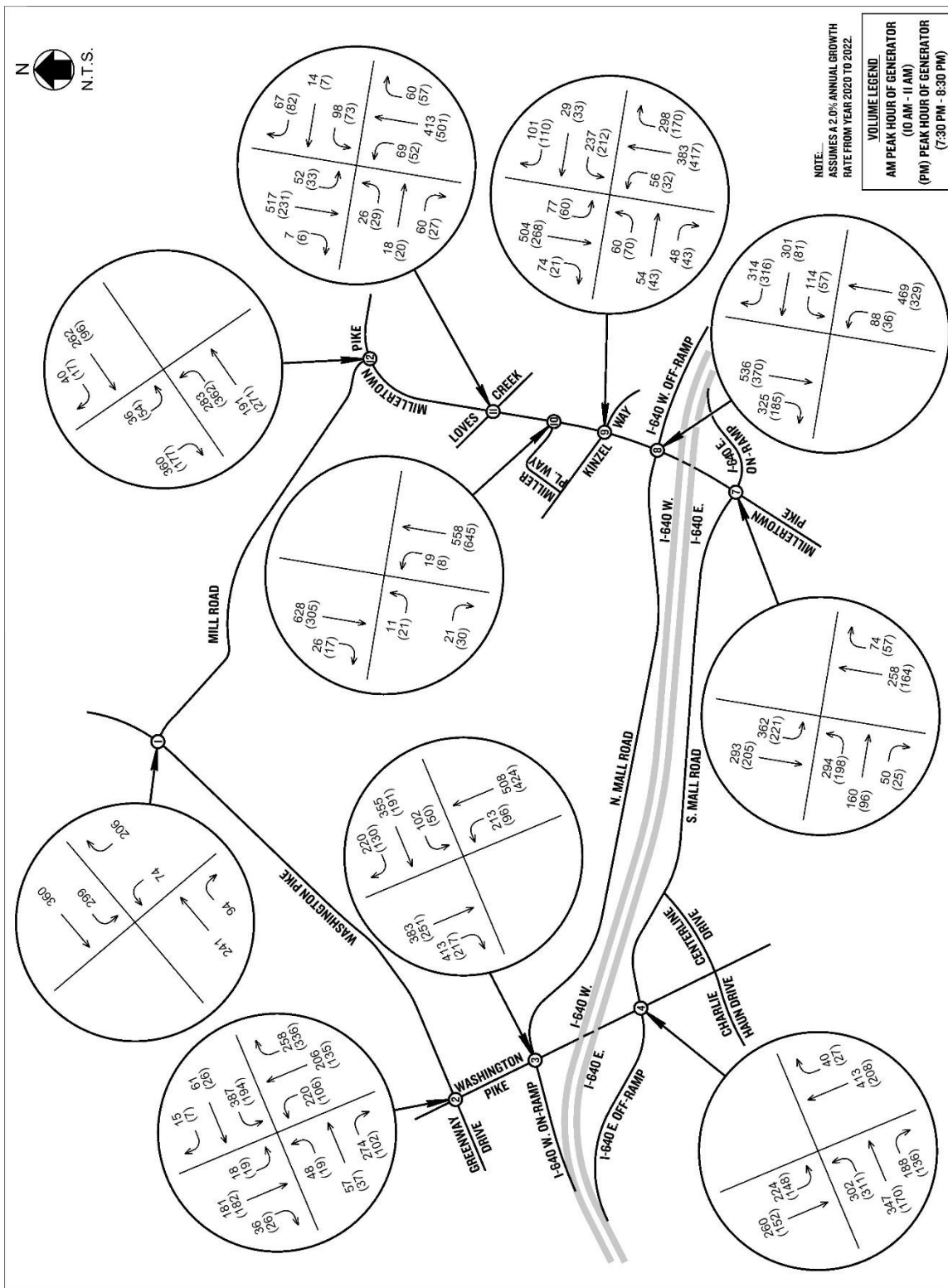


FIGURE G-2
 2022 BACKGROUND VOLUMES (STUDY AREA)

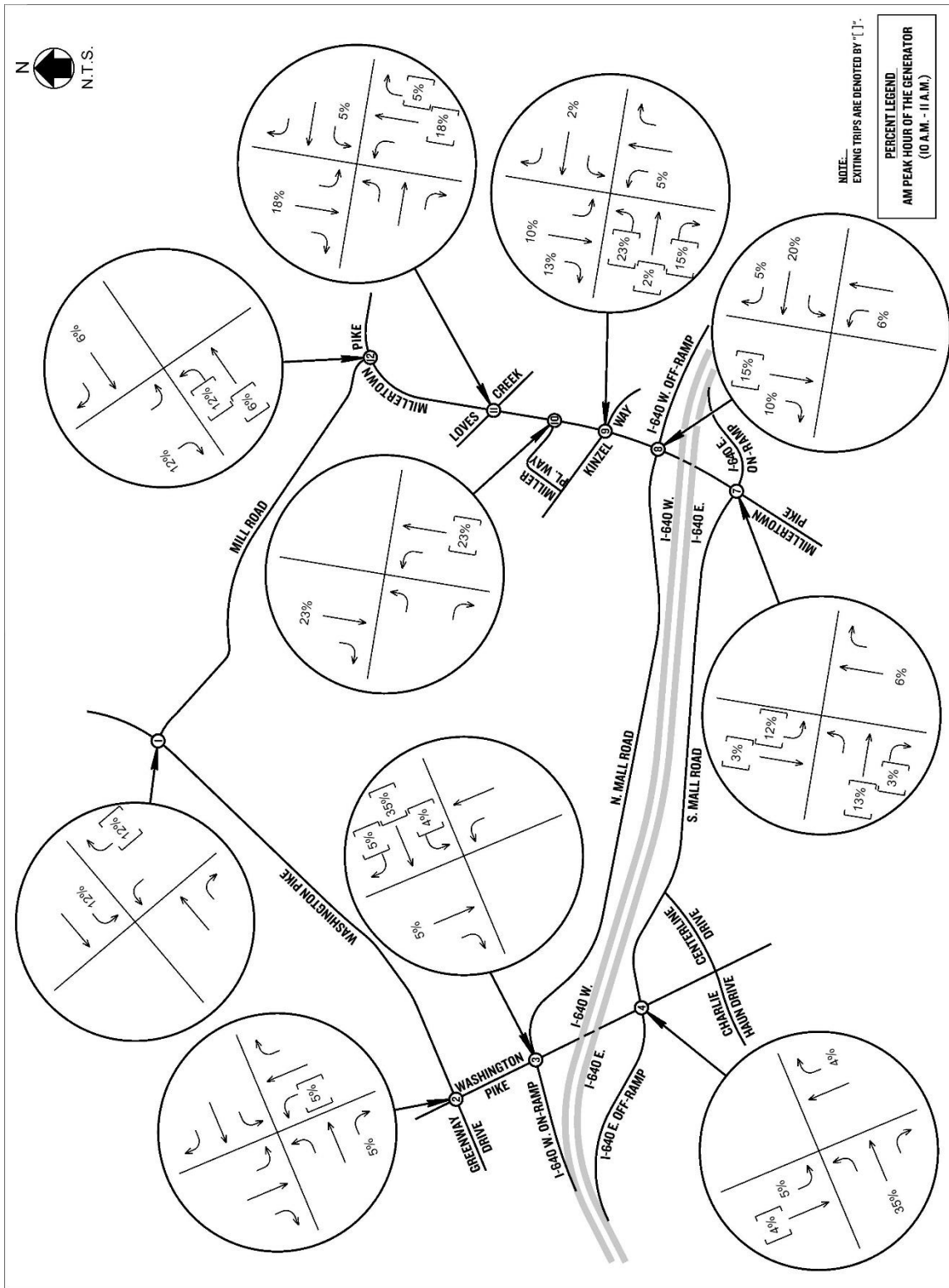


FIGURE G-3A
TRIP DISTRIBUTION FOR EMPLOYEES (STUDY AREA)

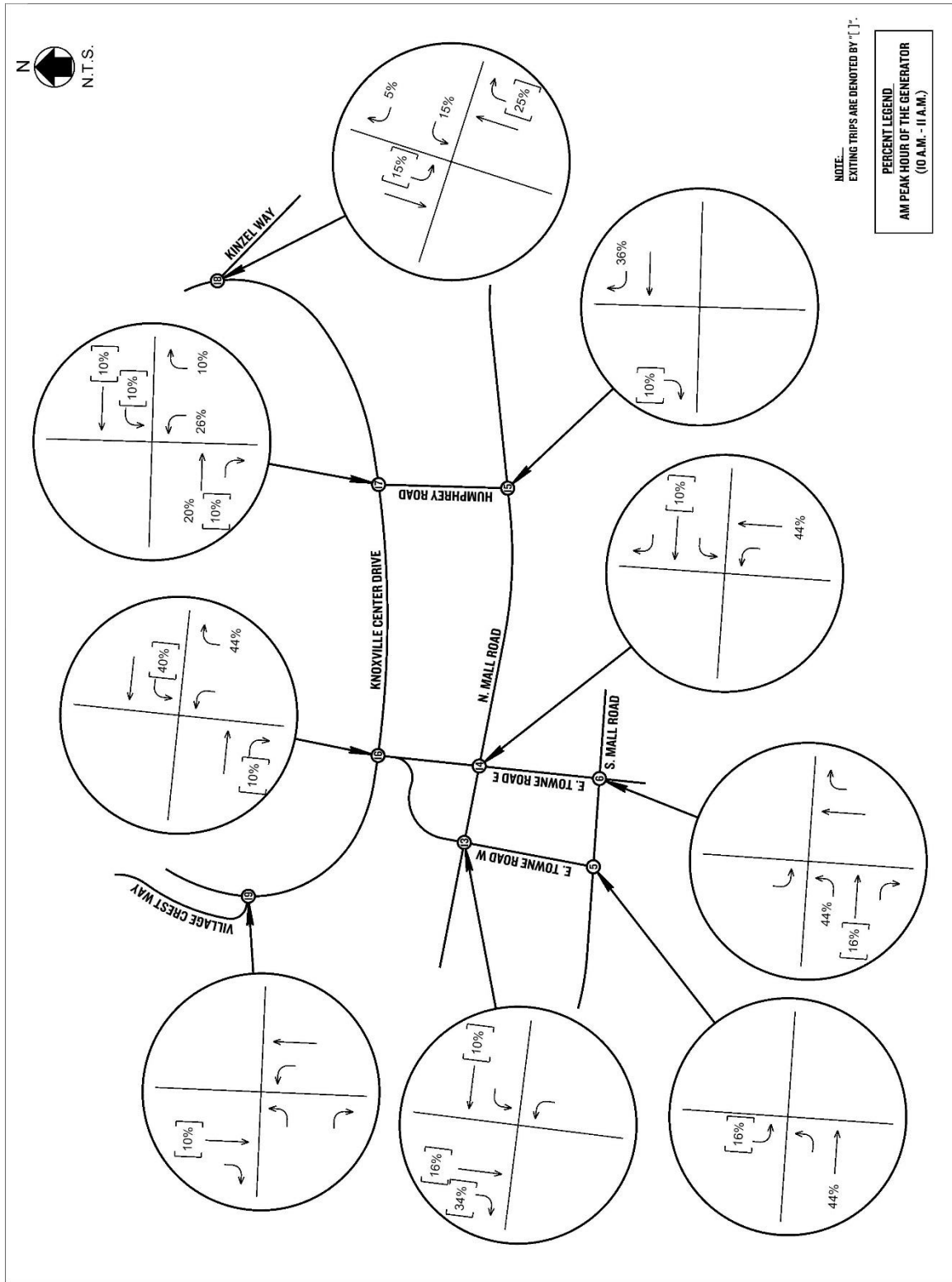


FIGURE G-3B
TRIP DISTRIBUTION FOR EMPLOYEES (SITE VICINITY)

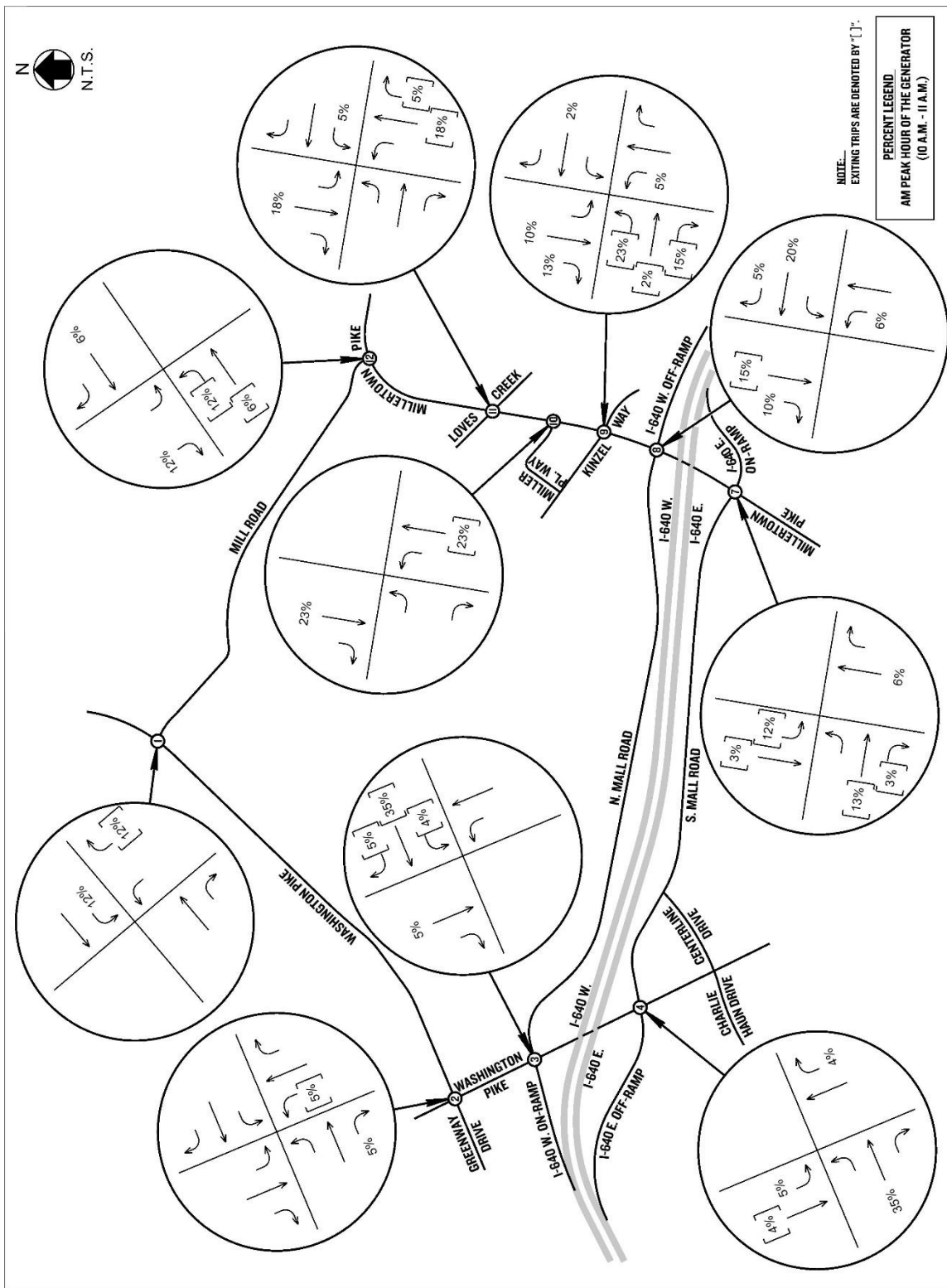


FIGURE G-4A
TRIP DISTRIBUTION FOR SERVICE VEHICLES (STUDY AREA)

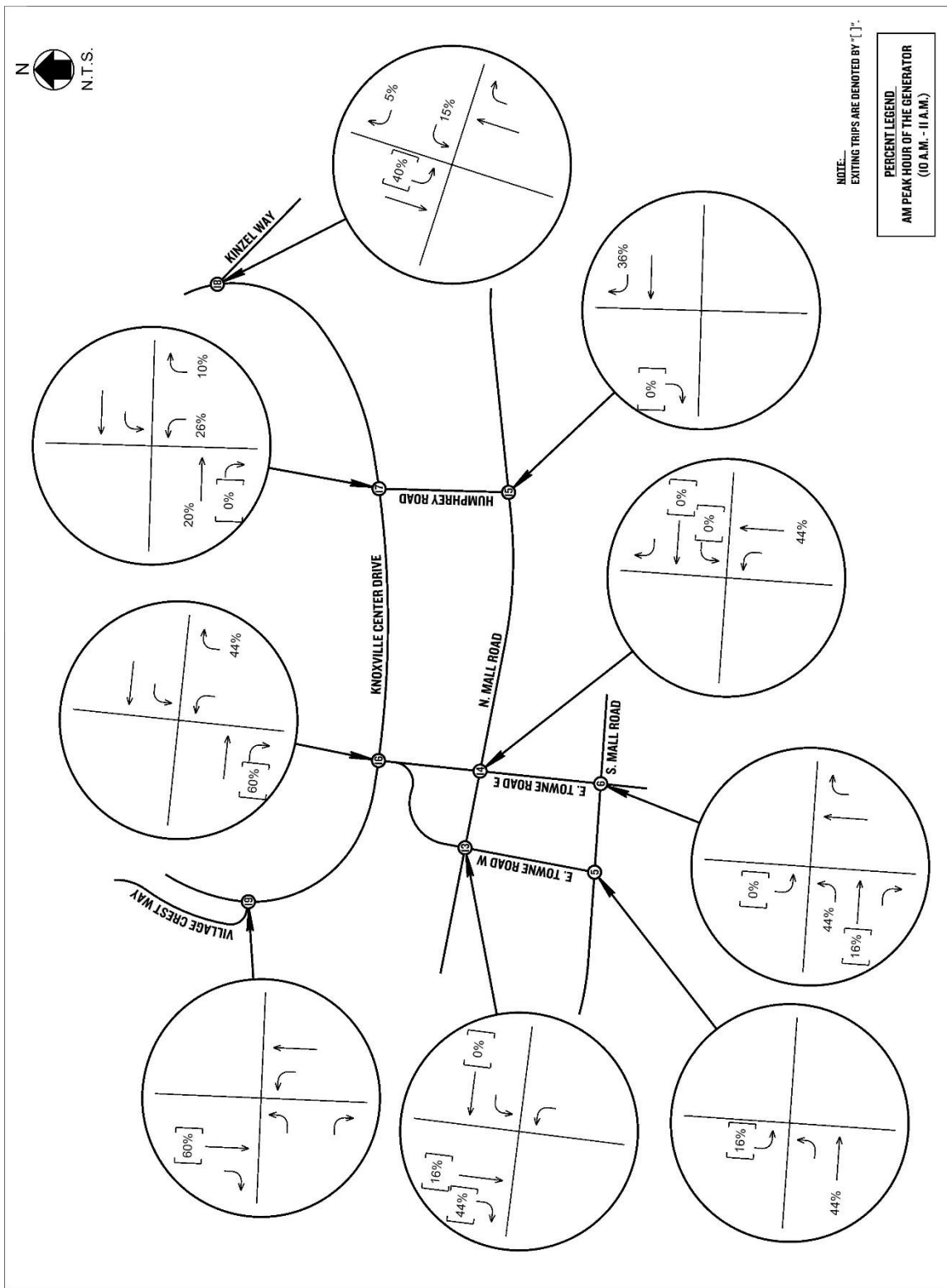


FIGURE G-4B
TRIP DISTRIBUTION FOR SERVICE VEHICLES (SITE VICINITY)

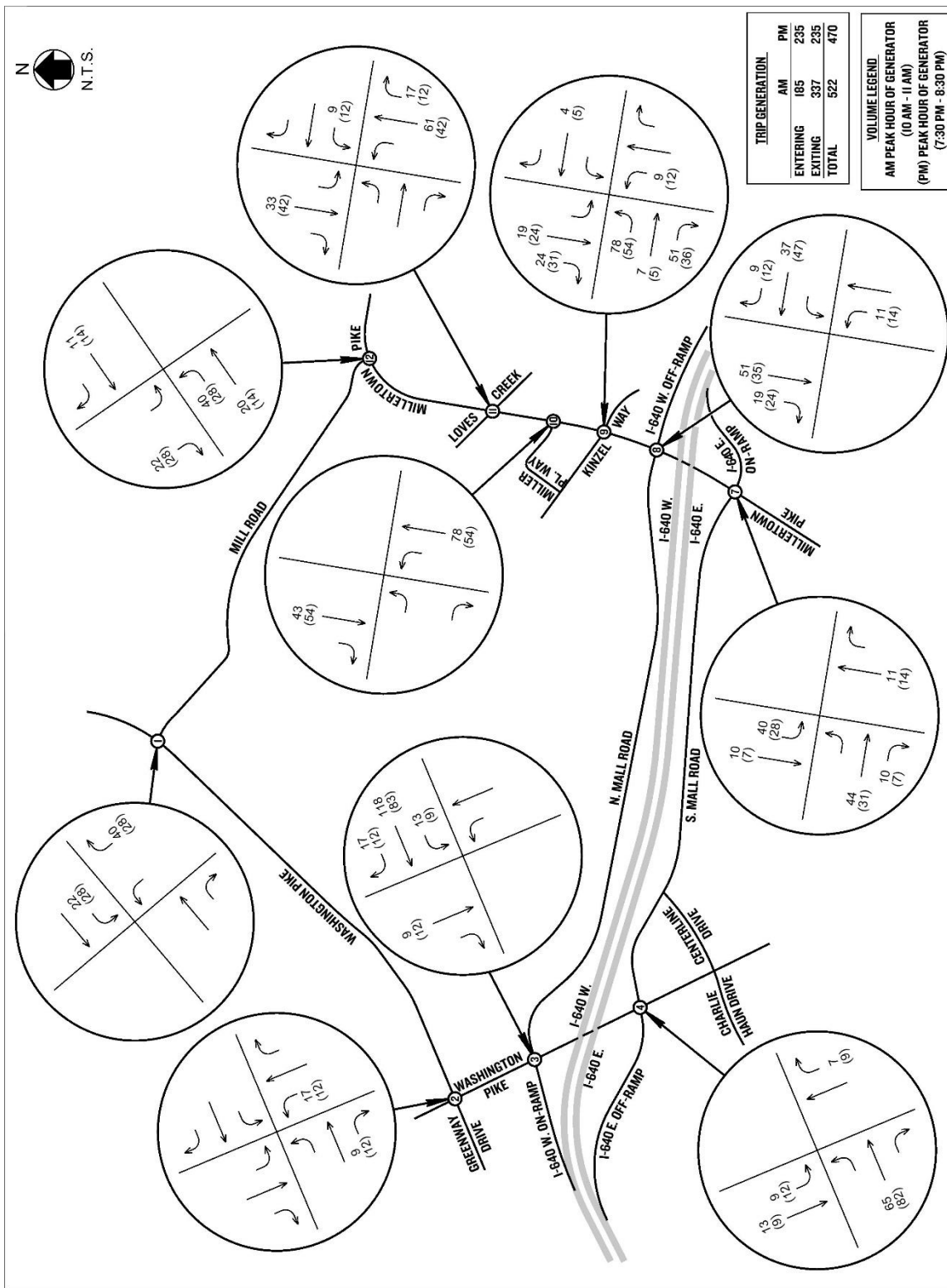


FIGURE G-5A
GENERATED TRIPS (STUDY AREA)

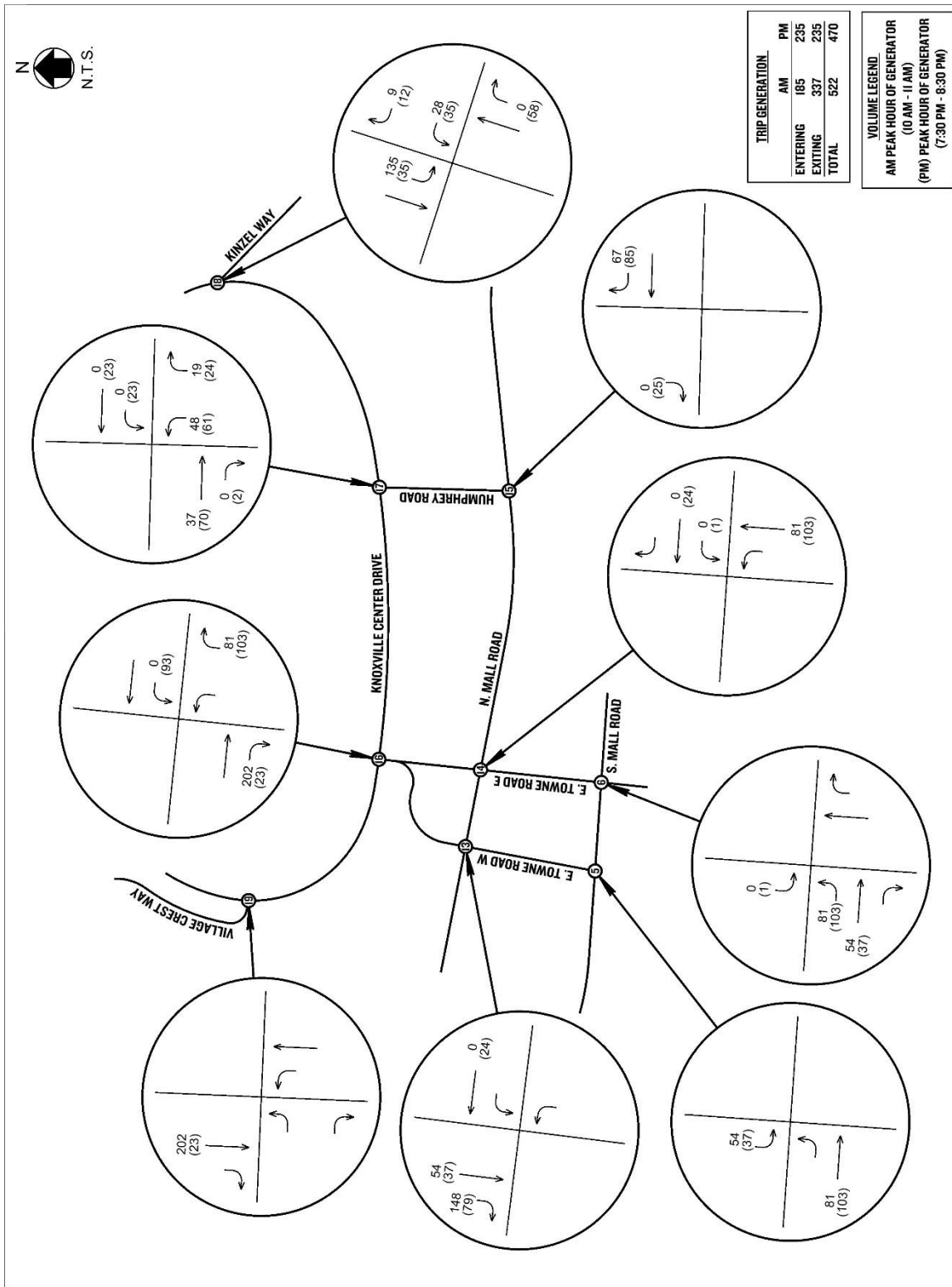


FIGURE G-5B
GENERATED TRIPS (SITE VICINITY)

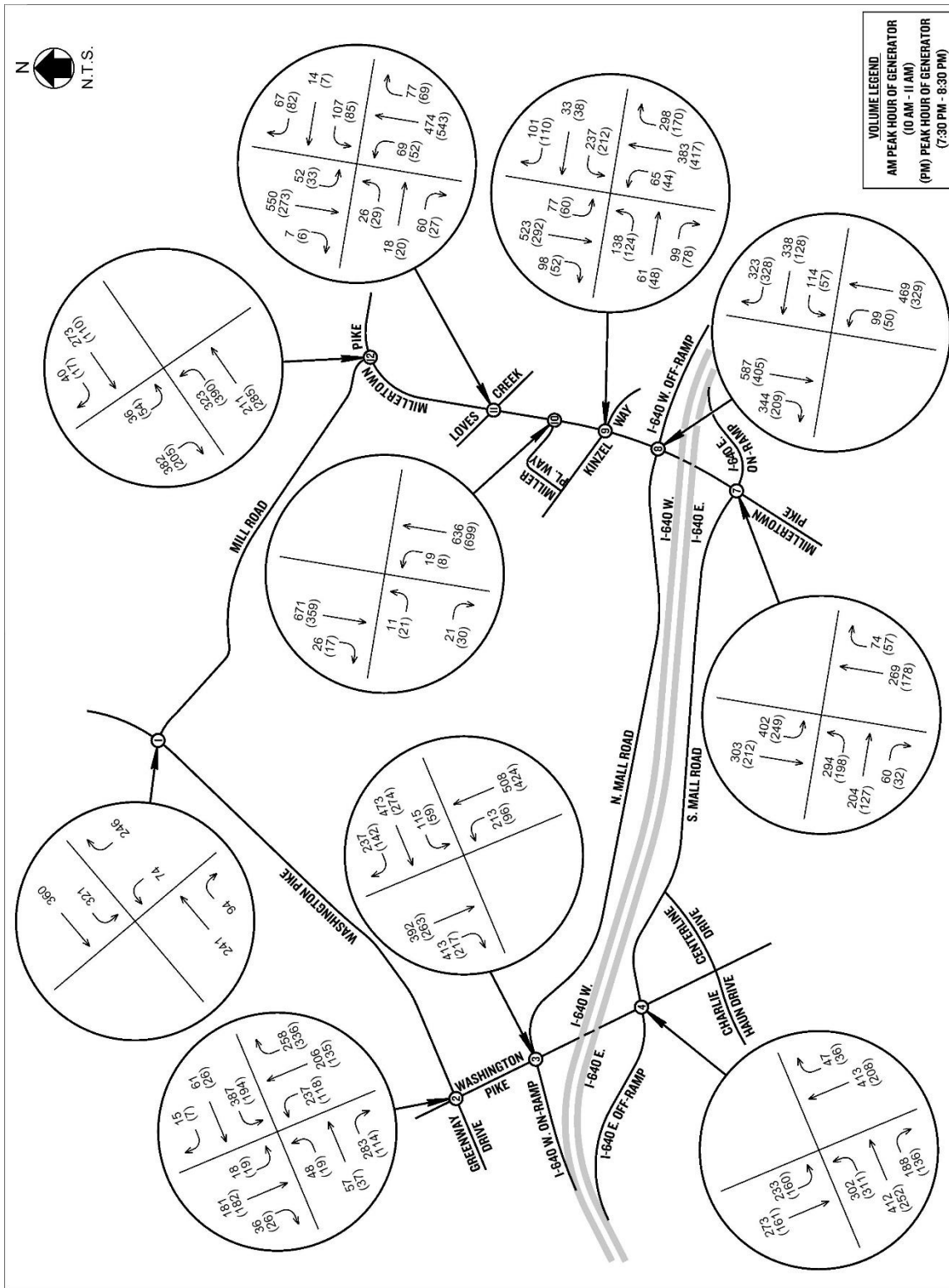


FIGURE G-6
 2022 COMBINED VOLUMES (STUDY AREA)

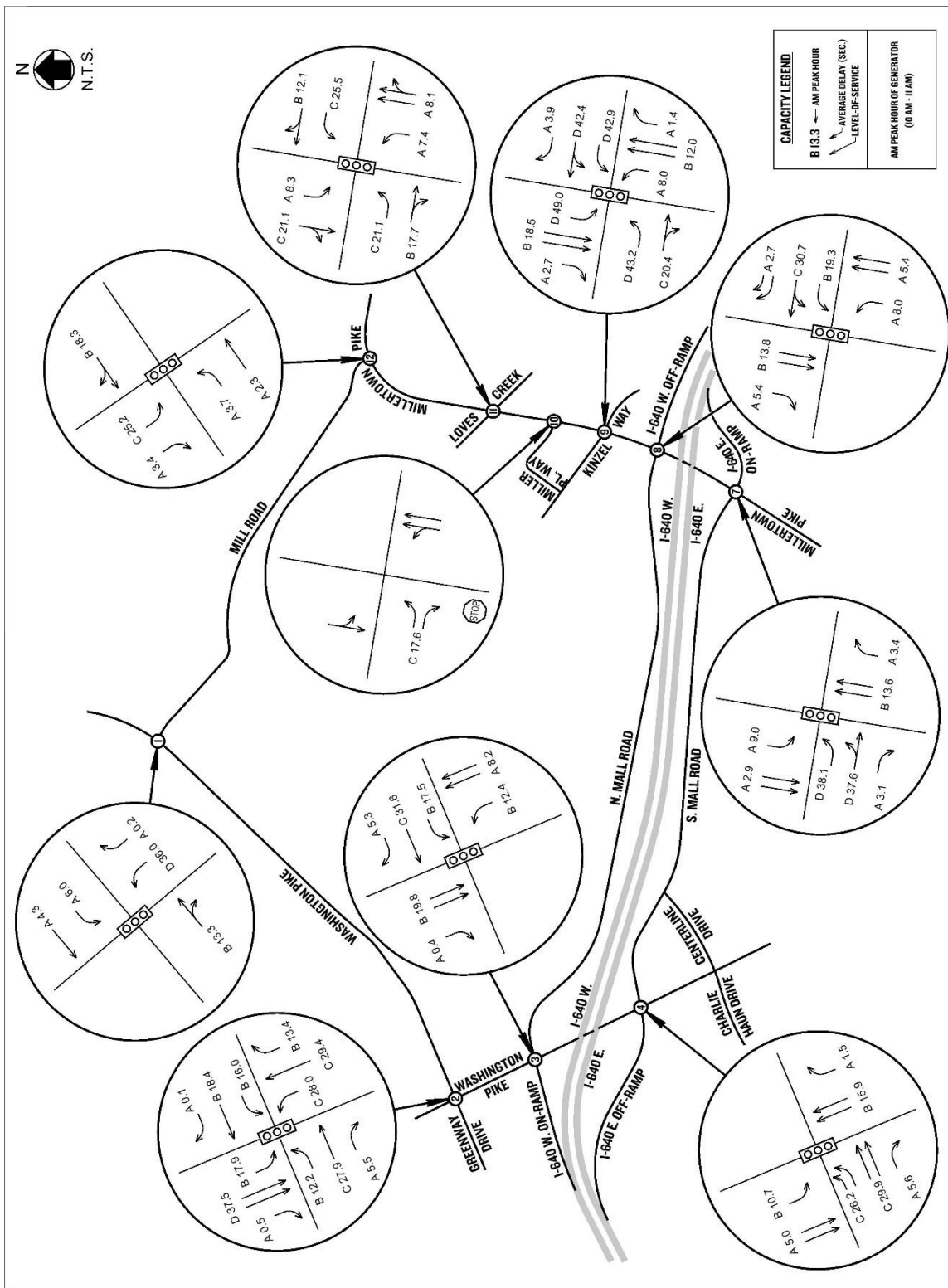


FIGURE G-7
2022 CAPACITY ANALYSIS RESULTS (STUDY AREA)

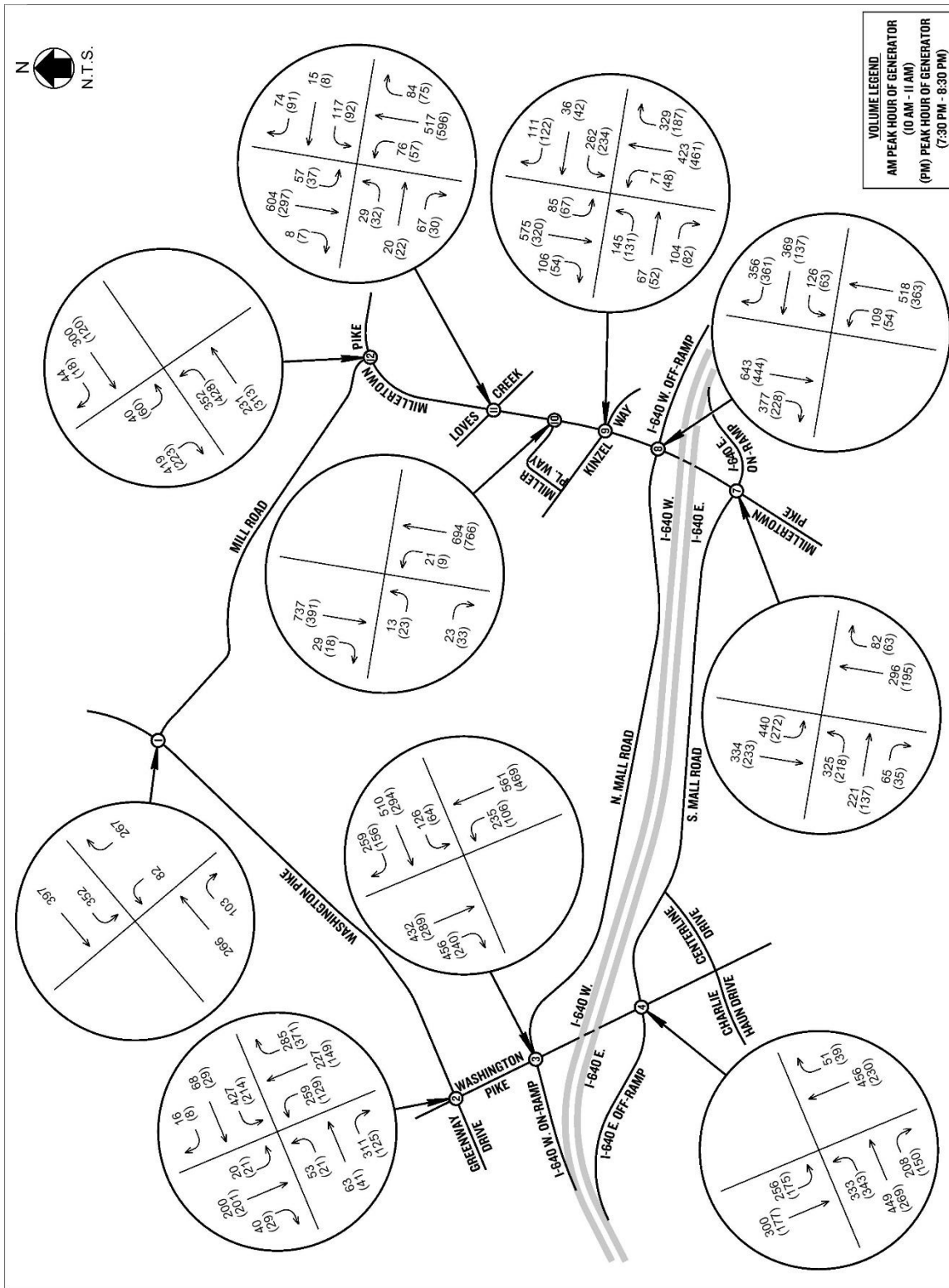
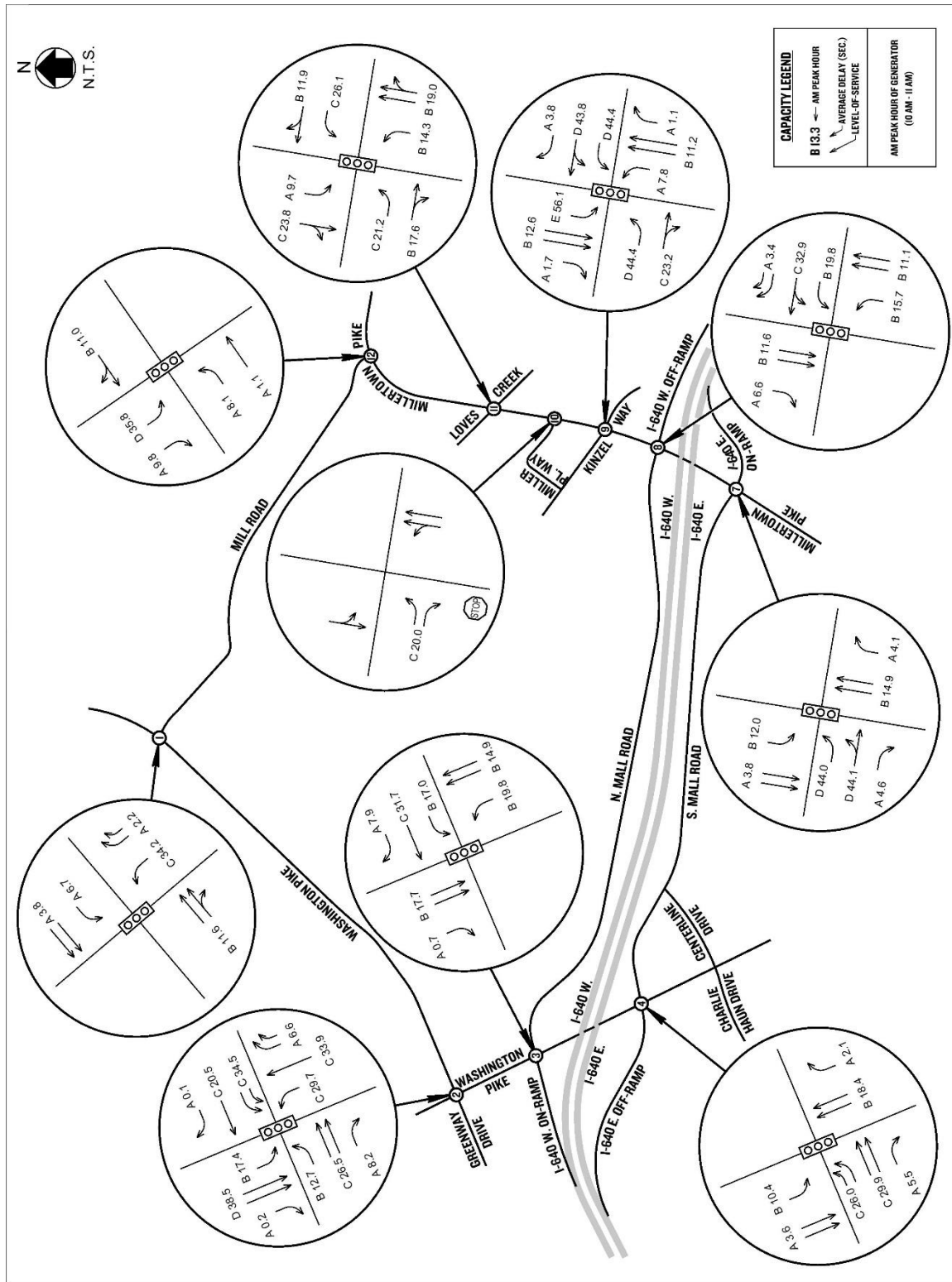


FIGURE G-9
 2027 COMBINED VOLUMES (STUDY AREA)



Lanes, Volumes, Timings
1: Mill Road & Washington Pike



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↕		↕	↕	↕	↕
Traffic Volume (vph)	241	94	321	360	74	246
Future Volume (vph)	241	94	321	360	74	246
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr't	0.962					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1792	0	1770	1863	1770	1583
Flt Permitted			0.420		0.950	
Satd. Flow (perm)	1792	0	782	1863	1770	1583
Satd. Flow (RTOR)	29					276
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Shared Lane Traffic (%)						
Lane Group Flow (vph)	377	0	361	404	83	276
Turn Type	NA		pm+pt	NA	Prot	Free
Protected Phases	2		1	6	4	
Permitted Phases			6			Free
Detector Phase	2		1	6	4	
Switch Phase						
Minimum Initial (s)	12.0		10.0	12.0	10.0	
Minimum Split (s)	19.0		17.0	19.0	17.0	
Total Split (s)	37.0		26.0	63.0	17.0	
Total Split (%)	46.3%		32.5%	78.8%	21.3%	
Maximum Green (s)	31.0		20.0	57.0	11.0	
Yellow Time (s)	4.0		4.0	4.0	4.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	6.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	Max		None	Max	None	
Act Effct Green (s)	39.7		57.5	59.0	10.4	76.1
Actuated g/C Ratio	0.52		0.76	0.78	0.14	1.00
v/c Ratio	0.40		0.49	0.28	0.35	0.17
Control Delay	13.3		6.0	4.3	36.0	0.2
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	13.3		6.0	4.3	36.0	0.2
LOS	B		A	A	D	A
Approach Delay	13.3			5.1	8.5	
Approach LOS	B			A	A	
Queue Length 50th (ft)	100		51	57	38	0
Queue Length 95th (ft)	185		84	94	79	0
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200		100	
Base Capacity (vph)	948		853	1443	258	1583
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	0.40		0.42	0.28	0.32	0.17

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 76.1	
Natural Cycle: 60	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.49	
Intersection Signal Delay: 8.0	Intersection LOS: A
Intersection Capacity Utilization 59.5%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Mill Road & Washington Pike



Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

Knoxville Center TIS
2022 Combined Peakof Generator - Improvements

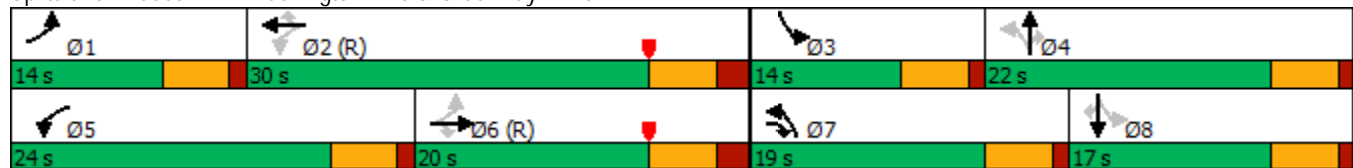


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	57	283	387	61	15	237	206	258	18	181	36
Future Volume (vph)	48	57	283	387	61	15	237	206	258	18	181	36
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	3539	1583
Flt Permitted	0.714			0.554			0.442			0.619		
Satd. Flow (perm)	1330	1863	1583	1032	1863	1583	823	1863	1583	1153	3539	1583
Satd. Flow (RTOR)			230			164			280			245
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	52	62	308	421	66	16	258	224	280	20	197	39
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	7	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	14.0	20.0	19.0	24.0	30.0	30.0	19.0	22.0	22.0	14.0	17.0	17.0
Total Split (%)	17.5%	25.0%	23.8%	30.0%	37.5%	37.5%	23.8%	27.5%	27.5%	17.5%	21.3%	21.3%
Maximum Green (s)	9.0	14.0	14.0	19.0	24.0	24.0	14.0	17.0	17.0	9.0	12.0	12.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	C-Max	None	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	28.7	20.1	39.1	43.1	34.1	34.1	26.9	22.5	22.5	14.9	8.9	8.9
Actuated g/C Ratio	0.36	0.25	0.49	0.54	0.43	0.43	0.34	0.28	0.28	0.19	0.11	0.11
v/c Ratio	0.10	0.13	0.35	0.59	0.08	0.02	0.60	0.43	0.43	0.08	0.50	0.10
Control Delay	12.2	27.9	5.5	16.0	18.4	0.1	28.0	29.4	13.4	17.9	37.5	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.2	27.9	5.5	16.0	18.4	0.1	28.0	29.4	13.4	17.9	37.5	0.5
LOS	B	C	A	B	B	A	C	C	B	B	D	A
Approach Delay		9.6			15.8			23.1			30.3	
Approach LOS		A			B			C			C	
Queue Length 50th (ft)	12	25	21	122	22	0	124	106	19	6	49	0
Queue Length 95th (ft)	31	60	73	211	53	0	182	186	112	19	78	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	335		170	160			150		75
Base Capacity (vph)	549	467	908	734	794	769	442	523	646	327	530	445
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.13	0.34	0.57	0.08	0.02	0.58	0.43	0.43	0.06	0.37	0.09

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.60	
Intersection Signal Delay: 19.2	Intersection LOS: B
Intersection Capacity Utilization 59.6%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 2: Washington Pike & Greenway Drive



Lanes, Volumes, Timings

Knoxville Center TIS

3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↕	↗	↙	↕			↕	↗
Traffic Volume (vph)	0	0	0	115	473	237	213	508	0	0	392	413
Future Volume (vph)	0	0	0	115	473	237	213	508	0	0	392	413
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1770	1863	1583	1770	3539	0	0	3539	1583
Flt Permitted				0.950			0.403					
Satd. Flow (perm)	0	0	0	1770	1863	1583	751	3539	0	0	3539	1583
Satd. Flow (RTOR)							210					388
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	121	498	249	224	535	0	0	413	435
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Free
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					Free
Detector Phase				4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0			10.0	
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0			19.0	
Total Split (s)				40.0	40.0	40.0	16.0	40.0			24.0	
Total Split (%)				50.0%	50.0%	50.0%	20.0%	50.0%			30.0%	
Maximum Green (s)				34.0	34.0	34.0	11.0	34.0			18.0	
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5			4.5	
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5			1.5	
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	
Total Lost Time (s)				6.0	6.0	6.0	5.0	6.0			6.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			2.0	
Recall Mode				None	None	None	None	C-Max			C-Max	
Act Effect Green (s)				27.6	27.6	27.6	41.4	40.4			25.8	80.0
Actuated g/C Ratio				0.34	0.34	0.34	0.52	0.50			0.32	1.00
v/c Ratio				0.20	0.78	0.36	0.44	0.30			0.36	0.27
Control Delay				17.5	31.6	5.3	12.4	8.2			19.8	0.4
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				17.5	31.6	5.3	12.4	8.2			19.8	0.4
LOS				B	C	A	B	A			B	A
Approach Delay					22.1			9.5			9.9	
Approach LOS					C			A			A	
Queue Length 50th (ft)				41	215	13	18	33			70	0
Queue Length 95th (ft)				69	291	53	131	111			128	0
Internal Link Dist (ft)		569			2042			923			673	
Turn Bay Length (ft)						475	105					100
Base Capacity (vph)				752	791	793	532	1787			1141	1583
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				0.16	0.63	0.31	0.42	0.30			0.36	0.27

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBTL, Start of Yellow

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 14.1

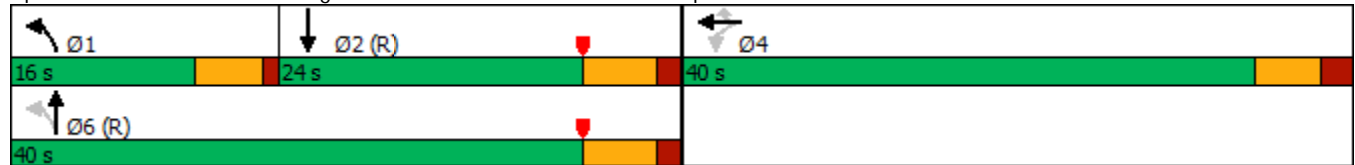
Intersection LOS: B

Intersection Capacity Utilization 61.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road



Lanes, Volumes, Timings

Knoxville Center TIS

4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road Combined Peak of Generator - Improvements

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	302	412	188	0	0	0	0	413	47	233	273	0
Future Volume (vph)	302	412	188	0	0	0	0	413	47	233	273	0
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	3539	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.478		
Satd. Flow (perm)	3433	3539	1583	0	0	0	0	3539	1583	890	3539	0
Satd. Flow (RTOR)			209							95		
Peak Hour Factor	0.90	0.78	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	336	528	209	0	0	0	0	459	52	259	303	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	29.0	29.0	29.0					30.0	30.0	21.0		
Total Split (%)	36.3%	36.3%	36.3%					37.5%	37.5%	26.3%		
Maximum Green (s)	24.0	24.0	24.0					24.0	24.0	16.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	19.2	19.2	19.2					36.6	36.6	45.8	49.8	
Actuated g/C Ratio	0.24	0.24	0.24					0.46	0.46	0.57	0.62	
v/c Ratio	0.41	0.62	0.39					0.28	0.07	0.43	0.14	
Control Delay	26.2	29.9	5.6					15.9	1.5	10.7	5.0	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	26.2	29.9	5.6					15.9	1.5	10.7	5.0	
LOS	C	C	A					B	A	B	A	
Approach Delay		24.0						14.5			7.6	
Approach LOS		C						B			A	
Queue Length 50th (ft)	73	125	0					69	0	34	22	
Queue Length 95th (ft)	96	129	45					136	8	81	28	
Internal Link Dist (ft)		2101			1667			717			923	
Turn Bay Length (ft)	400		265						150	120		
Base Capacity (vph)	1045	1078	627					1617	774	771	2546	
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	0.32	0.49	0.33					0.28	0.07	0.34	0.12	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Yellow

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 17.5

Intersection LOS: B

Intersection Capacity Utilization 61.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road



Lanes, Volumes, Timings

Knoxville Center TIS

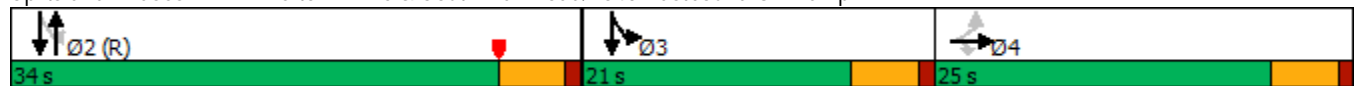
7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp Combined Peak of Generator - Improvements

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	294	204	60	0	0	0	0	269	74	402	303	0
Future Volume (vph)	294	204	60	0	0	0	0	269	74	402	303	0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.990								0.950		
Satd. Flow (prot)	1681	1752	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.990								0.575		
Satd. Flow (perm)	1681	1752	1583	0	0	0	0	3539	1583	1071	3539	0
Satd. Flow (RTOR)			95							95		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)	17%											
Lane Group Flow (vph)	262	273	65	0	0	0	0	289	80	432	326	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	25.0	25.0	25.0					34.0	34.0	21.0		
Total Split (%)	31.3%	31.3%	31.3%					42.5%	42.5%	26.3%		
Maximum Green (s)	20.0	20.0	20.0					29.0	29.0	16.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	16.4	16.4	16.4					38.6	38.6	48.6	53.6	
Actuated g/C Ratio	0.20	0.20	0.20					0.48	0.48	0.61	0.67	
v/c Ratio	0.76	0.76	0.16					0.17	0.10	0.59	0.14	
Control Delay	38.1	37.6	3.1					13.6	3.4	9.0	2.9	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	38.1	37.6	3.1					13.6	3.4	9.0	2.9	
LOS	D	D	A					B	A	A	A	
Approach Delay		34.1						11.4			6.4	
Approach LOS		C						B			A	
Queue Length 50th (ft)	136	143	3					38	0	36	13	
Queue Length 95th (ft)	214	222	m13					80	22	71	16	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	423	441	469					1709	813	871	2638	
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	0.62	0.62	0.14					0.17	0.10	0.50	0.12	

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 17.1	Intersection LOS: B
Intersection Capacity Utilization 69.1%	ICU Level of Service C
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

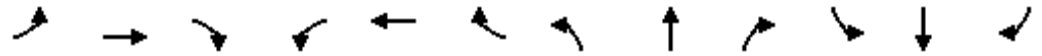
Splits and Phases: 7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp



Lanes, Volumes, Timings

Knoxville Center TIS

8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp Combined Peak of Generator - Improvements

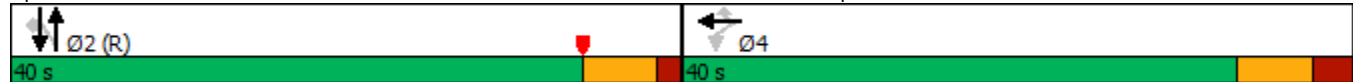


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↑			↑	↗
Traffic Volume (vph)	0	0	0	114	338	323	99	469	0	0	587	344
Future Volume (vph)	0	0	0	114	338	323	99	469	0	0	587	344
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.998		0.950					
Satd. Flow (prot)	0	0	0	1681	1766	2787	1770	3539	0	0	3539	1583
Flt Permitted				0.950	0.998		0.376					
Satd. Flow (perm)	0	0	0	1681	1766	2787	700	3539	0	0	3539	1583
Satd. Flow (RTOR)						359						335
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	0	114	389	359	110	521	0	0	652	382
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2			2	
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				40.0	40.0	40.0	40.0	40.0			40.0	40.0
Total Split (%)				50.0%	50.0%	50.0%	50.0%	50.0%			50.0%	50.0%
Maximum Green (s)				33.0	33.0	33.0	34.0	34.0			34.0	34.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)				7.0	7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)				25.0	25.0	25.0	42.0	42.0			42.0	42.0
Actuated g/C Ratio				0.31	0.31	0.31	0.52	0.52			0.52	0.52
v/c Ratio				0.22	0.71	0.32	0.30	0.28			0.35	0.39
Control Delay				19.3	30.7	2.7	8.0	5.4			13.8	5.4
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				19.3	30.7	2.7	8.0	5.4			13.8	5.4
LOS				B	C	A	A	A			B	A
Approach Delay					17.5			5.8			10.7	
Approach LOS					B			A			B	
Queue Length 50th (ft)				43	176	0	22	49			101	7
Queue Length 95th (ft)				71	236	26	m39	53			133	63
Internal Link Dist (ft)		1096			1137			650			484	
Turn Bay Length (ft)				450		800	95					
Base Capacity (vph)				693	728	1360	367	1858			1858	990
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				0.16	0.53	0.26	0.30	0.28			0.35	0.39

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 11.8	Intersection LOS: B
Intersection Capacity Utilization 69.1%	ICU Level of Service C
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp



Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way

Knoxville Center TIS
2022 Combined Peakof Generator - Improvements



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	138	61	99	237	33	101	65	383	298	77	523	98
Future Volume (vph)	138	61	99	237	33	101	65	383	298	77	523	98
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.900				0.850			0.850			0.850
Flt Protected	0.950			0.950	0.964		0.950			0.950		
Satd. Flow (prot)	1770	1676	0	1681	1706	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950	0.964		0.397			0.950		
Satd. Flow (perm)	1770	1676	0	1681	1706	1583	740	3539	1583	1770	3539	1583
Satd. Flow (RTOR)		108				106			314			103
Peak Hour Factor	0.79	0.95	0.78	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				43%								
Lane Group Flow (vph)	175	191	0	142	142	106	68	403	314	81	551	103
Turn Type	Split	NA		Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4		3	3	1	5	2	3	1	6	4
Permitted Phases						3	2		2			6
Detector Phase	4	4		3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0		16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	19.0	19.0		18.0	18.0	14.0	14.0	29.0	18.0	14.0	29.0	19.0
Total Split (%)	23.8%	23.8%		22.5%	22.5%	17.5%	17.5%	36.3%	22.5%	17.5%	36.3%	23.8%
Maximum Green (s)	14.0	14.0		13.0	13.0	9.0	9.0	24.0	13.0	9.0	24.0	14.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)	12.2	12.2		11.2	11.2	19.0	36.4	31.0	47.3	7.7	32.1	45.4
Actuated g/C Ratio	0.15	0.15		0.14	0.14	0.24	0.46	0.39	0.59	0.10	0.40	0.57
v/c Ratio	0.65	0.55		0.60	0.59	0.23	0.16	0.29	0.30	0.47	0.39	0.11
Control Delay	43.2	20.4		42.9	42.4	3.9	8.0	12.0	1.4	49.0	18.5	2.7
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.2	20.4		42.9	42.4	3.9	8.0	12.0	1.4	49.0	18.5	2.7
LOS	D	C		D	D	A	A	B	A	D	B	A
Approach Delay		31.3			32.1			7.4			19.7	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)	81	36		69	69	0	8	77	21	44	60	0
Queue Length 95th (ft)	124	98		128	128	19	22	58	0	m80	132	m21
Internal Link Dist (ft)		713			953			484			243	
Turn Bay Length (ft)	290			155		245	180		180	120		105
Base Capacity (vph)	309	382		273	277	479	469	1372	1091	199	1421	953
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.57	0.50		0.52	0.51	0.22	0.14	0.29	0.29	0.41	0.39	0.11

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	11	21	19	636	671	26
Future Vol, veh/h	11	21	19	636	671	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	23	21	699	737	29

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1144	752	766	0	-	0
Stage 1	752	-	-	-	-	-
Stage 2	392	-	-	-	-	-
Critical Hdwy	6.63	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	207	409	845	-	-	-
Stage 1	465	-	-	-	-	-
Stage 2	653	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	202	409	845	-	-	-
Mov Cap-2 Maneuver	202	-	-	-	-	-
Stage 1	453	-	-	-	-	-
Stage 2	653	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.6	0.3	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	845	-	202	409	-	-
HCM Lane V/C Ratio	0.025	-	0.06	0.056	-	-
HCM Control Delay (s)	9.4	-	24	14.3	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	0.2	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road

Knoxville Center TIS
2022 Combined Peakof Generator - Improvements

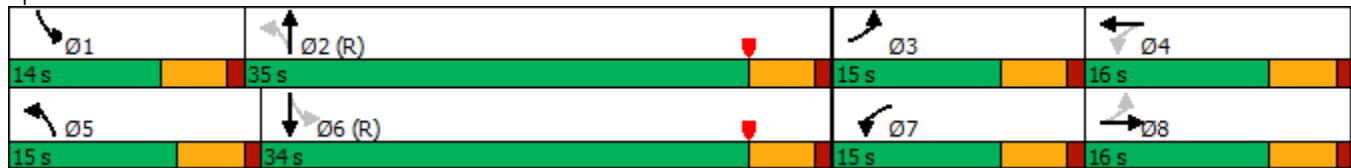


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	18	60	107	14	67	69	474	77	52	550	7
Future Volume (vph)	26	18	60	107	14	67	69	474	77	52	550	7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt		0.885			0.876			0.979			0.998	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1649	0	1770	1632	0	1770	3465	0	1770	1859	0
Flt Permitted	0.701			0.455			0.249			0.419		
Satd. Flow (perm)	1306	1649	0	848	1632	0	464	3465	0	780	1859	0
Satd. Flow (RTOR)		63			71			26			1	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	27	82	0	113	86	0	73	580	0	55	586	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	15.0	16.0		15.0	16.0		15.0	24.0		14.0	24.0	
Total Split (s)	15.0	16.0		15.0	16.0		15.0	35.0		14.0	34.0	
Total Split (%)	18.8%	20.0%		18.8%	20.0%		18.8%	43.8%		17.5%	42.5%	
Maximum Green (s)	10.0	11.0		10.0	11.0		10.0	30.0		9.0	29.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effect Green (s)	13.4	8.1		18.9	14.9		50.3	46.7		47.7	43.7	
Actuated g/C Ratio	0.17	0.10		0.24	0.19		0.63	0.58		0.60	0.55	
v/c Ratio	0.11	0.37		0.37	0.24		0.18	0.29		0.10	0.58	
Control Delay	21.1	17.7		25.5	12.1		7.4	8.1		8.3	21.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	21.1	17.7		25.5	12.1		7.4	8.1		8.3	21.1	
LOS	C	B		C	B		A	A		A	C	
Approach Delay		18.6			19.7			8.0			20.0	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)	10	9		43	5		7	42		10	227	
Queue Length 95th (ft)	26	47		78	44		m26	118		28	#440	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)				175			200			65		
Base Capacity (vph)	331	281		322	379		463	2032		597	1015	
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	0.08	0.29		0.35	0.23		0.16	0.29		0.09	0.58	













Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.58
 Intersection Signal Delay: 15.0 Intersection LOS: B
 Intersection Capacity Utilization 59.5% ICU Level of Service B
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: Millertown Pike & Loves Creek Road



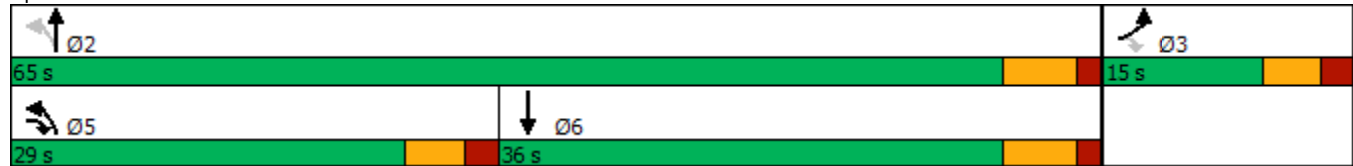
Lanes, Volumes, Timings
12: Millertown Pike & Mill Road

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	36	382	323	211	273	40
Future Volume (vph)	36	382	323	211	273	40
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.983	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1831	0
Flt Permitted	0.950		0.385			
Satd. Flow (perm)	1770	1583	717	1863	1831	0
Satd. Flow (RTOR)		396			11	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)						
Lane Group Flow (vph)	39	411	347	227	337	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	15.0	29.0	29.0	65.0	36.0	
Total Split (%)	18.8%	36.3%	36.3%	81.3%	45.0%	
Maximum Green (s)	9.5	23.5	23.5	59.0	30.0	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	8.9	19.0	39.5	43.7	18.0	
Actuated g/C Ratio	0.18	0.38	0.80	0.88	0.36	
v/c Ratio	0.12	0.48	0.39	0.14	0.50	
Control Delay	25.2	3.4	3.7	2.3	18.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	25.2	3.4	3.7	2.3	18.3	
LOS	C	A	A	A	B	
Approach Delay	5.3			3.1	18.3	
Approach LOS	A			A	B	
Queue Length 50th (ft)	8	2	0	0	59	
Queue Length 95th (ft)	43	42	68	45	199	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85				
Base Capacity (vph)	370	1109	1116	1773	1215	
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	0.11	0.37	0.31	0.13	0.28	

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 49.6	
Natural Cycle: 50	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.50	
Intersection Signal Delay: 7.6	Intersection LOS: A
Intersection Capacity Utilization 55.5%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 12: Millertown Pike & Mill Road







Lanes, Volumes, Timings
1: Mill Road & Washington Pike

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑	↑↑	↑	↑↑
Traffic Volume (vph)	266	103	352	397	82	267
Future Volume (vph)	266	103	352	397	82	267
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	0.88
Frt	0.958				0.850	
Flt Protected			0.950			0.950
Satd. Flow (prot)	3391	0	1770	3539	1770	2787
Flt Permitted			0.435			0.950
Satd. Flow (perm)	3391	0	810	3539	1770	2787
Satd. Flow (RTOR)	71					300
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Shared Lane Traffic (%)						
Lane Group Flow (vph)	415	0	396	446	92	300
Turn Type	NA	pm+pt		NA	Prot	pm+ov
Protected Phases	2	1		6	4	1
Permitted Phases			6			4
Detector Phase	2	1		6	4	1
Switch Phase						
Minimum Initial (s)	12.0	10.0		12.0	10.0	10.0
Minimum Split (s)	19.0	17.0		19.0	17.0	17.0
Total Split (s)	28.0	32.0		60.0	20.0	32.0
Total Split (%)	35.0%	40.0%		75.0%	25.0%	40.0%
Maximum Green (s)	22.0	26.0		54.0	14.0	26.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0
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)	6.0	6.0		6.0	6.0	6.0
Lead/Lag	Lag	Lead				Lead
Lead-Lag Optimize?	Yes	Yes				Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Recall Mode	Max	None		Max	None	None
Act Effect Green (s)	35.4	54.5		56.0	10.8	26.0
Actuated g/C Ratio	0.48	0.74		0.76	0.15	0.35
v/c Ratio	0.25	0.51		0.17	0.36	0.25
Control Delay	11.6	6.7		3.8	34.2	2.2
Queue Delay	0.0	0.0		0.0	0.0	0.0
Total Delay	11.6	6.7		3.8	34.2	2.2
LOS	B	A		A	C	A
Approach Delay	11.6			5.1	9.7	
Approach LOS	B			A	A	
Queue Length 50th (ft)	47	57		30	41	0
Queue Length 95th (ft)	94	105		50	82	19
Internal Link Dist (ft)	924			775	732	
Turn Bay Length (ft)			200			100
Base Capacity (vph)	1667	943		2696	340	1625
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	0.25	0.42		0.17	0.27	0.18

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 73.5	
Natural Cycle: 55	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.51	
Intersection Signal Delay: 7.9	Intersection LOS: A
Intersection Capacity Utilization 53.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Mill Road & Washington Pike

 Ø1 32 s	 Ø2 28 s	 Ø4 20 s
 Ø6 60 s		

Lanes, Volumes, Timings
2: Washington Pike & Greenway Drive

Knoxville Center TIS
2027 Combined Peak of Generator - Improvements

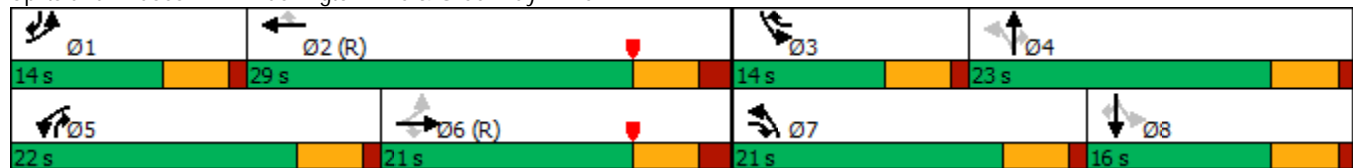


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	53	63	311	427	68	16	259	227	285	20	200	40
Future Volume (vph)	53	63	311	427	68	16	259	227	285	20	200	40
Lane Util. Factor	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	3433	1863	1583	1770	1863	2787	1770	3539	1583
Flt Permitted	0.709			0.950			0.424			0.606		
Satd. Flow (perm)	1321	3539	1583	3433	1863	1583	790	1863	2787	1129	3539	1583
Satd. Flow (RTOR)			164			164			310			245
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	58	68	338	464	74	17	282	247	310	22	217	43
Turn Type	pm+pt	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	1	6	7	5	2	3	7	4	5	3	8	1
Permitted Phases	6		6			2	4		4	8		8
Detector Phase	1	6	7	5	2	3	7	4	5	3	8	1
Switch Phase												
Minimum Initial (s)	4.0	10.0	6.0	4.0	10.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0
Minimum Split (s)	14.0	19.0	14.0	14.0	19.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	14.0	21.0	21.0	22.0	29.0	14.0	21.0	23.0	22.0	14.0	16.0	14.0
Total Split (%)	17.5%	26.3%	26.3%	27.5%	36.3%	17.5%	26.3%	28.8%	27.5%	17.5%	20.0%	17.5%
Maximum Green (s)	9.0	15.0	16.0	17.0	23.0	9.0	16.0	18.0	17.0	9.0	11.0	9.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	4.0	2.0	2.0	4.0
Recall Mode	None	C-Max	None	None	C-Max	None	None	None	None	None	None	None
Act Effect Green (s)	28.3	19.5	39.8	16.2	30.2	42.2	28.4	21.7	42.9	15.1	9.0	21.8
Actuated g/C Ratio	0.35	0.24	0.50	0.20	0.38	0.53	0.36	0.27	0.54	0.19	0.11	0.27
v/c Ratio	0.11	0.08	0.39	0.67	0.11	0.02	0.62	0.49	0.19	0.08	0.54	0.07
Control Delay	12.7	26.5	8.2	34.5	20.5	0.1	29.7	33.9	6.6	17.4	38.5	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.7	26.5	8.2	34.5	20.5	0.1	29.7	33.9	6.6	17.4	38.5	0.2
LOS	B	C	A	C	C	A	C	C	A	B	D	A
Approach Delay		11.5			31.6			22.4			31.0	
Approach LOS		B			C			C			C	
Queue Length 50th (ft)	14	14	49	108	25	0	132	130	3	7	54	0
Queue Length 95th (ft)	34	32	110	158	59	0	190	201	44	20	87	0
Internal Link Dist (ft)		1031			479			673			229	
Turn Bay Length (ft)	80		380	300		170	160		160	150		75
Base Capacity (vph)	537	861	899	739	702	965	476	505	1671	326	486	630
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.08	0.38	0.63	0.11	0.02	0.59	0.49	0.19	0.07	0.45	0.07

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 13 (16%), Referenced to phase 2:WBT and 6:EBTL, Start of Yellow	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 23.6	Intersection LOS: C
Intersection Capacity Utilization 52.1%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Washington Pike & Greenway Drive



Lanes, Volumes, Timings

Knoxville Center TIS

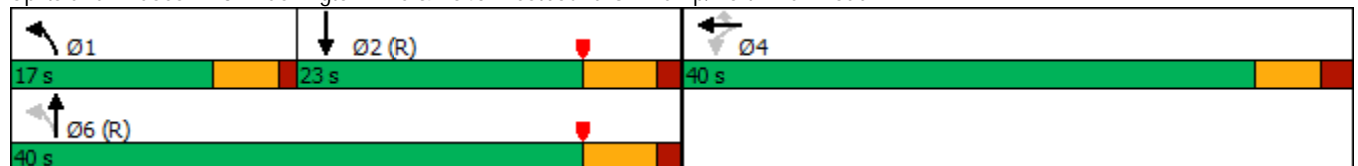
3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↕	↗	↙	↕			↕	↗
Traffic Volume (vph)	0	0	0	126	510	259	235	561	0	0	432	456
Future Volume (vph)	0	0	0	126	510	259	235	561	0	0	432	456
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1770	1863	1583	1770	3539	0	0	3539	1583
Flt Permitted				0.950			0.360					
Satd. Flow (perm)	0	0	0	1770	1863	1583	671	3539	0	0	3539	1583
Satd. Flow (RTOR)						176						358
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	133	537	273	247	591	0	0	455	480
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Free
Protected Phases					4		1	6				2
Permitted Phases				4		4	6					Free
Detector Phase				4	4	4	1	6				2
Switch Phase												
Minimum Initial (s)				6.0	6.0	6.0	6.0	10.0				10.0
Minimum Split (s)				16.0	16.0	16.0	14.0	19.0				19.0
Total Split (s)				40.0	40.0	40.0	17.0	40.0				23.0
Total Split (%)				50.0%	50.0%	50.0%	21.3%	50.0%				28.8%
Maximum Green (s)				34.0	34.0	34.0	12.0	34.0				17.0
Yellow Time (s)				4.0	4.0	4.0	4.0	4.5				4.5
All-Red Time (s)				2.0	2.0	2.0	1.0	1.5				1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0				0.0
Total Lost Time (s)				6.0	6.0	6.0	5.0	6.0				6.0
Lead/Lag							Lead					Lag
Lead-Lag Optimize?							Yes					Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0				2.0
Recall Mode				None	None	None	None	C-Max				C-Max
Act Effect Green (s)				29.0	29.0	29.0	40.0	39.0				23.8
Actuated g/C Ratio				0.36	0.36	0.36	0.50	0.49				0.30
v/c Ratio				0.21	0.80	0.40	0.52	0.34				0.43
Control Delay				17.0	31.7	7.9	19.8	14.9				17.7
Queue Delay				0.0	0.0	0.0	0.0	0.0				0.0
Total Delay				17.0	31.7	7.9	19.8	14.9				17.7
LOS				B	C	A	B	B				B
Approach Delay					22.8			16.4				8.9
Approach LOS					C			B				A
Queue Length 50th (ft)				44	228	31	42	37				74
Queue Length 95th (ft)				75	322	78	121	130				140
Internal Link Dist (ft)		569			2042			923				673
Turn Bay Length (ft)						475	105					100
Base Capacity (vph)				752	791	773	500	1725				1053
Starvation Cap Reductn				0	0	0	0	0				0
Spillback Cap Reductn				0	0	0	0	0				0
Storage Cap Reductn				0	0	0	0	0				0
Reduced v/c Ratio				0.18	0.68	0.35	0.49	0.34				0.43

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 9 (11%), Referenced to phase 2:SBT and 6:NBTL, Start of Yellow	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 16.0	Intersection LOS: B
Intersection Capacity Utilization 66.0%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 3: Washington Pike & I-640 Westbound On-Ramp/North Mall Road



Lanes, Volumes, Timings

Knoxville Center TIS

4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road Combined Peak of Generator - Improvements

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	333	449	208	0	0	0	0	456	51	256	300	0
Future Volume (vph)	333	449	208	0	0	0	0	456	51	256	300	0
Lane Util. Factor	0.97	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	3539	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950									0.437		
Satd. Flow (perm)	3433	3539	1583	0	0	0	0	3539	1583	814	3539	0
Satd. Flow (RTOR)			231							95		
Peak Hour Factor	0.90	0.78	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	370	576	231	0	0	0	0	507	57	284	333	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					10.0	10.0	6.0		
Minimum Split (s)	16.0	16.0	16.0					20.0	20.0	15.0		
Total Split (s)	29.0	29.0	29.0					29.0	29.0	22.0		
Total Split (%)	36.3%	36.3%	36.3%					36.3%	36.3%	27.5%		
Maximum Green (s)	24.0	24.0	24.0					23.0	23.0	17.0		
Yellow Time (s)	4.0	4.0	4.0					4.5	4.5	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.5	1.5	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					6.0	6.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	3.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	20.1	20.1	20.1					33.8	33.8	44.9	48.9	
Actuated g/C Ratio	0.25	0.25	0.25					0.42	0.42	0.56	0.61	
v/c Ratio	0.43	0.65	0.41					0.34	0.08	0.49	0.15	
Control Delay	26.0	29.9	5.5					18.4	2.1	10.4	3.6	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	26.0	29.9	5.5					18.4	2.1	10.4	3.6	
LOS	C	C	A					B	A	B	A	
Approach Delay		23.9						16.8			6.7	
Approach LOS		C						B			A	
Queue Length 50th (ft)	79	134	0					86	0	40	17	
Queue Length 95th (ft)	109	146	48					156	11	115	12	
Internal Link Dist (ft)		2101			1667			717			923	
Turn Bay Length (ft)	400		265						150	120		
Base Capacity (vph)	1032	1064	637					1495	723	730	2468	
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	0.36	0.54	0.36					0.34	0.08	0.39	0.13	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 19 (24%), Referenced to phase 2:NBSB, Start of Yellow

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 17.7

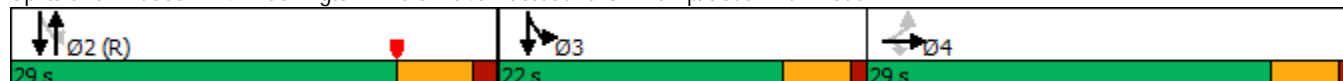
Intersection LOS: B

Intersection Capacity Utilization 66.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 4: Washington Pike & I-640 Eastbound Off-Ramp/South Mall Road



Lanes, Volumes, Timings

Knoxville Center TIS

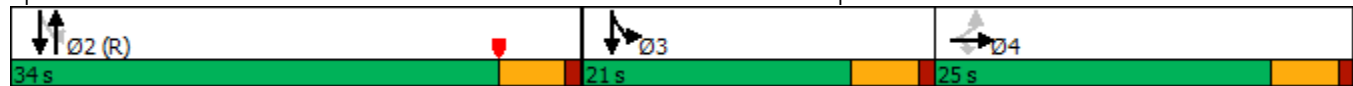
7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp Combined Peak of Generator - Improvements

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	325	221	65	0	0	0	0	296	82	440	334	0
Future Volume (vph)	325	221	65	0	0	0	0	296	82	440	334	0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.990								0.950		
Satd. Flow (prot)	1681	1752	1583	0	0	0	0	3539	1583	1770	3539	0
Flt Permitted	0.950	0.990								0.559		
Satd. Flow (perm)	1681	1752	1583	0	0	0	0	3539	1583	1041	3539	0
Satd. Flow (RTOR)			95							95		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)	18%											
Lane Group Flow (vph)	286	301	70	0	0	0	0	318	88	473	359	0
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						2		3	2 3	
Permitted Phases	4		4						2	2 3		
Detector Phase	4	4	4					2	2	3	2 3	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0					25.0	25.0	8.0		
Minimum Split (s)	16.0	16.0	16.0					34.0	34.0	16.0		
Total Split (s)	25.0	25.0	25.0					34.0	34.0	21.0		
Total Split (%)	31.3%	31.3%	31.3%					42.5%	42.5%	26.3%		
Maximum Green (s)	20.0	20.0	20.0					29.0	29.0	16.0		
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0					1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0	0.0					0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0					5.0	5.0	5.0		
Lead/Lag	Lag	Lag	Lag							Lead		
Lead-Lag Optimize?	Yes	Yes	Yes							Yes		
Vehicle Extension (s)	2.0	2.0	2.0					3.0	3.0	2.0		
Recall Mode	None	None	None					C-Max	C-Max	None		
Act Effect Green (s)	17.3	17.3	17.3					36.7	36.7	47.7	52.7	
Actuated g/C Ratio	0.22	0.22	0.22					0.46	0.46	0.60	0.66	
v/c Ratio	0.79	0.80	0.17					0.20	0.11	0.66	0.15	
Control Delay	44.0	44.1	4.6					14.9	4.1	12.0	3.8	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	44.0	44.1	4.6					14.9	4.1	12.0	3.8	
LOS	D	D	A					B	A	B	A	
Approach Delay		39.8						12.6			8.5	
Approach LOS		D						B			A	
Queue Length 50th (ft)	118	125	0					46	0	66	25	
Queue Length 95th (ft)	#198	#206	m12					87	26	88	32	
Internal Link Dist (ft)		1517			348			309			650	
Turn Bay Length (ft)			230						250	175		
Base Capacity (vph)	426	444	472					1623	777	831	2552	
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	0.67	0.68	0.15					0.20	0.11	0.57	0.14	

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 78 (98%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.80
 Intersection Signal Delay: 20.2 Intersection LOS: C
 Intersection Capacity Utilization 72.5% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Millertown Pike & South Mall Road/I-640 Eastbound On-Ramp



Lanes, Volumes, Timings

Knoxville Center TIS

8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp Combined Peak of Generator - Improvements

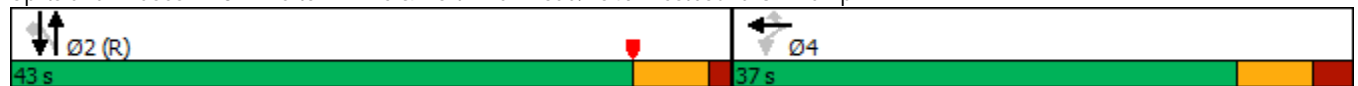


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↑↑			↑↑	↙
Traffic Volume (vph)	0	0	0	126	369	356	109	518	0	0	643	377
Future Volume (vph)	0	0	0	126	369	356	109	518	0	0	643	377
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.998		0.950					
Satd. Flow (prot)	0	0	0	1681	1766	2787	1770	3539	0	0	3539	1583
Flt Permitted				0.950	0.998		0.342					
Satd. Flow (perm)	0	0	0	1681	1766	2787	637	3539	0	0	3539	1583
Satd. Flow (RTOR)						377						263
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	0	126	424	396	121	576	0	0	714	419
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					4			2				2
Permitted Phases				4		4	2					2
Detector Phase				4	4	4	2	2				2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	15.0	15.0			15.0	15.0
Minimum Split (s)				21.0	21.0	21.0	25.0	25.0			25.0	25.0
Total Split (s)				37.0	37.0	37.0	43.0	43.0			43.0	43.0
Total Split (%)				46.3%	46.3%	46.3%	53.8%	53.8%			53.8%	53.8%
Maximum Green (s)				30.0	30.0	30.0	37.0	37.0			37.0	37.0
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				2.5	2.5	2.5	1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)				7.0	7.0	7.0	6.0	6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effect Green (s)				25.5	25.5	25.5	41.5	41.5			41.5	41.5
Actuated g/C Ratio				0.32	0.32	0.32	0.52	0.52			0.52	0.52
v/c Ratio				0.24	0.75	0.35	0.37	0.31			0.39	0.44
Control Delay				19.8	32.9	3.4	15.7	11.1			11.6	6.6
Queue Delay				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay				19.8	32.9	3.4	15.7	11.1			11.6	6.6
LOS				B	C	A	B	B			B	A
Approach Delay					18.8			11.9			9.7	
Approach LOS					B			B			A	
Queue Length 50th (ft)				46	190	3	55	135			80	14
Queue Length 95th (ft)				83	282	32	m98	116			107	68
Internal Link Dist (ft)		1096			1137			650			484	
Turn Bay Length (ft)				450		800	95					
Base Capacity (vph)				630	662	1280	330	1835			1835	947
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				0.20	0.64	0.31	0.37	0.31			0.39	0.44

Intersection Summary
























Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 14 (18%), Referenced to phase 2:NBSB, Start of Yellow	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.75	
Intersection Signal Delay: 13.4	Intersection LOS: B
Intersection Capacity Utilization 72.5%	ICU Level of Service C
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 8: Millertown Pike & North Mall Road/I-640 Westbound Off-Ramp



Lanes, Volumes, Timings
9: Millertown Pike & Kinzel Way







Knoxville Center TIS
2027 Combined Peak of Generator - Improvements

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	67	104	262	36	111	71	423	329	85	575	106
Future Volume (vph)	145	67	104	262	36	111	71	423	329	85	575	106
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.902				0.850			0.850			0.850
Flt Protected	0.950			0.950	0.963		0.950			0.950		
Satd. Flow (prot)	1770	1680	0	1681	1704	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950	0.963		0.358			0.950		
Satd. Flow (perm)	1770	1680	0	1681	1704	1583	667	3539	1583	1770	3539	1583
Satd. Flow (RTOR)		102				117			346			112
Peak Hour Factor	0.79	0.95	0.78	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				43%								
Lane Group Flow (vph)	184	204	0	157	157	117	75	445	346	89	605	112
Turn Type	Split	NA		Split	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4		3	3	1	5	2	3	1	6	4
Permitted Phases						3	2		2			6
Detector Phase	4	4		3	3	1	5	2	3	1	6	4
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	6.0	6.0	20.0	7.0	6.0	20.0	7.0
Minimum Split (s)	16.0	16.0		16.0	16.0	14.0	14.0	29.0	16.0	14.0	29.0	16.0
Total Split (s)	19.0	19.0		18.0	18.0	14.0	14.0	29.0	18.0	14.0	29.0	19.0
Total Split (%)	23.8%	23.8%		22.5%	22.5%	17.5%	17.5%	36.3%	22.5%	17.5%	36.3%	23.8%
Maximum Green (s)	14.0	14.0		13.0	13.0	9.0	9.0	24.0	13.0	9.0	24.0	14.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	None
Act Effect Green (s)	12.4	12.4		11.7	11.7	19.5	35.9	30.3	47.0	7.9	31.4	44.8
Actuated g/C Ratio	0.16	0.16		0.15	0.15	0.24	0.45	0.38	0.59	0.10	0.39	0.56
v/c Ratio	0.67	0.59		0.64	0.63	0.25	0.19	0.33	0.32	0.51	0.44	0.12
Control Delay	44.4	23.2		44.4	43.8	3.8	7.8	11.2	1.1	56.1	12.6	1.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.4	23.2		44.4	43.8	3.8	7.8	11.2	1.1	56.1	12.6	1.2
LOS	D	C		D	D	A	A	B	A	E	B	A
Approach Delay		33.3			33.2			6.9			15.8	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)	86	45		76	76	0	10	43	0	40	90	4
Queue Length 95th (ft)	129	111		141	140	20	25	67	0	m79	99	m1
Internal Link Dist (ft)		713			953			484			243	
Turn Bay Length (ft)	290			155		245	180		180	120		105
Base Capacity (vph)	309	378		273	276	495	437	1341	1093	199	1390	945
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.54		0.58	0.57	0.24	0.17	0.33	0.32	0.45	0.44	0.12

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 5 (6%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.67
 Intersection Signal Delay: 18.4
 Intersection LOS: B
 Intersection Capacity Utilization 56.4%
 ICU Level of Service B
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Millertown Pike & Kinzel Way

 Ø1 14 s	 Ø2 (R) 29 s	 Ø3 18 s	 Ø4 19 s
 Ø5 14 s	 Ø6 (R) 29 s		

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↙	↗	↙	↑↑	↑	
Traffic Vol, veh/h	13	23	21	694	737	29
Future Vol, veh/h	13	23	21	694	737	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	35	0	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	25	23	763	810	32























Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1254	826	842	0	-	0
Stage 1	826	-	-	-	-	-
Stage 2	428	-	-	-	-	-
Critical Hdwy	6.63	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	176	371	792	-	-	-
Stage 1	429	-	-	-	-	-
Stage 2	626	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	171	371	792	-	-	-
Mov Cap-2 Maneuver	171	-	-	-	-	-
Stage 1	417	-	-	-	-	-
Stage 2	626	-	-	-	-	-

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













Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	792	-	171	371	-	-
HCM Lane V/C Ratio	0.029	-	0.084	0.068	-	-
HCM Control Delay (s)	9.7	-	28	15.4	-	-
HCM Lane LOS	A	-	D	C	-	-
HCM 95th %tile Q(veh)	0.1	-	0.3	0.2	-	-

Lanes, Volumes, Timings
11: Millertown Pike & Loves Creek Road

Knoxville Center TIS
2027 Combined Peak of Generator - Improvements

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	20	67	117	15	74	76	517	84	57	604	8
Future Volume (vph)	29	20	67	117	15	74	76	517	84	57	604	8
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt		0.884			0.876			0.979				0.998
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1647	0	1770	1632	0	1770	3465	0	1770	1859	0
Flt Permitted	0.696			0.451			0.199			0.389		
Satd. Flow (perm)	1296	1647	0	840	1632	0	371	3465	0	725	1859	0
Satd. Flow (RTOR)		71			78			26			1	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	31	92	0	123	94	0	80	632	0	60	644	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	15.0		6.0	15.0	
Minimum Split (s)	15.0	16.0		15.0	16.0		15.0	24.0		14.0	24.0	
Total Split (s)	15.0	16.0		15.0	16.0		15.0	35.0		14.0	34.0	
Total Split (%)	18.8%	20.0%		18.8%	20.0%		18.8%	43.8%		17.5%	42.5%	
Maximum Green (s)	10.0	11.0		10.0	11.0		10.0	30.0		9.0	29.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	3.0		2.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effect Green (s)	13.5	8.1		19.0	14.9		50.2	46.5		47.4	43.4	
Actuated g/C Ratio	0.17	0.10		0.24	0.19		0.63	0.58		0.59	0.54	
v/c Ratio	0.12	0.40		0.40	0.26		0.22	0.31		0.12	0.64	
Control Delay	21.2	17.6		26.1	11.9		14.3	19.0		9.7	23.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	21.2	17.6		26.1	11.9		14.3	19.0		9.7	23.8	
LOS	C	B		C	B		B	B		A	C	
Approach Delay		18.5			19.9			18.5			22.6	
Approach LOS		B			B			B			C	
Queue Length 50th (ft)	11	10		47	6		28	122		10	217	
Queue Length 95th (ft)	29	50		84	47		m54	167		m33	#524	
Internal Link Dist (ft)		485			668			502			873	
Turn Bay Length (ft)				175			200			65		
Base Capacity (vph)	331	287		322	385		413	2024		566	1008	
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	0.09	0.32		0.38	0.24		0.19	0.31		0.11	0.64	

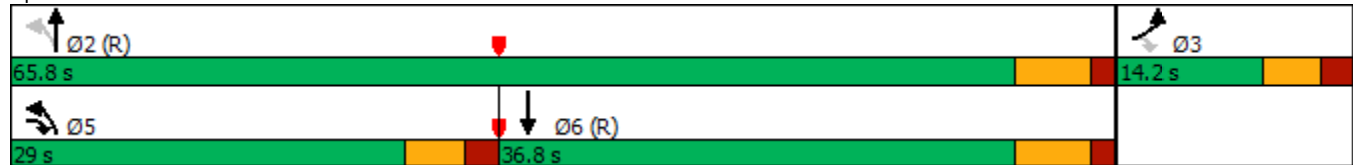
Lanes, Volumes, Timings
12: Millertown Pike & Mill Road

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	40	419	352	231	300	44
Future Volume (vph)	40	419	352	231	300	44
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.983	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	1831	0
Flt Permitted	0.950		0.455			
Satd. Flow (perm)	1770	1583	848	1863	1831	0
Satd. Flow (RTOR)		368			11	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Shared Lane Traffic (%)						
Lane Group Flow (vph)	43	451	378	248	370	0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	
Protected Phases	3	5	5	2	6	
Permitted Phases		3	2			
Detector Phase	3	5	5	2	6	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	15.0	15.0	
Minimum Split (s)	13.5	13.5	13.5	21.0	21.0	
Total Split (s)	14.2	29.0	29.0	65.8	36.8	
Total Split (%)	17.8%	36.3%	36.3%	82.3%	46.0%	
Maximum Green (s)	8.7	23.5	23.5	59.8	30.8	
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	6.0	6.0	
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	4.0	4.0	
Recall Mode	None	None	None	C-Min	C-Min	
Act Effect Green (s)	8.4	20.0	66.0	67.9	48.5	
Actuated g/C Ratio	0.10	0.25	0.82	0.85	0.61	
v/c Ratio	0.23	0.67	0.45	0.16	0.33	
Control Delay	35.8	9.8	8.1	1.1	11.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	35.8	9.8	8.1	1.1	11.0	
LOS	D	A	A	A	B	
Approach Delay	12.0			5.3	11.0	
Approach LOS	B			A	B	
Queue Length 50th (ft)	20	30	52	11	95	
Queue Length 95th (ft)	49	94	119	19	186	
Internal Link Dist (ft)	499			873	714	
Turn Bay Length (ft)		85				
Base Capacity (vph)	197	854	970	1585	1114	
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	0.22	0.53	0.39	0.16	0.33	

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 72 (90%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 9.0	Intersection LOS: A
Intersection Capacity Utilization 58.8%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 12: Millertown Pike & Mill Road



APPENDIX H | MPC COMMENTS

Date: January 19, 2021

Project Name: Project Malibu

To: City of Knoxville and Knoxville-Knox County Planning.

Subject: TIS Comment Response Document for Project Malibu (Knoxville Center Drive)

**Review Comments Dated: December 23, 2020 (City of Knoxville),
January 8, 2021 (Knoxville-Knox County Planning).**

Dear City of Knoxville and Knoxville-Knox County Planning staff,

The following comment response document is submitted to address comments dated December 23, 2020 and January 8, 2021:

City of Knoxville Engineering (December 23, 2020)

1. **Reviewer Comment:** Please provide a comment response document when resubmitted. Please indicate where/how the comments are addressed (i.e. page number, table number, etc.). It is preferred that the comment response document be bound and included as the end of the appendix section of the study.

Response: The comment response document is located in Appendix H of the revised TIA report.

2. **Reviewer Comment:** The 2019 Estimated AADT in Table 1 for Station ID 093T308 “Washington Pike, South of Valley View Drive” is 10,113 per KGIS Engineering Maps.

Response: The 2019 Estimated AADT entry for Station ID 093T308 “Washington Pike, South of Valley View Drive” has been corrected to 10,113 vpd. The original value shown was the 2020 AADT for this station. (Table 1, Page 9)

Knoxville-Knox County Planning (January 8, 2021)

1. **Reviewer Comment:** As we have been talking about Project Malibu for several months, did we have a discussion about non-ITE manual rates used? From what we can see in our emails is that we talked about 2020 existing traffic volumes, 2022 and 2027 Background traffic volumes, and the Distribution of site generated trips. In accordance with our TIA Guidelines, the review team is supposed to review and approve the final trip generation numbers before the study is completed if non-ITE rates were used. We should've mentioned this earlier. It would be helpful if Appendix C could be expanded to provide additional background information beyond the trip generation table to further discuss and justify rates.

Response: Additional discussion has been provided in the trip generation section (Page 18) to further explain the operating characteristics of the proposed facility, specifically addressing the arrival and departure time frames of the various shifts. The trip generation data located in

Appendix C was provided by the end user that will be occupying the proposed development. This user has other facilities of this type of which this data is derived.

- 2. Reviewer Comment: With a follow-up to #1 above, it would be helpful if there was a section within the table that totaled daily trips generated in addition to just the AM and PM peak numbers, a description of what is meant by "service vehicles," and a peak hour of the generator volume.**

Response: Table 2 on page 18 of the report has been updated to include daily trip generation estimates for this project. Table 2A on page 19 has been added to the report to summarize the peak hour of the generator estimated trips. In both Tables 2 and 2A, the Service Vehicle line has been expanded to show the number of trips attributed to large trucks versus the smaller delivery vehicles. The term "service vehicles" was used in the report to include both the large trucks delivering goods to the facility and delivery vehicles that will depart from the facility and delivery goods to individual households / businesses.

- 3. Reviewer Comment: It may have been better to evaluate the AM peak period for the development during 10-11 am (522 trips generated) instead of the early AM "assumed" peak period. What are your thoughts about this analysis modification?**

Response: An evaluation of the peak hour of the development has been conducted for the 10 am – 11 am time period. A discussion of this evaluation has been added to the Evaluations section of the report (page 29). Appendix G has been added to the Appendices to contain the various figures related to the development of the volumes used for this analysis (existing, background, and combined volumes, as well as, trip distribution patterns, generated site trips, and summaries of capacity analysis results). Appendix G also contains capacity analysis printouts for the peak hour of the generator evaluation. The results of this evaluation did not produce any additional recommendations. The recommendations from the original study remain valid.

- 4. Reviewer Comment: Please revise the site plan shown with a legend to better understand where parking areas, new buildings, etc. will be placed. Please also include the proposed routing of the trucks/delivery vehicles and how that will look like as a supplement to the detailed trip distribution charts to provide a big picture view.**

Response: Figure 2 on page 4 has been updated with a version of the site plan where the building and parking areas are more visible. An additional figure, Figure 2A (page 5), has been added to the report to more clearly illustrate the anticipated site circulation of the various vehicle types.

- 5. Reviewer Comment: Please include graphics to supplement the proposed recommendations. This would include at a minimum the one that was shared with us during the preview meeting that was held showing the general locations of where improvements were recommended and more preferably functional layouts showing specific lane configurations at each location. This is especially needed when discussing recommendations, like recommendation #3 & #4.**

Response: Two new figures, Figures 12A & 12B, have been added to the Conclusions & Recommendations section of the report (pages 46 & 47). Figure 12A provides a summary of improvements, both City / TDOT proposed projects and additional projects identified in the

study. Figure 12B provides schematic layouts for the two locations that are not currently included in City or TDOT projects.

- 6. Reviewer Comment: Are there any general way-finding, signage upgrades, or striping improvements recommended for the area considering all the truck usage and one-way roads around the mall/I-640 area? It may be good to get some initial recommendations mentioned in the TIA, but this will probably be worked out further with the City of Knoxville.**

Response: An item has been added to the recommendations indicating that the project should coordinate with the City and TDOT about any necessary signing or pavement marking modification or additions needed due to the project. It is anticipated this will occur within the site plan review process.

Sincerely,



Alan L. Childers, P.E.