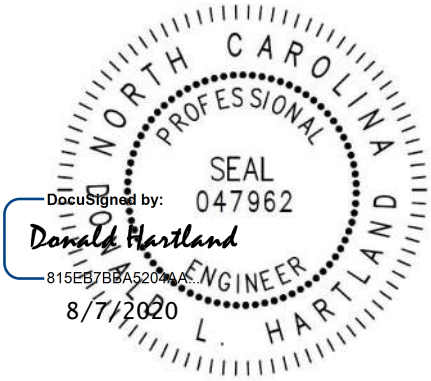
TRAFFIC IMPACT ANALYSIS
FOR
BUSBEE SWEETEN CREEK
ASHEVILLE, NC

Prepared For

Flournoy Development Company
P. O. Box 6566
Columbus, GA 31917

August 7, 2020

Commission No: 3973



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Executive Summary

A multi-use development, known as "Busbee/Sweeten Creek Road Development" is proposed on US 25A (Sweeten Creek Road) south of I-40 in Buncombe County, NC. The development is expected to be built out in the year 2024. The Busbee/Sweeten Creek Road development will consist of 630 mid-rise apartment units, 211 senior housing units, and 11 single family units.

The development is located in South Asheville area along US 25A (Sweeten Creek Road) (See Figure 1). US 25A (Sweeten Creek Road) is maintained by NCDOT as a primary roadway and runs north to south from US 25 (McDowell Street) to US 25 (Hendersonville Road) at NC 280 (Airport Road). Access to the site is provided by two (2) connections on US 25A (Sweeten Creek Road). The main driveway (#1) will be across from the Carolina Day Driveway and it will be a full movement intersection. The second driveway will be south of the main driveway (#2) and will be constructed in a right-in/right-out configuration.

In accordance with NCDOT TIA Guidelines, the signalized intersections were modeled as being part of a coordinated system. During the analyses, levels of service may change in unexpected fashions due to coordination of the system as a whole. Certain intersections may have a change in Level of Service grade to show a decrease in delay even with additional traffic in the background or future time periods. This is usually the result of cycle length optimization. The minimum cycle length allowed was 90 seconds for a three-phase signal and 120 for a 4 phase. Synchro modeling software predicted that certain cycle lengths greater than 180 seconds would be the most efficient for the system during several peak hour time periods.

The traffic signals at the intersections in this analysis should be optimized for traffic conditions as they change. Because NCDOT has sole jurisdiction for the operation and maintenance of the signals, this should not be a responsibility of the development (See Appendix G for the NCDOT TIA Checklist).

*Note: The **NCDOT STIP project, U-2801**, is planned in the area of this project. It will widen US 25A (Sweeten Creek Road) from a two-lane road to a four-lane divided roadway with right-turn lanes and left-turn lanes at U-turn bulbouts. In turn, it will impact the intersections on US 25A (Sweeten Creek Road from the Rock Hill Road intersection south to US 25 (Hendersonville Road). Since no formal plans were available at this time, this project was assumed to be completed after the buildout of the Busbee/Sweeten Creek Road Development. The Level of Service of the intersections along Sweeten Creek Road should be greatly improved by the increased capacity of the intersections resulting from the construction of the project (See Appendix G).*

For modeling purposes, right turns on red were prohibited. Additionally, all left turns with dedicated left-turn lanes were modeled as protected only. The signalized intersections were modeled as being part of a coordinated system.

This traffic impact analysis (TIA) has demonstrated that it is reasonable to conclude that the construction of Busbee/Sweeten Creek Road development **should not have a significant adverse impact on the surrounding roadway network.**

Intersection of US 25A (Sweeten Creek Road) and Rock Hill Road

- The traffic signal at this intersection should be optimized for traffic conditions as they change. Because NCDOT has sole jurisdiction for the operation and maintenance of the signal, this should not be a responsibility of the development.
- This intersection was modeled as an "actuated-uncoordinated" intersection for the existing and future conditions.
- The ***Existing*** AM peak hour intersection delay experienced by this intersection is currently 30.2 seconds and it is currently operating at an LOS of "C". During the ***2024 Background*** AM peak hour condition, the intersection will experience a delay of 35.5 seconds and an LOS of "D". During the ***2024 Future*** AM peak hour condition, the intersection will experience a delay of 37.5 seconds and an LOS of "D".
- During the ***Existing*** PM peak hour, the intersection experiences an intersection delay of 31.8 seconds and an LOS of "C". The delay is expected to be 37.6 seconds and the LOS will be "D" during the ***2024 Background*** PM peak hour condition. During the ***2024 Future*** PM peak hour condition, the intersection will experience a delay of 40.7 seconds and an LOS of "D".
- Therefore, no geometric changes to this intersection are recommended based on this Traffic Impact Study.

Intersection of US 25A (Sweeten Creek Road) and Carolina Day Complex and Site Driveway #1

- This intersection is currently a three (3) legged intersection. It was modeled as an "Two-Way Stop Controlled" intersection, with a Stop sign on the Carolina Day Complex approach.
- During the ***Existing*** AM peak hour, the eastbound Carolina Day approach experiences 63.0 seconds of delay and an LOS of "F". During the ***2024 Background*** AM peak hour condition, the eastbound approach will experience a delay of 91.0 seconds and an LOS of "F". During the ***2024 Future*** AM peak hour condition, the intersection will experience a delay of 45.6 seconds and an LOS of "D", with the installation of a traffic signal and left and right-turn lanes into the development.
- During the ***Existing*** PM peak hour, the eastbound Carolina Day approach experiences 99.9 seconds of delay and an LOS of "F". The delay is expected to be 152.5 seconds and the LOS will be "F" during the ***2024 Background*** PM peak hour condition. During the ***2024 Future*** PM peak hour condition, the intersection will experience a

delay of 49.4 seconds and an LOS of "D".

- It is the opinion of Mattern & Craig that a traffic signal and turn lanes to and from the development are required. The additional lanes needed are; a southbound left-turn lane, a northbound right-turn lane, westbound left-turn lane, westbound through/right-turn lane. This traffic signal was modeled as an "actuated-uncoordinated" intersection due to the large distance (approx. 1 mile) between the closest signals both north and south of the development. According the signal warrant analysis discussed in the Signal Warrant section of this study, the intersection will meet 4 warrants; therefore, was assumed to be installed for the Future condition.

Intersection of US 25A (Sweeten Creek Road) and Site Driveway #2

- This future intersection will serve the development as a secondary access for ingress and egress. This intersection is a three (3) legged intersection. It was modeled as an "Two-Way Stop Controlled" intersection, with a Stop sign on westbound (Site Access) and will operate as a right-in/right-out. The southbound and westbound left-turn movements will not be permitted.
- During the ***2024 Future*** AM peak hour conditions, the westbound approach will experience an LOS of "E" with 36.5 seconds of delay.
- During the ***2024 Future*** PM peak hour conditions, the westbound approach will experience an LOS of "E" with 38.3 seconds of delay.

Intersection of US 25A (Sweeten Creek Road) and Wesley Drive

- The traffic signal at this intersection should be optimized for traffic conditions as they change. Because NCDOT has sole jurisdiction for the operation and maintenance of the signal, this should not be a responsibility of the development.
- This intersection was modeled as an "actuated-coordinated" intersection in the existing and the future conditions.
- The ***Existing*** AM peak hour intersection delay experienced by this intersection is currently 15.6 seconds and it is currently operating at an LOS of "B". During the ***2024 Background*** AM peak hour condition, the intersection will experience a delay of 26.8 seconds and an LOS of "C". During the ***2024 Future*** AM peak hour condition, the intersection will experience a delay of 29.3 seconds and an LOS of "C".
- During the ***Existing*** PM peak hour, the intersection experiences an intersection delay of 23.2 seconds and an LOS of "C". The delay is expected to be 33.9 seconds and the LOS will be "C" during the ***2024 Background*** PM peak hour condition. During the ***2024 Future*** PM peak hour condition, the intersection will experience a delay of 44.8 seconds and an LOS of "D".

- Therefore, no geometric changes to this intersection are recommended based on this Traffic Impact Study.

A more detailed description / discussion of each intersection and its traffic conditions can be found in the Capacity/Level of Service and Conclusions/Suggestions Sections of this report.

Introduction

A multi-use development, known as "Busbee/Sweeten Creek Road Development" is proposed on US 25A (Sweeten Creek Road) south of I-40 in Buncombe County, NC. The development is expected to be built out in the year 2024. The Busbee/Sweeten Creek Road development will consist of 630 mid-rise apartment units, 211 senior housing units, and 11 single family units. (See Appendix A for proposed Site Plan)

The development is located in South Asheville area along US 25A (Sweeten Creek Road) (See Figure 1). US 25A (Sweeten Creek Road) is maintained by NCDOT as a primary roadway and runs north to south from US 25 (McDowell Street) to US 25 (Hendersonville Road) at NC 280 (Airport Road). Access to the site is provided by two (2) connections on US 25A (Sweeten Creek Road). The main driveway (#1) will be across from the Carolina Day Driveway and it will be a full movement intersection. The second driveway will be south of the main driveway (#2) and will be constructed in a right-in/right-out configuration.

The scope of work *(study area)* for the traffic impact study was identified by Mattern & Craig with concurrence of NCDOT. Three (3) existing intersections were studied per instructions provided by NCDOT. Peak hour (7:00 am – 9:00 am and 4:00 pm – 6:00 pm) traffic counts were obtained at the study intersections on Tuesdays, Wednesdays, and Thursdays, during the month of May 2019. These counts were used to determine the actual peak hours and their existing traffic volumes. (See Appendix B for traffic counts)

The AM and PM Peak Hours were determined from these traffic counts and are based on the existing traffic conditions at each of the three (3) intersections. Although there are variations between intersections in the exact times for the peak hours, each actual peak hour was used, for a "worst case scenario". 2024 Background and future volume projections were based on an historical growth rate of two (2) percent.

The intersections that were studied are:

- US 25A Sweeten Creek Road and Rock Hill Road
- US 25A Sweeten Creek Road and Carolina Day Athletic Entrance
- US 25A Sweeten Creek Road and Wesley Drive

This study is based on information obtained during a typical weekday. According to the ***Traffic Control Devices Handbook*** published by the Institute of Transportation Engineers (ITE), a typical weekday is interpreted to be during a normal work week representing traffic that is usually and repeatedly found at the intersection.

Background

The subject site is located in Buncombe County, NC. Primary access to the site is provided by two (2) privately maintained driveways on US 25A (Sweeten Creek Road). The section of US 25A (Sweeten Creek Road) adjacent to the project has an estimated AADT of 19,000 vehicles per day. The section of US 25A (Sweeten Creek Road) north of the Blue Ridge Parkway has an AADT of 19,500 vehicles per day. The section of US 25A (Sweeten Creek Road) north of the I-40 has an AADT of 12,000 vehicles per day. (See Appendix A).

US 25A (Sweeten Creek Road) is a major north/south corridor in Buncombe County. US 25A (Sweeten Creek Road) runs from the intersection of US 25 (Hendersonville Road) and NC 280 (Airport Road) to the intersection of US 25 (McDowell Street) and US 25A (Lodge Street) in Asheville. US 25A (Sweeten Creek Road) roughly parallels I-26, and is one of 3 major north/south corridors that connect Hendersonville and Asheville. US 25A (Sweeten Creek Road) in the vicinity of the project exists with a three-lane cross section at the primary access. It also has both two-lane and five-lane cross sections.

There is a future STIP project (U-2801A) that is currently planned to be constructed by the year 2026. It will widen US 25A (Sweeten Creek Road) to a four-lane divided highway with curb and gutter, a median, paved shoulders, and sidewalks in most locations.

US 25A (Sweeten Creek Road)

US 25A (Sweeten Creek Road)

US 25A (Sweeten Creek Road)

US 25A (Sweeten Creek Road)

SR 3081 (Rock Hill Road / Forest Lake Drive) is a two-lane street that is maintained by the NCDOT as a secondary roadway. Parking is not permitted along a majority of its length. It serves as an access to US 25 (Hendersonville Road) with mainly residential uses.

SR 3081 (Rock Hill Road)

SR 3081 (Rock Hill Road/Forest Lake Drive)

Carolina Day Athletic Entrance is a two-lane, privately maintained, gated access drive for the athletic fields owned and used by Carolina Day School. Carolina Day School is a private school. It does not have routine daily traffic patterns and only sees use for athletic events.

Carolina Day Athletic Entrance

Wesley Drive is a two-lane street that is privately maintained as an access to Givens Estates, a private community.

Wesley Drive

Figure 2 illustrates the existing lane geometry, intersection spacing, and existing traffic control treatments.

Full-turning movement traffic counts (*7:00 am until 9:00 am and 4:00 pm until 6:00 pm*) were collected at the intersections of:

- US 25A Sweeten Creek Road and Rock Hill Road
- US 25A Sweeten Creek Road and Carolina Day Athletic Entrance
- US 25A Sweeten Creek Road and Wesley Drive

These counts were used to determine the actual peak hours and their existing traffic volumes. Counts were conducted on Tuesdays, Wednesdays,

and Thursdays, during the month of May, 2019.

Individual peak hour volumes at each intersection were used in the analyses to present a worst-case scenario. As such, some volume imbalances may exist between adjacent intersections.

SITE LOCATION

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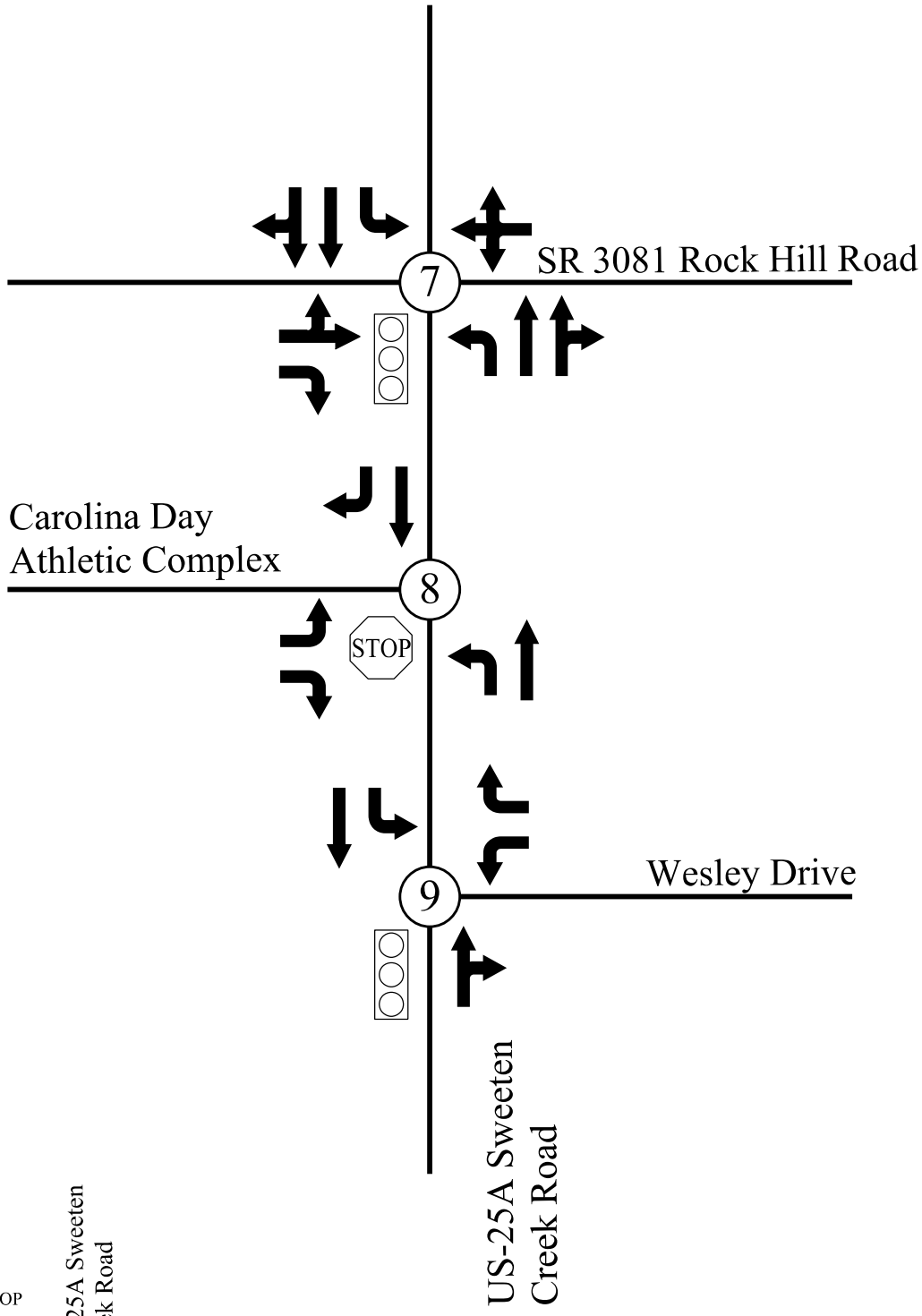
Figure:

1



LEGEND:

STOP = EXISTING STOP SIGN/STOP CONTROLLED

= EXISTING TRAFFIC SIGNAL

= EXISTING LANE CONFIGURATION

EXISTING LANE GEOMETRY

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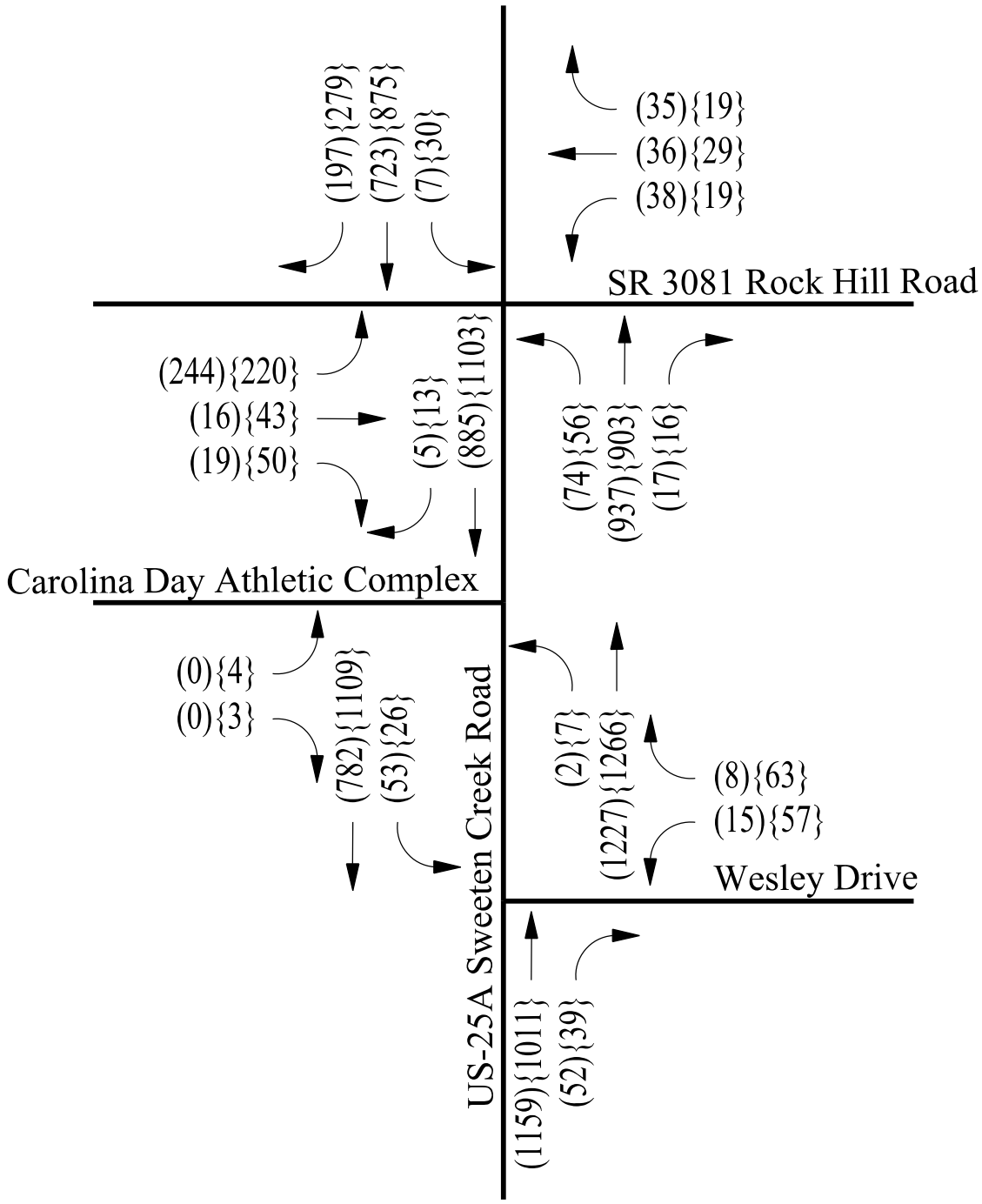
Figure:
2



LEGEND:
(XX) = AM Traffic
{XX} = PM Traffic

EXISTING TRAFFIC VOLUMES

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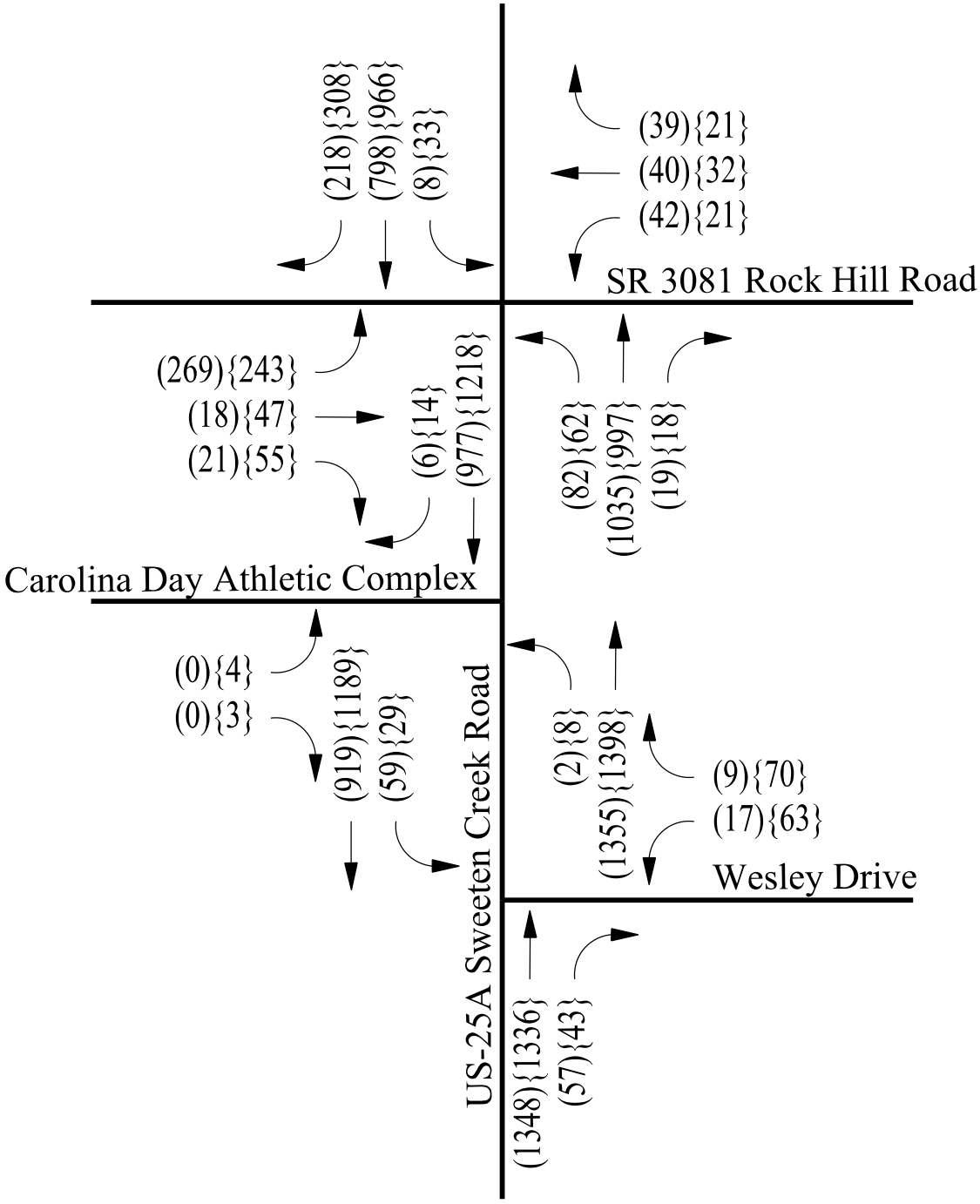
Figure:
3



LEGEND:
(XX) = AM Traffic
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2024 Background Traffic Volumes

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Figure:
4

Trip Generation

A multi-use development, known as "Busbee/Sweeten Creek Road Development" is proposed on US 25A (Sweeten Creek Road) south of I-40 in Buncombe County, NC. The development is expected to be built out in the year 2024. The Busbee/Sweeten Creek Road development will consist of 630 mid-rise apartment units, 211 senior housing units, and 11 single family units. (See Appendix A for proposed Site Plan)

Access to the site is provided by two (2) proposed connections on US 25A (Sweeten Creek Road). The primary access is directly across from the Carolina Day School

The estimated trips that would be generated by the development were determined using methodology contained in the ***Trip Generation Manual – 10th Edition*** that is published by the Institute of Transportation Engineers (ITE) and the ***Trip Generation Handbook – 3rd Edition*** (August 2014) also published by the Institute of Transportation Engineers (ITE).

The scope of work *(study area)* for the traffic impact study was identified by Mattern & Craig with concurrence of NCDOT. Three (3) existing intersections were studied per instructions provided by NCDOT. Peak hour (7:00 am – 9:00 am and 4:00 pm – 6:00 pm) traffic counts were obtained at the study intersections on Tuesdays, Wednesdays, and Thursdays, during the month of May 2019. These counts were used to determine the actual peak hours and their existing traffic volumes. (See Appendix B for traffic counts)

The AM and PM Peak Hours were determined from these traffic counts and are based on the existing traffic conditions at each of the three (3) intersections. Although there are variations between intersections in the exact times for the peak hours, each actual peak hour was used, for a "worst case scenario".

An annual traffic growth rate of two (2) percent was used for the background traffic volumes. For purposes of this study, the anticipated completion date is 2024; therefore, the two (2) percent growth rate is applicable for five (5) years. (See Figure 4).

Table 1 –Trip Generation (Typical Weekday)

Land Use (ITE Code)	Intensity	Unit	ADT (vpd)	AM (vph)			PM (vph)		
				Total	In	Out	Total	In	Out
Multi-Family Mid-Rise (221)	315	Units	1715	105	27	78	133	81	52
Multi-Family Mid-Rise (221)	315	Units	1715	105	27	78	133	81	52
Senior Adult Housing (252)	155	Units	598	31	11	20	39	21	18
Senior Adult Housing (252)	56	Units	200	11	4	7	16	9	7
Single Family Houses (210)	11	Units	136	13	3	10	12	7	5
Peak Hour New (Primary) Totals =			4364	265	72	72	333	199	134

Land use code 221 is defined and described as rental dwelling units that include apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have between three and 10 levels (floors).

Land use code 252 defined and described as Senior adult housing consists of attached independent living developments, including retirement communities, age-restricted housing, and active adult communities. These developments may include limited social or recreational services. However, they generally lack centralized dining and onsite medical facilities. Residents in these communities live independently, are typically active (requiring little to no medical supervision) and may or may not be retired. *Note: This section of the development will target adults in the 55+ age group, but will not discriminate based on age. The design and amenities of the units will not be as favorable to families with children.*

Land use code 210 is defined as detached housing includes all single-family detached homes on individual lots. A typical site surveyed is a suburban subdivision. The number of vehicles and residents had a high correlation with average weekday vehicle trip ends. The use of these variables was limited, however, because the number of vehicles and residents was often difficult to obtain or predict. The number of dwelling units was generally used as the independent variable of choice because it was usually readily available, easy to project, and had a high correlation with average weekday vehicle trip ends. This land use included data from a wide variety of units with different sizes, price ranges, locations, and ages. Consequently, there was a wide variation in trips generated within this category. Other factors, such as geographic location and type of adjacent

and nearby development, may also have had an effect on the site trip generation. Single-family detached units had the highest trip generation rate per dwelling unit of all residential uses because they were the largest units in size and had more residents and more vehicles per unit than other residential land uses; they were generally located farther away from shopping centers, employment areas, and other trip attractors than other residential land uses; and they generally had fewer alternative modes of transportation available because they were typically not as concentrated as other residential land uses.

Given the anticipated land use types, pass-by trips and internal capture rates are not applicable and therefore not included in this study.

Trip Distribution

Busbee/Sweeten Creek Road development will be served by three (3) access points on US 25A (Sweeten Creek Road). The main site driveway will be across from the Carolina Day Athletic Complex driveway (See conceptual site plan in Appendix A of this report).

Traffic was distributed with respect to population centers and transportation corridors nearby to the site, and the recent traffic counts. It is expected that the majority of traffic will utilize US 25A (Sweeten Creek Road), I-40 and SR 3116 (Mills Gap Road) for commuting purposes.

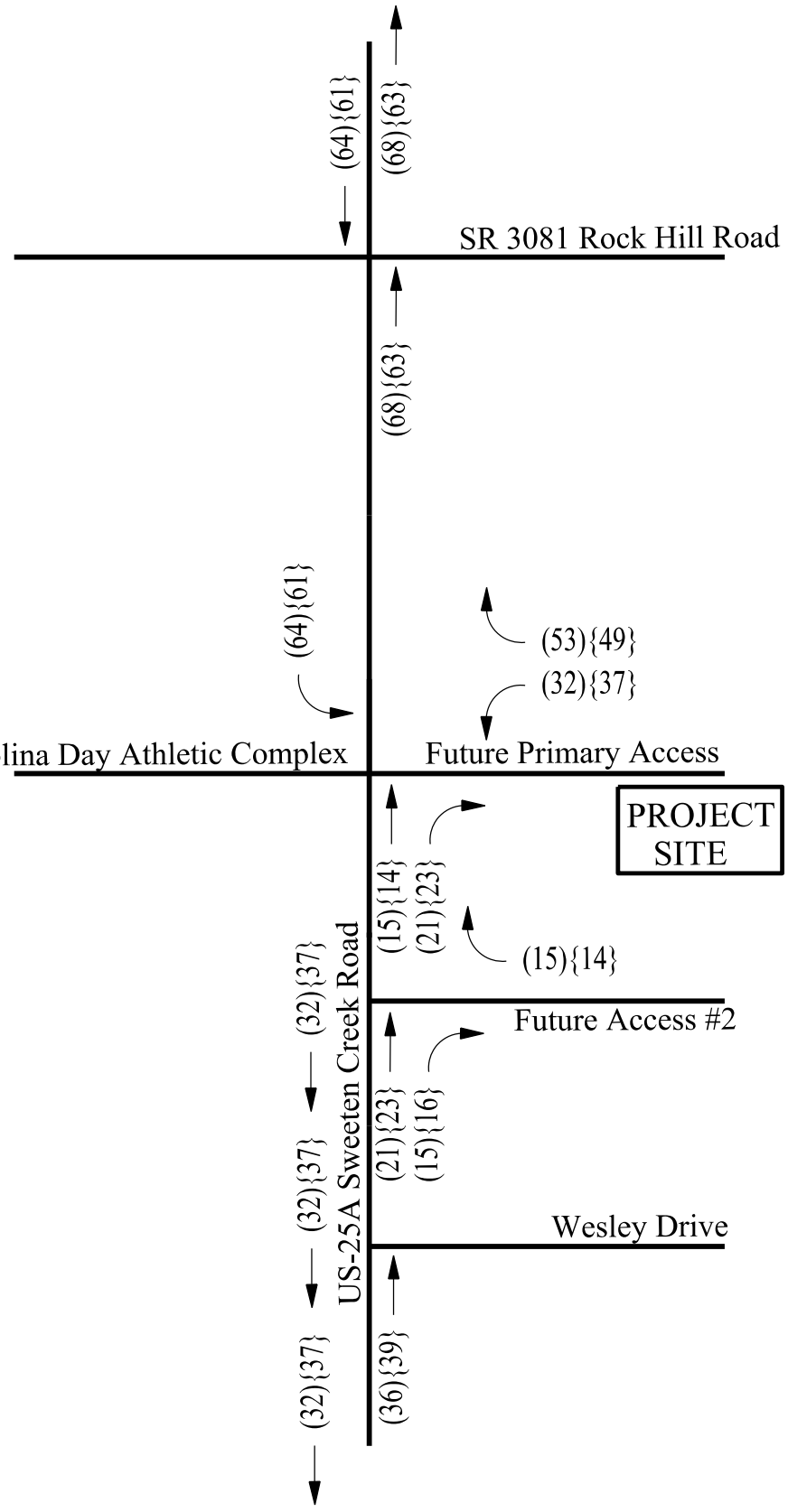
The site traffic was distributed throughout the surrounding roadways for all peak hours as follows:

- A majority of the traffic generated by the Busbee/Sweeten Creek Road development will utilize the primary driveway (approximately 60 percent) with the remaining percentage using the secondary driveway.
- Over sixty (60) percent of the site traffic will be oriented to and from the north of the development.

The AM and PM peak hour inbound and outbound trip distribution percentages for the trips are depicted on Figure 5.

Using the trip distribution rates from Figure 5, the traffic generated by the Busbee/Sweeten Creek development during the AM and PM peak hours is shown on Figure 6.

Figure 7 depicts the projected traffic from the Busbee/Sweeten Creek development added to the 2024 background traffic. This yields the build out traffic predicted for the year 2024 (2024 Future).



LEGEND:
(XX) = Percentage AM Traffic
{XX} = Percentage PM Traffic

2024 SITE TRIP DISTRIBUTION

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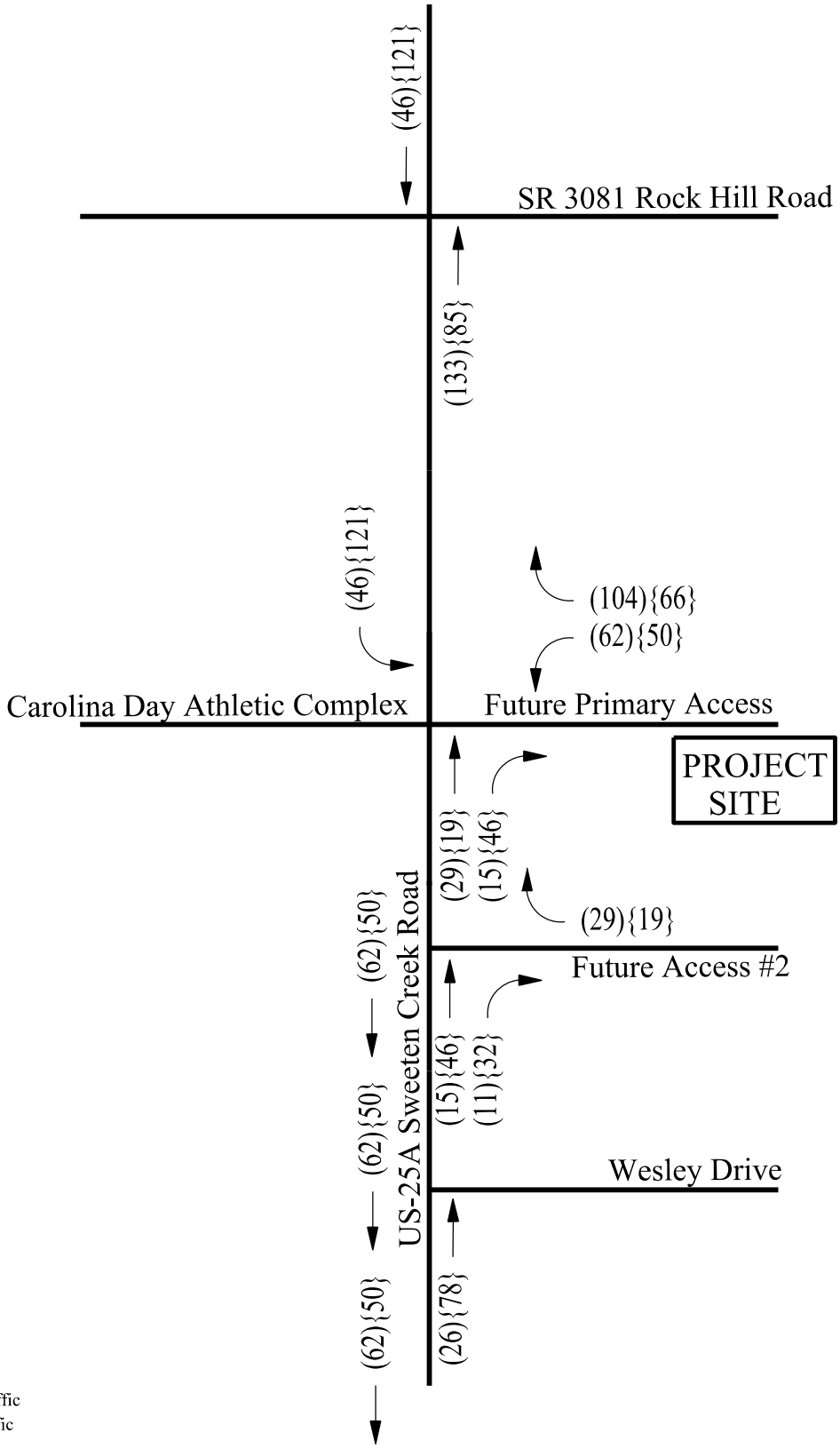
Figure:
5



2024 SITE TRAFFIC VOLUMES

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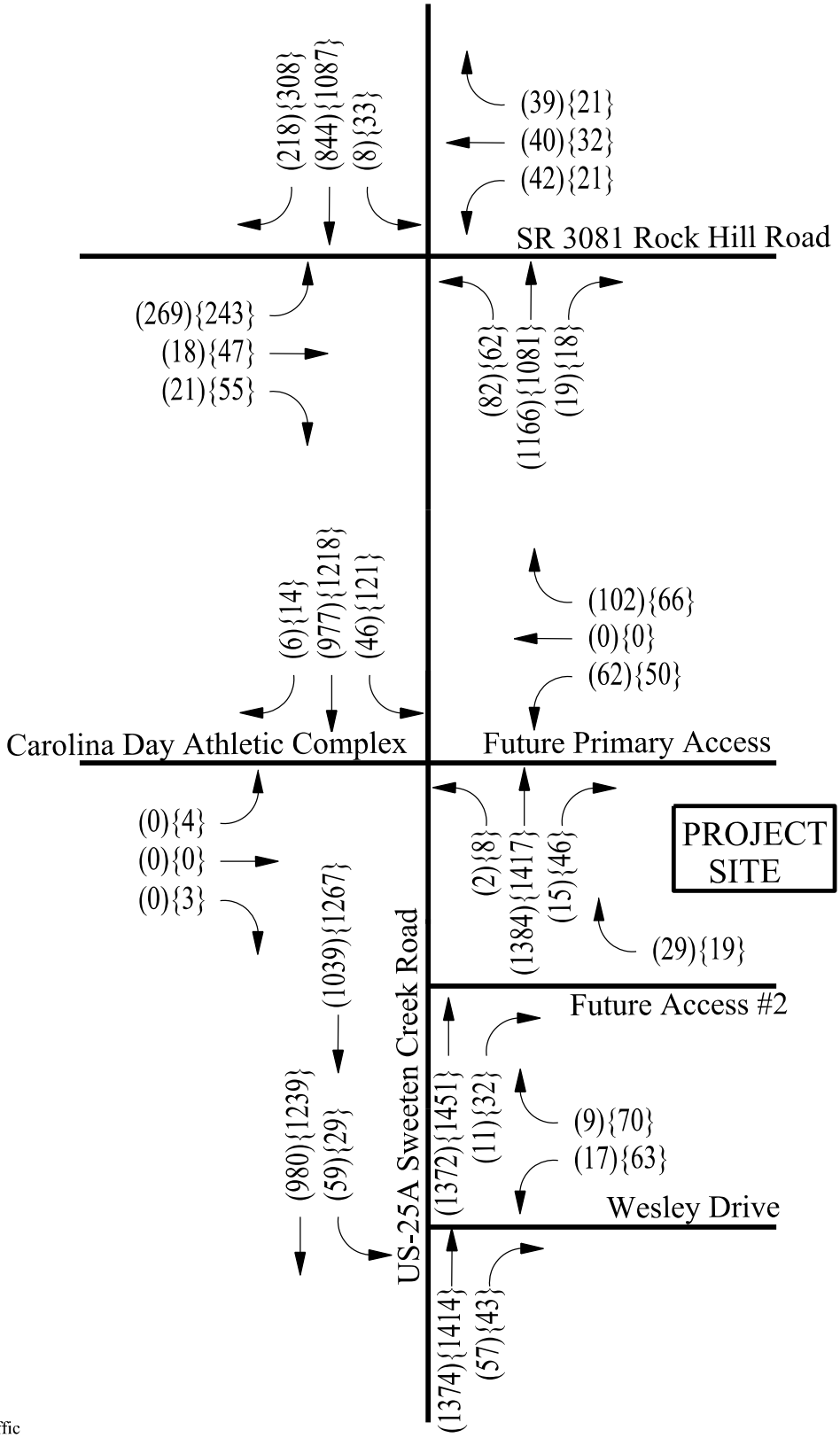
Figure:
6



LEGEND:

(XX) = Percentage AM Traffic

{XX} = Percentage PM Traffic

2024 Future Traffic Volumes

Busbee Property Sweeten Creek
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Figure: 7

Capacity/Levels of Service (LOS)

Capacity, levels of service, and queue length analyses for the unsignalized and signalized intersections were completed using methodology contained in the software program *Synchro 10 with SimTraffic* published by Trafficware and the results are included in Appendix E of this report. For these analyses the through volumes have been balanced for optimization.

Unsignalized Intersections

Factors affecting the capacity and level of service (LOS) at two-way stop controlled (TWSC) and four-way stop controlled intersections (AWSC) include number and use of lanes, channelization, two-way left-turn lanes (TWLTL) and raised or striped median storage *(or both)*, approach grade, and existence of flared approaches on the minor street. The LOS for these intersections is defined for each minor movement and not for the intersection as a whole. The LOS criteria are somewhat different from the criteria used for signalized intersections because most drivers expect to find higher traffic volumes and greater delay at signalized intersections. Levels of service still range from "A" describing best operating conditions to "F" describing worst conditions (See Table 2).

Table 2 Unsignalized Level of Service Criteria

LEVEL OF SERVICE	CONTROL DELAY (seconds per vehicle)
	Unsignalized Intersections
A	≤ 10
B	>10 and 15
C	>15 and 25
D	>25 and 35
E	>35 and 50
F	>50

Source: Highway Capacity Manual, 6th Edition

Existing Conditions

Intersection of US 25A (Sweeten Creek Road) and Carolina Day Complex and Site Driveway #1

The results of the capacity analyses for the ***Existing*** AM and PM peak hour conditions indicate that the level of service (LOS) at the intersection of **US 25A (Sweeten Creek Road) and Carolina Day Complex and Site Driveway #1** for the eastbound approach are "F" with delays of 63.0 seconds and 99.9 seconds, respectively.

2024 Background Conditions

Intersection of US 25A (Sweeten Creek Road) and Carolina Day Complex and Site Driveway #1

The results of the capacity analyses for the ***2024 Background*** AM and PM peak hour conditions indicate that the level of service (LOS) at the intersection of **US 25A (Sweeten Creek Road) and Carolina Day Complex and Site Driveway #1** for the eastbound approach is "F" with delays of 91.0 seconds and 152.5 seconds, respectively.

2024 Future Conditions

The ***2024 Future*** *(Existing traffic plus growth for 5 years with development traffic generated from the proposed development added)* traffic volumes were used in the analysis of the ***2024 Future*** traffic conditions at the intersections in the study area.

Intersection of US 25A (Sweeten Creek Road) and Site Driveway #2

The results of the capacity analyses at the TWSC intersection of **US 25A (Sweeten Creek Road) and Site Driveway #2** for the ***2024 Future*** AM and PM peak hours indicates that the westbound approach from Site Driveway #2 will operate at an LOS of "E" and have delays of 36.5 seconds and 38.3 seconds, respectively.

Signalized Intersections

Performance measures used to analyze the operating conditions at signalized intersections include lane group capacities, critical volume to capacity ratios, average back of queues, and levels of service. The lane group capacity is defined as the maximum hourly rate at which vehicles can reasonably be expected to pass through the intersection under prevailing traffic, roadway, and signalization conditions. The critical v/c ratio, which is the volume to capacity ratio for the intersection as a whole, is an approximate indicator of the overall sufficiency of an intersection. *(It represents an absolute prediction of the total sufficiency of capacity in all critical lane groups –* ***Traffic Engineering, Third Edition****, Roess, Prassas, and McShane).* The back of queue is defined as the number of vehicles that are queued depending on arrival patterns of vehicles and vehicles that do not clear the intersection during a given green interval. Levels of service is defined in terms of control delay, which is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. Levels of service range from "A" that describes the best operating conditions to "F" that describes the worst operating conditions (See Table 3).

It is widely accepted in the traffic engineering profession that signalized intersections in urbanized areas be designed to operate at a level of service "D" or better (***Traffic Engineering Handbook, Fifth Edition***).

Table 3
Signalized Level of Service Criteria

LEVEL OF SERVICE	CONTROL DELAY (seconds per vehicle)
	Signalized Intersections
A	≤ 10
B	>10 and 20
C	>20 and 35
D	>35 and 55
E	>55 and 80
F	>80

Source: Highway Capacity Manual, 6th Edition

The signalized intersection was modeled as actuated, un-coordinated. Individual peak hour traffic volumes at the intersection were used, therefore some volume imbalances may occur. The signal cycle lengths and splits were optimized for all iterations of the analysis. This gives an equal baseline for analyzing the signals.

Existing Conditions:

Intersection of US 25A (Sweeten Creek Road) and Rock Hill Road

The results of the capacity analyses at the intersection of **US 25A (Sweeten Creek Road) and Rock Hill Road** for the ***Existing*** AM Peak hour traffic volumes indicate that the LOS for the intersection as a whole is "C" with a delay of 30.2 seconds per vehicle. The eastbound approach operates at an LOS of "D" with a delay of 45.0 seconds. The remaining approaches experience an LOS of "C" with delays of 33.3 seconds or less.

For the PM Peak hour under ***Existing*** traffic volumes, the LOS for the intersection as a whole is "C" with a delay of 31.8 seconds per vehicle. The eastbound and westbound approaches operate at an LOS of "D" with delays of 47.1 seconds and 35.2 seconds, respectively. The remaining approaches experience an LOS of "C" with delays of 29.8 seconds or less.

Intersection of US 25A (Sweeten Creek Road) and Wesley Drive

The results of the capacity analyses at the intersection of **US 25A (Sweeten Creek Road) and Wesley Drive** volumes indicate that the LOS for the intersection as a whole is "B" with a delay of 15.6 seconds per vehicle. The westbound approach of Wesley Drive experiences a delay of 83.7 seconds and an LOS of "F". The remaining approaches experience an LOS of "B" or better with delays of 19.6 seconds or less.

For the PM Peak hour under ***Existing*** traffic volumes, the LOS for the intersection as a whole is "C" with a delay of 23.2 seconds per vehicle. The westbound approach will experience a delay of 95.7 seconds and an LOS of "F". The remaining approaches experience an LOS of "C" or better with delays of 28.2 seconds or less.

2024 Background Conditions:

The ***2024 Background*** conditions *(existing traffic volumes plus a growth rate of two (2) percent for five (5) years)* were modeled in Synchro and SimTraffic using "worst case" conditions. The traffic signal in the ***2024 Background*** conditions was set to exclude right turns on red.

Intersection of US 25A (Sweeten Creek Road) and Rock Hill Road

The results of the capacity analyses at the intersection of **US 25A (Sweeten Creek Road) and Rock Hill Road** for the ***2024 Background*** AM Peak hour traffic volumes indicate that the LOS for the intersection as a whole will be "D" with a delay of 35.5 seconds per vehicle. The southbound, eastbound, and westbound approaches will experience an LOS of "D" or better with delays of 38.6, 54.0, and 35.9 seconds, respectively. The northbound approach will have an LOS of "C" with 27.5 seconds of delay.

For the PM Peak hour under ***2024 Background*** traffic volumes, the LOS for the intersection as a whole will be "D" with a delay of 37.6 seconds. The eastbound approach will experience an LOS of "E" with a delay of 60.2 seconds. The other approaches will experience an LOS of "D" or better with delays of 40.5 seconds (WB) or less.

Intersection of US 25A (Sweeten Creek Road) and Wesley Drive

The results of the capacity analyses at the intersection of **US 25A (Sweeten Creek Road) and Wesley Drive** for the ***2024 Background*** AM Peak hour traffic volumes indicate that the LOS for the intersection as a whole will be "C" with a delay of 26.8 seconds per vehicle. The westbound approach will experience a delay of 86.5 seconds and an LOS of "F". The other approaches will experience an LOS of "D" or better with delays of 37.1 seconds or less.

For the PM Peak hour under ***2024 Background*** traffic volumes, the LOS for the intersection as a whole will be "C" with a delay of 33.9 seconds per vehicle. The westbound approach of Wesley Drive will operate at an LOS of "F" with a delay of 105.1 seconds. The southbound approach will operate at an LOS of "B" with an overall delay of 12.1 seconds; however, the northbound approach will experience delays of 46.4 seconds at an LOS of "D".

2024 Future Conditions:

The ***2024 Future*** conditions *(Existing Condition volumes plus traffic generated by the proposed project)* were modeled in Synchro and SimTraffic using "worst case" conditions. The traffic signals in the ***2024 Future*** conditions was set to exclude right turns on red.

Intersection of US 25A (Sweeten Creek Road) and Rock Hill Road

The results of the capacity analyses at the intersection of **US 25A (Sweeten Creek Road) and Rock Hill Road** for the ***2024 Future*** AM Peak hour traffic volumes indicate that the LOS for the intersection as a whole will be "D" with a delay of 37.5 seconds per vehicle. The eastbound approach is expected to experience an LOS of "E" with 55.3 seconds of delay. All other approaches will experience an LOS of "D" or better with delays of 40.0 seconds (SB) or less.

For the PM Peak hour under ***2024 Future*** traffic volumes, the LOS for the intersection as a whole will be "D" with a delay of 40.7 seconds per vehicle. The eastbound approach will operate with an LOS of "E" and a delay of 64.1 seconds. The other approaches will experience an LOS of "D" or better with delays of 43.0 seconds (WB) or less.

Intersection of US 25A (Sweeten Creek Road) and Carolina Day Complex and Site Driveway #1

A traffic signal was assumed since it is warranted at this intersection for this condition (See Signal Warrant Section of this study). The results of the capacity analyses at the intersection of **US 25A (Sweeten Creek Road) and Carolina Day Complex and Site Driveway #1** for the ***2024 Future*** AM Peak hour traffic volumes indicate that the LOS for the intersection as a whole will be "D" with a delay of 45.6 seconds per vehicle. The westbound approach will operate at an LOS of "F" with a delay of 97.6 seconds. The northbound and eastbound approaches will operate at an LOS of "E" with 61.5 and 72.6 seconds of delay, respectively. The southbound approach is expected to have an LOS of "B" with a delay of 15.0 seconds.

For the PM Peak hour under ***2024 Future*** traffic volumes, the LOS for the intersection as a whole will be "D" with a delay of 49.4 seconds per vehicle. The westbound approach will operate at an

LOS of "F" with a delay of 159.4 seconds. The northbound and eastbound approaches will experience an LOS of "E" with 60.3 and 84.8 seconds of delay, respectively. The southbound approach will have delays of 27.6 seconds and operate with an LOS of "C".

Intersection of US 25A (Sweeten Creek Road) and Wesley Drive

The results of the capacity analyses at the intersection of **US 25A (Sweeten Creek Road) and Wesley Drive** for the ***2024 Future*** AM Peak hour traffic volumes indicate that the LOS for the intersection as a whole will be "C" with a delay of 29.3 seconds per vehicle. The westbound approach is expected to have an LOS of "F" with a delay of 86.5 seconds. The northbound approach will operate under an LOS of "D" with 42.1 seconds of delay, and the southbound approach will operate under an LOS of "B" with 10.2 seconds of delay.

For the PM Peak hour under ***2024 Future*** traffic volumes, the LOS for the intersection as a whole will be "D" with a delay of 44.8 seconds per vehicle. The westbound approach will experience an LOS of "F" with a delay of 105.1 seconds. The northbound approach will operate under an LOS of "E" with 66.1 seconds of delay. The southbound approach will have an LOS of "B" with 13.9 seconds of delay.

US 25A (Sweeten Creek Road) at Rock Hill Road
Table 4

Approach	Peak Hour	Existing			2024 Background			2024 Future		
		LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue
Northbound (Sweeten Creek)	AM	C	23.3	362	C	27.5	514	C	31.2	562
	PM	C	29.8	533	C	33.0	514	D	37.0	524
Southbound (Sweeten Creek)	AM	C	33.3	456	D	38.6	1004	D	40.0	874
	PM	C	29.3	872	D	35.2	1614	D	38.0	1848
Eastbound (Rock Hill Road)	AM	D	45.0	374	D	54.0	374	E	55.3	401
	PM	D	47.1	505	E	60.2	399	E	64.1	441
Westbound (Rock Hill Road)	AM	C	31.4	274	D	35.9	222	D	36.7	216
	PM	D	35.2	144	D	40.5	134	D	43.0	140
Overall	AM	C	30.2		D	35.5		D	37.5	
	PM	C	31.8		D	37.6		D	40.7	

Exceeds NCDOT Thresholds
Delay increases by 25% or greater while maintaining the same LOS, or
LOS degrades by at least one level, or
LOS is "F"
Control delay is measured in seconds per vehicle

US 25A (Sweeten Creek Road) at Carolina Day Complex/Site Driveway #1
Table 5

Approach	Peak Hour	Existing			2024 Background			2024 Future*		
		LOS	Delay		LOS	Delay		LOS	Delay	Queue
Northbound (Sweeten Creek)	AM	A	0.0	28	A	0.0	28.0	E	61.5	1438
	PM	A	0.1	28	A	0.1	52.0	E	60.3	840
Southbound (Sweeten Creek)	AM	A	0.0	0	A	0.0	0.0	B	15.0	513
	PM	A	0.0	0	A	0.0	0.0	C	27.6	522
Eastbound (Carolina Day)	AM	F	63.0	30	F	91.0	30.0	E	72.6	30
	PM	F	99.9	30	F	152.5	49.0	E	84.8	51
Westbound (Site Driveway #1)	AM							F	97.6	258
	PM							F	159.4	152
Overall	AM							D	45.6	
	PM							D	49.4	

Exceeds NCDOT Thresholds

Delay increases by 25% or greater while maintaining the same LOS, or
LOS degrades by at least one level, or
LOS is "F"
Control delay is measured in seconds per vehicle
**Assumed to include a Traffic Signal and Northbound Right Turn Lane and Southbound Left Turn Lane*

US 25A (Sweeten Creek Road) at Wesley Drive
Table 6

Approach	Peak Hour	Existing			2024 Background			2024 Future		
		LOS	Delay		LOS	Delay		LOS	Delay	
Northbound (Sweeten Creek)	AM	B	19.6	1494	D	37.1	1954	D	42.1	1978
	PM	C	28.2	775	D	46.4	1954	E	66.1	1999
Southbound (Sweeten Creek)	AM	A	8.1	217	B	10.3	240	B	10.2	426
	PM	A	9.7	296	B	12.1	316	B	13.9	316
Westbound (Wesley Dr)	AM	F	83.7	67	F	86.5	49	F	86.5	50
	PM	F	95.7	196	F	105.1	216	F	105.1	284
Overall	AM	B	15.6		C	26.8		C	29.3	
	PM	C	23.2		C	33.9		D	44.8	

Exceeds NCDOT Thresholds
Delay increases by 25% or greater while maintaining the same LOS, or
LOS degrades by at least one level, or
LOS is "F"
Control delay is measured in seconds per vehicle

US 25A (Sweeten Creek Road) at Site Driveway #2
Table 7

Approach	Peak Hour	Existing		2024 Future		
		LOS	Delay	LOS	Delay	Queue
Northbound (US 25A)	AM	N/A	N/A	A	0.0	294
	PM	N/A	N/A	A	0.0	0
Southbound (US 25A)	AM	N/A	N/A	A	0.0	0
	PM	N/A	N/A	A	0.0	0
Westbound (Site Driveway #2)	AM	N/A	N/A	E	36.5	130
	PM	N/A	N/A	E	38.3	46

Exceeds NCDOT Thresholds

Delay increases by 25% or greater while maintaining the same LOS, or
LOS degrades by at least one level, or
LOS is "F"
Control delay is measured in seconds per vehicle

Traffic Signal Warrant Analysis

As part of the Busbee/Sweeten Creek Road Development Traffic Impact Analysis, Matterm & Craig performed a signal warrant analysis on the intersection of US 25A (Sweeten Creek Hill Road) and Carolina Day School Complex/Site Driveway #1 if a traffic signal is warranted at this particular location under existing and/or future conditions. The location of the analysis and potential traffic signal installation is shown in Appendix F of this report.

According to the ***2009 Manual on Uniform Traffic Control Devices***, an engineering study shall be performed to determine whether the installation of a traffic signal is justified at a particular location. The study shall include an analysis of the applicable factors contained in nine warrants *(listed below)* and other factors related to existing operation and safety at the study location.

- **Warrant 1, Eight-Hour Vehicular Volume** – *The purpose of this warrant is to consider the installation of a traffic signal because of either large volumes of traffic at intersecting streets (Condition A) or the need to interrupt continuous or near-continuous traffic on a large volume street (Condition B).*

- **Warrant 2, Four-Hour Vehicular Volume** – *The purpose of this warrant is to consider the installation of a traffic signal where, for four hours of the day, the minor-street traffic suffers undue delay trying to enter and/or cross the major street.*

- **Warrant 3, Peak Hour** – *The purpose of this warrant is to consider the installation of a traffic signal where, for a peak hour, the minor-street traffic suffers undue delay trying to enter and/or cross the major street. It is generally intended to be applied only in unusual cases such as office complexes or industrial complexes that attract and/or discharge large numbers of vehicles over a short period of time.*

- **Warrant 4, Pedestrian Volume** – *The purpose of this warrant is to consider the installation of a traffic signal on a major street where the traffic is so heavy that pedestrians experience excessive delay in crossing the major street.*

- **Warrant 5, School Crossing** – *The purpose of this warrant is to consider the installation of a traffic signal at a school crossing where children need adequate gaps in traffic.*

- **Warrant 6, Coordinated Signal System** – *The purpose of this warrant is to consider the installation of a traffic signal on a major street to maintain the desired platooning of traffic so that there is coordinated traffic movement along the street.*

- **Warrant 7, Crash Experience** – *The purpose of this warrant is to consider the installation of a traffic signal where it would be beneficial in reducing the frequency and/or severity of crashes at an intersection.*

- **Warrant 8, Roadway Network** – *The purpose of this warrant is to consider the installation of a traffic signal at the intersection of two major routes.*

- **Warrant 9, Intersection Near a Grade Crossing** – *The purpose of this warrant is to consider the installation of a traffic signal at an intersection where a grade crossing on one approach is in close proximity to the intersection.*

The traffic signal warrants have evolved over many years and represent the experiences of many traffic signal installations. They are considered to be a minimum threshold condition in the overall assessment of whether a traffic signal may be justified based on a comprehensive engineering study of the intersection's operations and safety benefits. **(Satisfaction of a traffic signal warrant(s) shall not in itself require the installation of a traffic signal).**

For the intersection of US 25A (Sweeten Creek Road) and the Carolina Day School Complex/Proposed Site Driveway #1, the 8-hour vehicular volume warrant *(Warrant 1)*, the four-hour vehicular volume warrant *(Warrant 2)*, the peak hour warrant *(Warrant 3)*, and the roadway network warrant *(Warrant 8)* were evaluated. The remaining warrants were not evaluated because they were not applicable to this particular location.

A traffic signal is considered justified when **all** of the following conditions are satisfied:

- One or more of the traffic signal warrants are met.

- The engineering study shows that the traffic signal installation will improve the overall operation and safety of the intersection.

- Other alternatives to a traffic signal installation have not been effective or are not feasible.

- The traffic signal will not seriously disrupt progressive traffic flow, now or in the future.

For this study, PC-Warrants *(Version 1.23.0); JAMAR Technologies, Inc.)* was used to analyze the various volume warrants.

The following assumptions were made in the analysis of the traffic signal warrants at the subject location:

Rural values apply since the posted speed limit exceeds 40 mph (posted speed limit is 45 mph).

Both mainline approaches and the minor approaches *(Site Driveway #1 and Carolina Day)* were modeled as **multi-lane approaches (2+ lanes)**

The results of the analysis at US 25A (Sweeten Creek Road) and the Carolina Day School Complex/Site Driveway #1 at Development Buildout conditions indicate that **four (4)**

warrants are met; the Eight Hour Vehicular Volume Warrant *(Warrant 1)*, the Four-Hour Volumes Warrant *(Warrant 2)*, the Peak-Hour Warrant *(Warrant 3)*, the Roadway Network *(Warrant 8)* with no volume reductions (See Appendix F). As such, **a traffic signal is warranted** at this location under 2024 future conditions.

- Trip distribution was performed to route traffic to and from the two (2) proposed access points to the development. Only traffic routed through the primary access (Site Driveway #1) intersection was used in the signal warrants analysis.

- No right turns on red (RTOR) reduction was applied to the forecasted westbound right turns.

- Internal capture was not applicable since the development is all residential land uses (the ITE Trip Generation Manual does not contain internal capture rates for this mix land uses).

- The trip generated 24-hour approach traffic volumes were generated assuming that the highest peak hour approach volume is twelve (12) percent of the 24-hour volume. The software estimated the volume distributed throughout the day by using the volume profile as defined in ***Traffic Engineering Theory and Practice***, Louis J. Pignataro (as provided within the PC Warrants software program). After the 24-hour volumes were distributed the calculated peak hour turning movement volumes where input with minor adjustments to the estimated hourly counts.

Conclusions/Suggestions

A multi-use development, known as "Busbee/Sweeten Creek Road Development" is proposed on US 25A (Sweeten Creek Road) south of I-40 in Buncombe County, NC. The development is expected to be built out in the year 2024. The Busbee/Sweeten Creek Road development will consist of 630 mid-rise apartment units, 211 senior housing units, and 11 single family units.

The development is located in South Asheville area along US 25A (Sweeten Creek Road) (See Figure 1). US 25A (Sweeten Creek Road) is maintained by NCDOT as a primary roadway and runs north to south from US 25 (McDowell Street) to US 25 (Hendersonville Road) at NC 280 (Airport Road). Access to the site is provided by two (2) connections on US 25A (Sweeten Creek Road). The main driveway (#1) will be across from the Carolina Day Driveway and it will be a full movement intersection. The second driveway will be south of the main driveway (#2) and will be constructed in a right-in/right-out configuration.

In accordance with NCDOT TIA Guidelines, the signalized intersections were modeled as being part of a coordinated system. During the analyses, levels of service may change in unexpected fashions due to coordination of the system as a whole. Certain intersections may have a change in Level of Service grade to show a decrease in delay even with additional traffic in the background or future time periods. This is usually the result of cycle length optimization. The minimum cycle length allowed was 90 seconds for a three-phase signal and 120 for a 4 phase. Synchro modeling software predicted that certain cycle lengths greater than 180 seconds would be the most efficient for the system during several peak hour time periods.

The traffic signals at the intersections in this analysis should be optimized for traffic conditions as they change. Because NCDOT has sole jurisdiction for the operation and maintenance of the signals, this should not be a responsibility of the development (See Appendix G for the NCDOT TIA Checklist).

*Note: The **NCDOT STIP project, U-2801**, is planned in the area of this project. It will widen US 25A (Sweeten Creek Road) from a two-lane road to a four-lane divided roadway with right-turn lanes and left-turn lanes at U-turn bulbouts. In turn, it will impact the intersections on US 25A (Sweeten Creek Road from the Rock Hill Road intersection south to US 25 (Hendersonville Road). Since no formal plans were available at this time, this project was assumed to be completed after the buildout of the Busbee/Sweeten Creek Road Development. The Level of Service of the intersections along Sweeten Creek Road should be greatly improved by the increased capacity of the intersections resulting from the construction of the project (See Appendix G).*

For modeling purposes, right turns on red were prohibited. Additionally, all left turns with dedicated left-turn lanes were modeled as protected only. The signalized intersections were modeled as being part of a coordinated system.

This traffic impact analysis (TIA) has demonstrated that it is reasonable to conclude that the construction of Busbee/Sweeten Creek Road development **should not have a significant adverse impact on the surrounding roadway network.**

Intersection of US 25A (Sweeten Creek Road) and Rock Hill Road

- The traffic signal at this intersection should be optimized for traffic conditions as they change. Because NCDOT has sole jurisdiction for the operation and maintenance of the signal, this should not be a responsibility of the development.
- This intersection was modeled as an "actuated-uncoordinated" intersection for the existing and future conditions.
- The ***Existing*** AM peak hour intersection delay experienced by this intersection is currently 30.2 seconds and it is currently operating at an LOS of "C". During the ***2024 Background*** AM peak hour condition, the intersection will experience a delay of 35.5 seconds and an LOS of "D". During the ***2024 Future*** AM peak hour condition, the intersection will experience a delay of 37.5 seconds and an LOS of "D".
- During the ***Existing*** PM peak hour, the intersection experiences an intersection delay of 31.8 seconds and an LOS of "C". The delay is expected to be 37.6 seconds and the LOS will be "D" during the ***2024 Background*** PM peak hour condition. During the ***2024 Future*** PM peak hour condition, the intersection will experience a delay of 40.7 seconds and an LOS of "D".
- Therefore, no geometric changes to this intersection are recommended based on this Traffic Impact Study.

Intersection of US 25A (Sweeten Creek Road) and Carolina Day Complex and Site Driveway #1

- This intersection is currently a three (3) legged intersection. It was modeled as an "Two-Way Stop Controlled" intersection, with a Stop sign on the Carolina Day Complex approach.
- During the ***Existing*** AM peak hour, the eastbound Carolina Day approach experiences 63.0 seconds of delay and an LOS of "F". During the ***2024 Background*** AM peak hour condition, the eastbound approach will experience a delay of 91.0 seconds and an LOS of "F". During the ***2024 Future*** AM peak hour condition, the intersection will experience a delay of 45.6 seconds and an LOS of "D", with the installation of a traffic signal and left and right-turn lanes into the development.
- During the ***Existing*** PM peak hour, the eastbound Carolina Day approach experiences 99.9 seconds of delay and an LOS of "F". The delay is expected to be 152.5 seconds and the LOS will be "F" during the ***2024 Background*** PM peak hour condition. During the ***2024 Future*** PM peak hour condition, the intersection will experience a

delay of 49.4 seconds and an LOS of "D".

- It is the opinion of Mattern & Craig that a traffic signal and turn lanes to and from the development are required. The additional lanes needed are; a southbound left-turn lane, a northbound right-turn lane, westbound left-turn lane, westbound through/right-turn lane. This traffic signal was modeled as an "actuated-uncoordinated" intersection due to the large distance (approx. 1 mile) between the closest signals both north and south of the development. According the signal warrant analysis discussed in the Signal Warrant section of this study, the intersection will meet 4 warrants; therefore, was assumed to be installed for the Future condition.

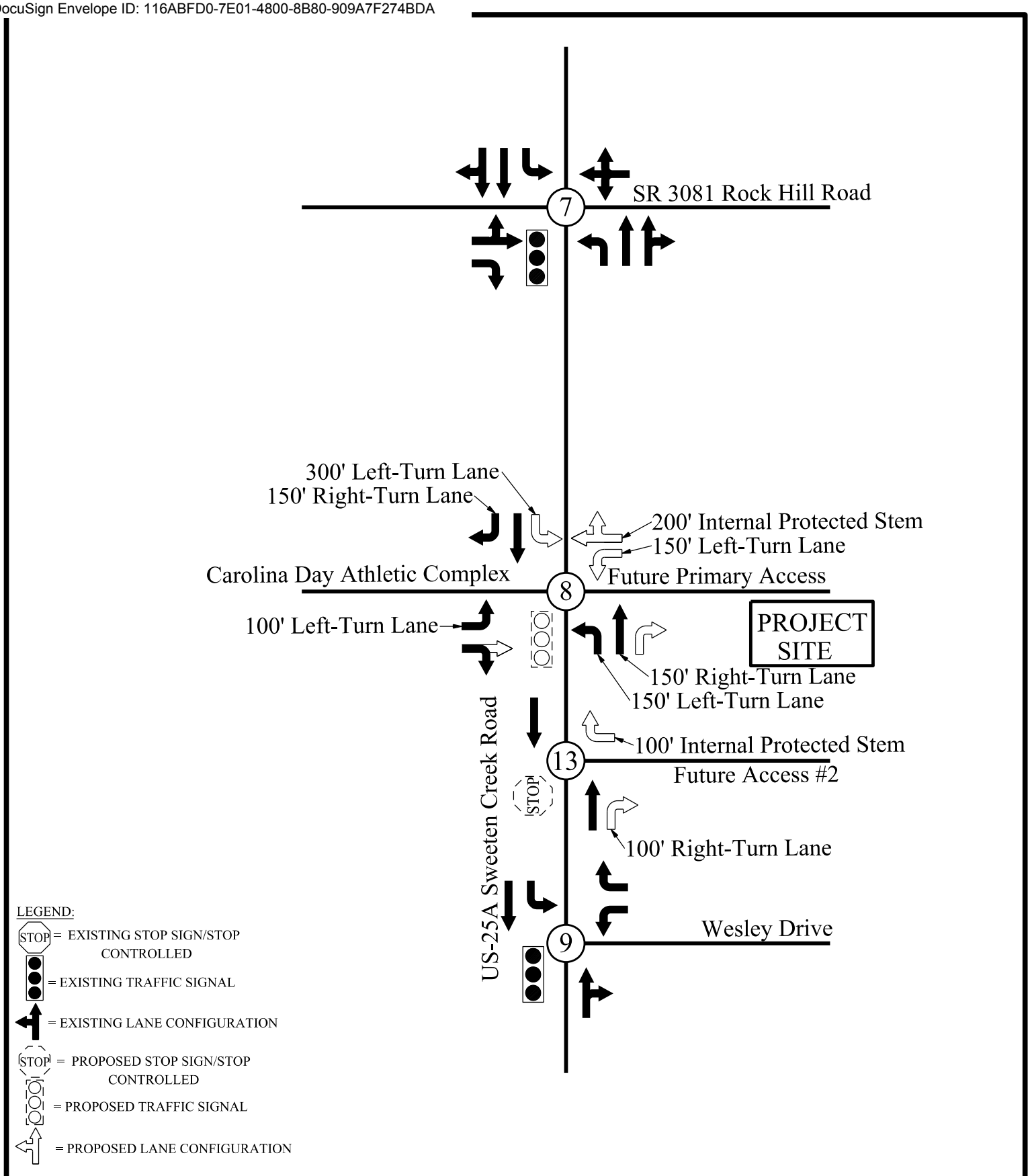
Intersection of US 25A (Sweeten Creek Road) and Site Driveway #2

- This future intersection will serve the development as a secondary access for ingress and egress. This intersection is a three (3) legged intersection. It was modeled as an "Two-Way Stop Controlled" intersection, with a Stop sign on westbound (Site Access) and will operate as a right-in/right-out. The southbound and westbound left-turn movements will not be permitted.
- During the ***2024 Future*** AM peak hour conditions, the westbound approach will experience an LOS of "E" with 36.5 seconds of delay.
- During the ***2024 Future*** PM peak hour conditions, the westbound approach will experience an LOS of "E" with 38.3 seconds of delay.

Intersection of US 25A (Sweeten Creek Road) and Wesley Drive

- The traffic signal at this intersection should be optimized for traffic conditions as they change. Because NCDOT has sole jurisdiction for the operation and maintenance of the signal, this should not be a responsibility of the development.
- This intersection was modeled as an "actuated-coordinated" intersection in the existing and the future conditions.
- The ***Existing*** AM peak hour intersection delay experienced by this intersection is currently 15.6 seconds and it is currently operating at an LOS of "B". During the ***2024 Background*** AM peak hour condition, the intersection will experience a delay of 26.8 seconds and an LOS of "C". During the ***2024 Future*** AM peak hour condition, the intersection will experience a delay of 29.3 seconds and an LOS of "C".
- During the ***Existing*** PM peak hour, the intersection experiences an intersection delay of 23.2 seconds and an LOS of "C". The delay is expected to be 33.9 seconds and the LOS will be "C" during the ***2024 Background*** PM peak hour condition. During the ***2024 Future*** PM peak hour condition, the intersection will experience a delay of 44.8 seconds and an LOS of "D".

- Therefore, no geometric changes to this intersection are recommended based on this Traffic Impact Study.



RECOMMENDED LANE GEOMETRY

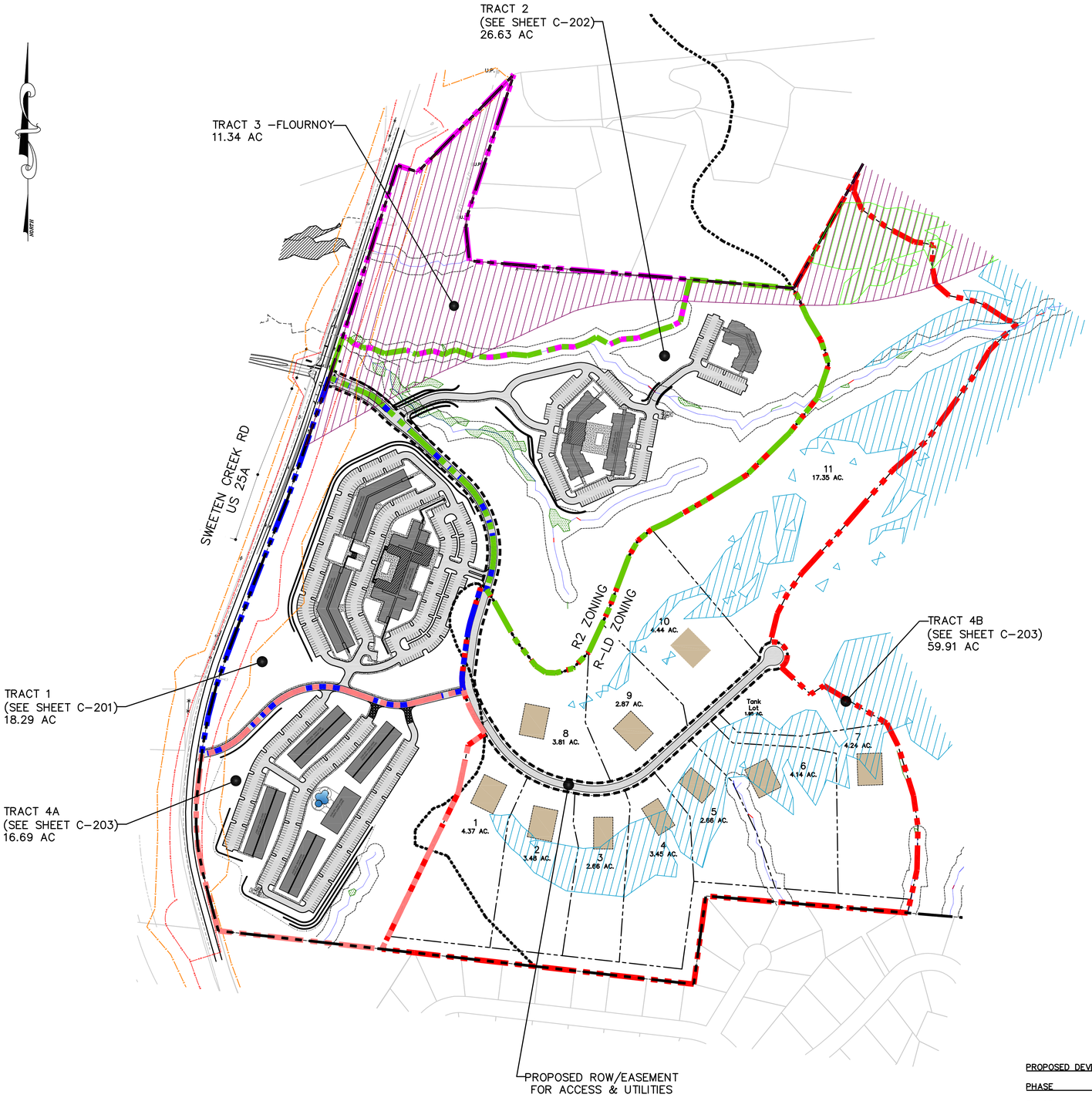
Busbee Property Sweeten Creek
Asheville, NC

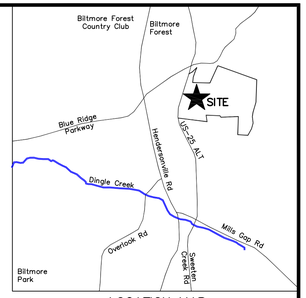
Comm. No. 3973

Mattern & Craig
ENGINEERS - SURVEYORS
FIRM LICENSE No. C-1154
12 BROAD STREET
ASHEVILLE, NORTH CAROLINA 28801
PHONE (828) 254-2201
FAX (828) 254-4562

Figure:
8

APPENDIX A





LOCATION MAP
N.T.S.

PROJECT SUMMARY

PROJECT NAME:	BUSBEE
PIN #	9656-42-9538
DB/PG:	1222/0645
ZONING	R2 75.31 AC./RLD 256.69 AC. (BUNCOMBE COUNTY)
OWNER	BILTMORE FARMS, LLC ASHEVILLE, NC 28803
DEVELOPER	FLOURNOY DEVELOPMENT COMPANY
ENGINEER	WILLIAM R. BUIE, P.E. WGLA ENGINEERING, PLLC 724 5TH AVENUE WEST HENDERSONVILLE, NC 28739
ACREAGE	331.82 AC±
ALLOWABLE DENSITY	R2 - 75.13 AC. x 12 UNITS/AC. = 902 R-LD - 57.76 AC. x 2 UNITS/AC. = 116 TOTAL ALLOWABLE UNITS = 1018
WATER SYSTEM	ON SITE (PUBLIC) CITY OF ASHEVILLE
SEWER SYSTEM	ON SITE (PUBLIC) MSD OF BUNCOMBE COUNTY
BUILDING SETBACKS for R-LD	FRONT -10' SIDE -10' REAR -20'
BUILDING SETBACKS for R-2	FRONT -20' SIDE -10' REAR -20'

LEGEND

- BLUE RIDGE PARKWAY OVERLAY
- PROTECTED RIDGES OVERLAY
- STEEP SLOPE/HIGH ELEVATION OVERLAY
- SLOPE/HIGH PARKWAY OVERLAY
- CEC STREAM
- CEC CULVERT
- CEC WETLAND
- CEC BUFFER

PROPOSED DEVELOPMENT

PHASE	UNITS	NATURAL SLOPE	ACRES	UNITS/AC
TRACT 1	315 APARTMENT UNITS	21.03%	18.29 AC.	17.22 UNITS/AC.
TRACT 2	211 AGE TARGETED UNITS (Age 55+)	22.62%	26.67 AC.	7.91 UNITS/AC.
TRACT 3		16.50%	11.34 AC.	
TRACT 4A	315 APT UNITS	22.63%	16.69 AC.	18.87 UNITS/AC.
TRACT 4B	11 SINGLE FAMILY LOTS	31.09%	59.91 AC.	0.18 UNITS/AC.
	852	25.76%	132.90 AC.±	6.41 UNITS/AC.

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)

WGLA Engineering

WGLA ENGINEERING, PLLC
724 5th AVENUE WEST
HENDERSONVILLE, NC 28739
(828) 687-7177
WGLA.COM
NC LICENSE P-1342

Busbee

Limestone Township
Buncombe County
North Carolina

NORTH CAROLINA REGISTERED PROFESSIONAL ENGINEER 23985 WILLIAM R. BUIE

Preliminary Not For Construction

REVISIONS

DATE	DESCRIPTION
7-9-20	CONCEPTUAL PLAN SUBMITTAL

811 Know what's below. Call before you dig.

PROJECT NUMBER:	18181
DATE:	6/20
DRAWN BY:	KHC
CHECKED BY:	WRB

Master
Site Plan

C-200

SCALE: 1"=200'

APPENDIX B

Mattern & Craig, Inc.
12 Broad St.
Asheville, NC, 28801
Phone: (828) 254-2201
Fax: (828) 254-4562

File Name : 7-AM
Site Code : 3973-AM
Start Date : 5/16/2019
Page No : 1

Groups Printed- PV - Duals - TTST - Twins - Pedestrians

	Sweeten Creek Road Southbound					Rock Hill Road Westbound					Sweeten Creek Road Northbound					Rock Hill Road Eastbound							
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	39	125	3	0	167	7	10	8	0	25	2	180	23	0	205	2	4	29	0	35	0	432	432
07:15 AM	42	155	1	0	198	9	17	2	0	28	2	228	21	0	251	6	4	56	0	66	0	543	543
07:30 AM	66	212	1	0	279	9	8	13	0	30	2	239	15	0	256	4	3	65	0	72	0	637	637
07:45 AM	50	212	2	0	264	10	10	7	0	27	5	225	27	0	257	6	4	61	0	71	0	619	619
Total	197	704	7	0	908	35	45	30	0	110	11	872	86	0	969	18	15	211	0	244	0	2231	2231
08:00 AM	41	126	3	0	170	9	12	13	0	34	4	234	17	0	255	3	6	61	0	70	0	529	529
08:15 AM	40	173	1	0	214	7	6	5	0	18	6	239	15	0	260	6	3	57	0	66	0	558	558
08:30 AM	53	163	3	0	219	4	8	6	0	18	3	220	19	0	242	6	5	42	0	53	0	532	532
08:45 AM	51	172	6	0	229	7	5	7	0	19	1	198	17	0	216	5	5	51	0	61	0	525	525
Total	185	634	13	0	832	27	31	31	0	89	14	891	68	0	973	20	19	211	0	250	0	2144	2144
Grand Total	382	1338	20	0	1740	62	76	61	0	199	25	1763	154	0	1942	38	34	422	0	494	0	4375	4375
Apprch %	22	76.9	1.1			31.2	38.2	30.7			1.3	90.8	7.9			7.7	6.9	85.4					
Total %	8.7	30.6	0.5		39.8	1.4	1.7	1.4		4.5	0.6	40.3	3.5		44.4	0.9	0.8	9.6		11.3	0	100	
PV	369	1266	19		1654	62	74	61		197	24	1696	153		1873	38	33	415		486	0	0	4210
% PV	96.6	94.6	95	0	95.1	100	97.4	100	0	99	96	96.2	99.4	0	96.4	100	97.1	98.3	0	98.4	0	0	96.2
Duals	12	51	1		64	0	1	0		1	1	47	1		49	0	0	7		7	0	0	121
% Duals	3.1	3.8	5	0	3.7	0	1.3	0	0	0.5	4	2.7	0.6	0	2.5	0	0	1.7	0	1.4	0	0	2.8
TTST	1	21	0		22	0	1	0		1	0	20	0		20	0	1	0		1	0	0	44
% TTST	0.3	1.6	0	0	1.3	0	1.3	0	0	0.5	0	1.1	0	0	1	0	2.9	0	0	0.2	0	0	1
Twins	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0
% Twins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Site Code : 3973-AM
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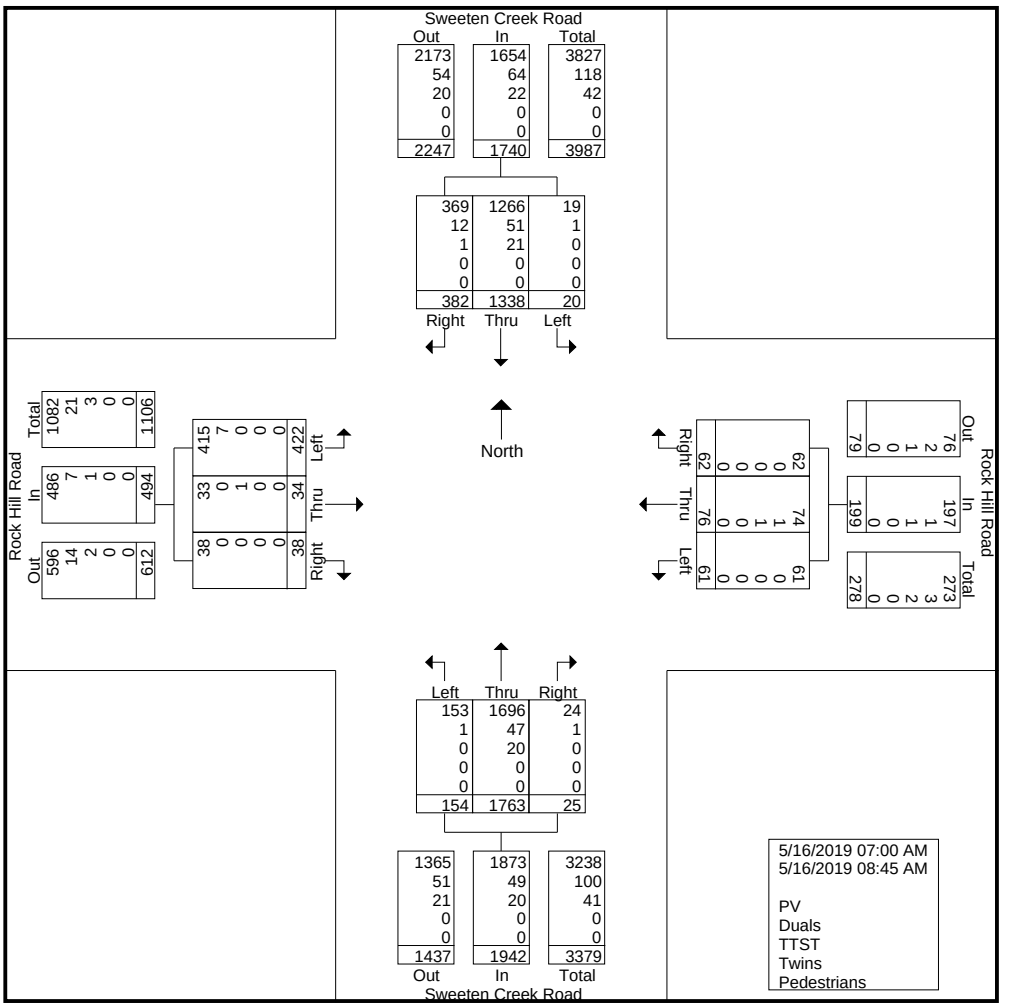

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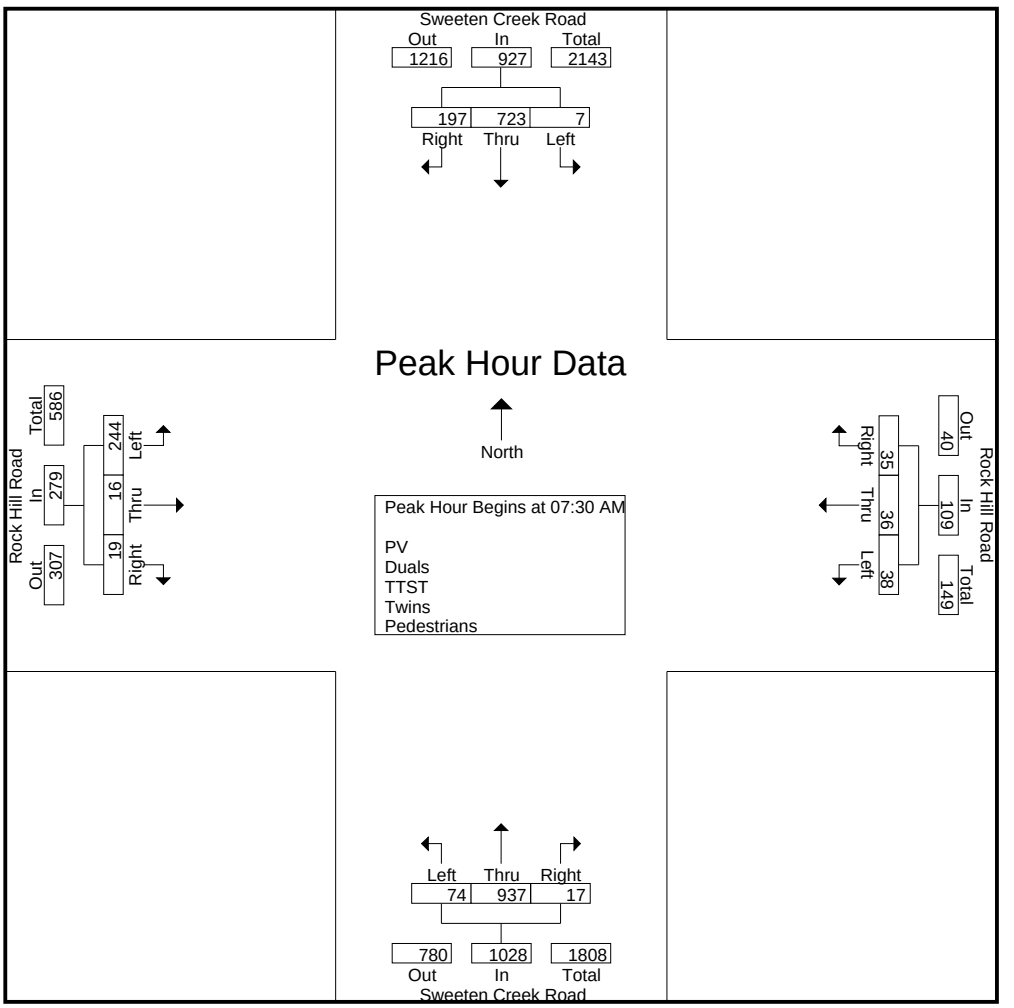
	Sweeten Creek Road Southbound				Rock Hill Road Westbound				Sweeten Creek Road Northbound				Rock Hill Road Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	66	212	1	279	9	8	13	30	2	239	15	256	4	3	65	72	637
07:45 AM	50	212	2	264	10	10	7	27	5	225	27	257	6	4	61	71	619
08:00 AM	41	126	3	170	9	12	13	34	4	234	17	255	3	6	61	70	529
08:15 AM	40	173	1	214	7	6	5	18	6	239	15	260	6	3	57	66	558
Total Volume	197	723	7	927	35	36	38	109	17	937	74	1028	19	16	244	279	2343
% App. Total	21.3	78	0.8		32.1	33	34.9		1.7	91.1	7.2		6.8	5.7	87.5		
PHF	.746	.853	.583	.831	.875	.750	.731	.801	.708	.980	.685	.988	.792	.667	.938	.969	.920



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File Name : 7-PM
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Start Date : 5/16/2019
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Groups Printed- PV - Duals - TTST - Twins - Pedestrians

	Sweeten Creek Road Southbound					Rock Hill Road Westbound					Sweeten Creek Road Northbound					Rock Hill Road Eastbound							
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	58	191	8	0	257	5	3	5	2	13	7	197	19	0	223	10	16	57	0	83	2	576	578
04:15 PM	79	233	11	0	323	4	8	5	0	17	4	214	14	0	232	5	12	46	0	63	0	635	635
04:30 PM	75	200	7	0	282	7	8	6	0	21	8	216	12	0	236	14	9	49	0	72	0	611	611
04:45 PM	57	181	6	0	244	6	10	5	0	21	3	237	9	0	249	13	9	48	0	70	0	584	584
Total	269	805	32	0	1106	22	29	21	2	72	22	864	54	0	940	42	46	200	0	288	2	2406	2408
05:00 PM	84	242	7	0	333	4	5	5	0	14	3	220	12	0	235	16	8	47	0	71	0	653	653
05:15 PM	65	239	8	0	312	1	9	4	1	14	5	238	22	0	265	8	12	56	0	76	1	667	668
05:30 PM	73	213	9	0	295	8	5	5	0	18	5	208	13	0	226	13	14	69	0	96	0	635	635
05:45 PM	59	150	6	0	215	7	6	4	0	17	7	200	15	0	222	11	21	46	0	78	0	532	532
Total	281	844	30	0	1155	20	25	18	1	63	20	866	62	0	948	48	55	218	0	321	1	2487	2488
Grand Total	550	1649	62	0	2261	42	54	39	3	135	42	1730	116	0	1888	90	101	418	0	609	3	4893	4896
Apprch %	24.3	72.9	2.7			31.1	40	28.9			2.2	91.6	6.1			14.8	16.6	68.6					
Total %	11.2	33.7	1.3		46.2	0.9	1.1	0.8		2.8	0.9	35.4	2.4		38.6	1.8	2.1	8.5		12.4	0.1	99.9	
PV	541	1604	62		2207	42	54	39		135	42	1677	116		1835	90	101	406		597	0	0	4774
% PV	98.4	97.3	100	0	97.6	100	100	100	0	97.8	100	96.9	100	0	97.2	100	100	97.1	0	98	0	0	97.5
Duals	8	33	0		41	0	0	0		0	0	27	0		27	0	0	12		12	0	0	80
% Duals	1.5	2	0	0	1.8	0	0	0	0	0	0	1.6	0	0	1.4	0	0	2.9	0	2	0	0	1.6
TTST	1	12	0		13	0	0	0		0	0	26	0		26	0	0	0		0	0	0	39
% TTST	0.2	0.7	0	0	0.6	0	0	0	0	0	0	1.5	0	0	1.4	0	0	0	0	0	0	0	0.8
Twins	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0
% Twins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0		0	0	0	0		3	0	0	0		0	0	0	0		0	0	0	3
% Pedestrians	0	0	0	0	0	0	0	0	100	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0.1

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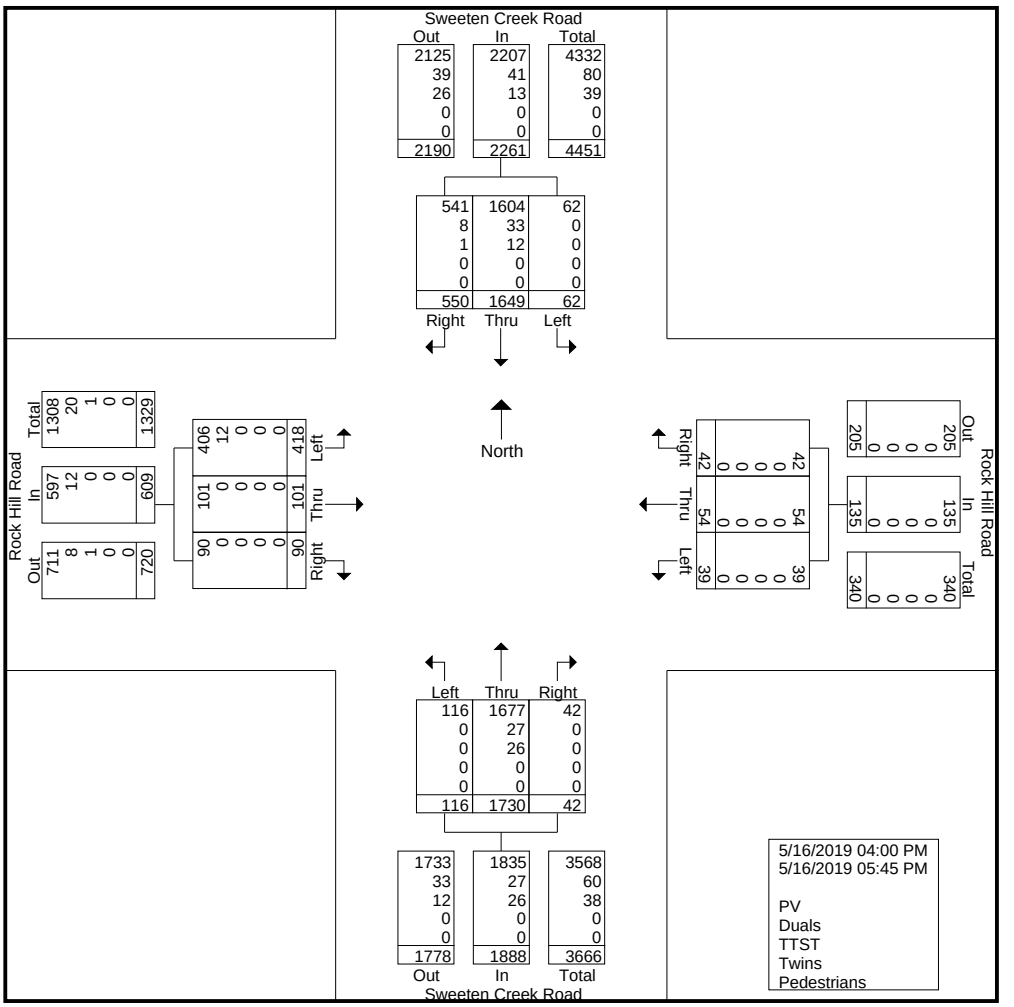

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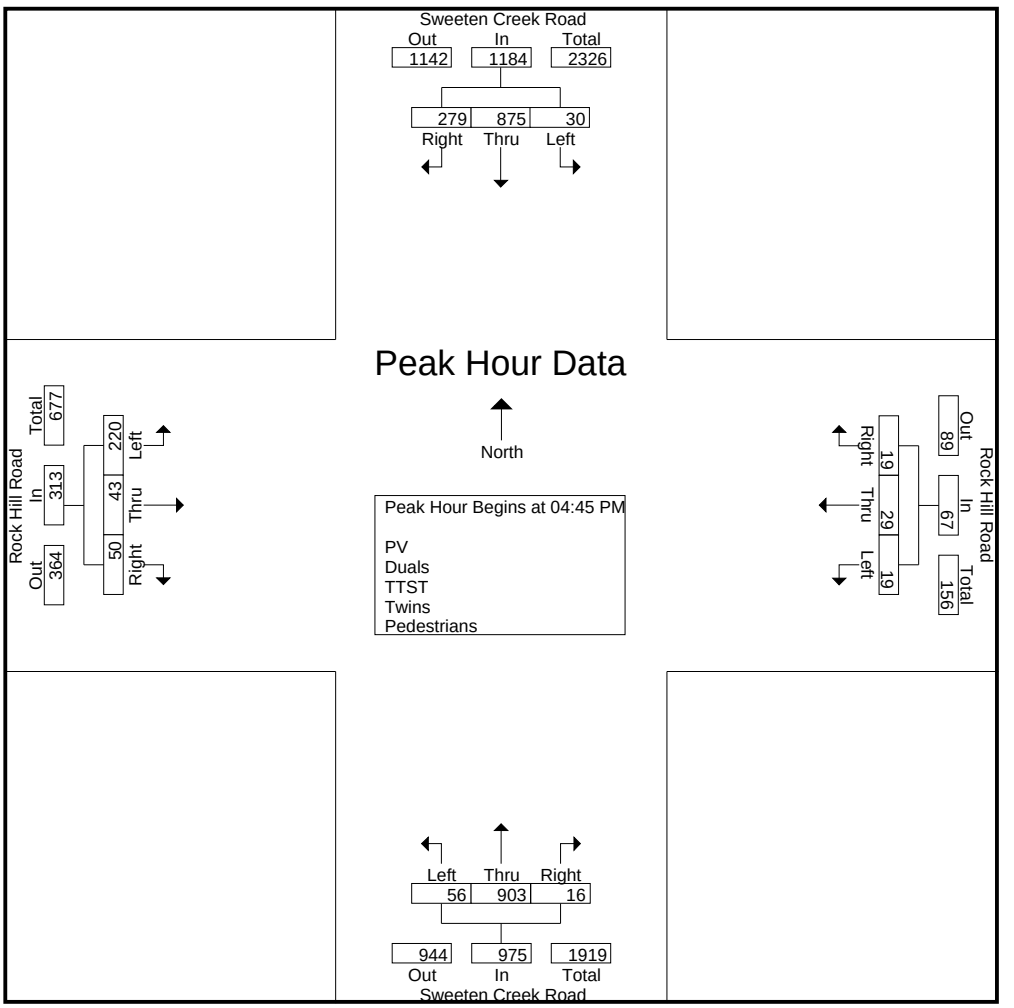
	Sweeten Creek Road Southbound				Rock Hill Road Westbound				Sweeten Creek Road Northbound				Rock Hill Road Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	57	181	6	244	6	10	5	21	3	237	9	249	13	9	48	70	584
05:00 PM	84	242	7	333	4	5	5	14	3	220	12	235	16	8	47	71	653
05:15 PM	65	239	8	312	1	9	4	14	5	238	22	265	8	12	56	76	667
05:30 PM	73	213	9	295	8	5	5	18	5	208	13	226	13	14	69	96	635
Total Volume	279	875	30	1184	19	29	19	67	16	903	56	975	50	43	220	313	2539
% App. Total	23.6	73.9	2.5		28.4	43.3	28.4		1.6	92.6	5.7		16	13.7	70.3		
PHF	.830	.904	.833	.889	.594	.725	.950	.798	.800	.949	.636	.920	.781	.768	.797	.815	.952



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File Name : 13 Hour
Site Code : 3973-13
Start Date : 5/23/2019
Page No : 1

Groups Printed- PV - Duals - TTST - Twins - Pedestrians

	Sweeten Creek Road From North				Sweeten Creek Road From South				Carolina Day School Field Entrance From West						
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Exclu. Total	Inclu. Total	Int. Total
06:00 AM	0	72	0	72	94	0	0	94	0	0	0	0	0	166	166
06:15 AM	0	84	0	84	118	0	0	118	0	0	0	0	0	202	202
06:30 AM	0	138	0	138	177	0	0	177	0	0	0	0	0	315	315
06:45 AM	0	135	0	135	198	1	0	199	0	0	0	0	0	334	334
Total	0	429	0	429	587	1	0	588	0	0	0	0	0	1017	1017
07:00 AM	0	127	0	127	243	0	0	243	0	0	0	0	0	370	370
07:15 AM	0	180	0	180	288	0	0	288	0	0	0	0	0	468	468
07:30 AM	0	241	0	241	319	1	0	320	0	0	0	0	0	561	561
07:45 AM	0	264	0	264	307	0	0	307	0	0	0	0	0	571	571
Total	0	812	0	812	1157	1	0	1158	0	0	0	0	0	1970	1970
08:00 AM	0	176	0	176	296	0	0	296	0	0	0	0	0	472	472
08:15 AM	5	204	0	209	305	1	0	306	0	0	0	0	0	515	515
08:30 AM	9	157	0	166	252	2	0	254	0	0	0	0	0	420	420
08:45 AM	4	188	0	192	232	0	0	232	0	0	0	0	0	424	424
Total	18	725	0	743	1085	3	0	1088	0	0	0	0	0	1831	1831
09:00 AM	1	152	0	153	191	0	0	191	0	0	0	0	0	344	344
09:15 AM	1	152	0	153	176	0	0	176	0	1	0	1	0	330	330
09:30 AM	0	163	0	163	199	1	0	200	1	1	0	2	0	365	365
09:45 AM	0	170	0	170	207	0	0	207	0	0	0	0	0	377	377
Total	2	637	0	639	773	1	0	774	1	2	0	3	0	1416	1416
10:00 AM	0	151	0	151	175	0	0	175	0	0	0	0	0	326	326
10:15 AM	0	138	0	138	176	0	0	176	1	11	0	12	0	326	326
10:30 AM	3	140	0	143	162	0	0	162	0	2	0	2	0	307	307
10:45 AM	0	207	0	207	181	0	0	181	0	0	0	0	0	388	388
Total	3	636	0	639	694	0	0	694	1	13	0	14	0	1347	1347
11:00 AM	1	165	0	166	167	1	0	168	0	1	0	1	0	335	335
11:15 AM	1	192	0	193	204	0	0	204	1	1	0	2	0	399	399
11:30 AM	0	172	0	172	185	2	0	187	1	0	0	1	0	360	360
11:45 AM	0	172	0	172	190	0	0	190	0	0	0	0	0	362	362
Total	2	701	0	703	746	3	0	749	2	2	0	4	0	1456	1456
12:00 PM	1	178	0	179	200	0	0	200	0	0	0	0	0	379	379
12:15 PM	0	182	0	182	231	1	0	232	0	0	0	0	0	414	414
12:30 PM	3	219	0	222	192	0	0	192	0	0	0	0	0	414	414
12:45 PM	0	188	0	188	208	0	0	208	0	0	0	0	0	396	396
Total	4	767	0	771	831	1	0	832	0	0	0	0	0	1603	1603
01:00 PM	2	183	0	185	220	3	0	223	0	2	0	2	0	410	410
01:15 PM	0	198	0	198	158	1	0	159	1	1	0	2	0	359	359
01:30 PM	2	171	0	173	216	2	0	218	2	1	0	3	0	394	394
01:45 PM	2	221	0	223	269	1	0	270	0	1	0	1	0	494	494
Total	6	773	0	779	863	7	0	870	3	5	0	8	0	1657	1657
02:00 PM	3	225	0	228	239	1	0	240	0	0	0	0	0	468	468
02:15 PM	0	227	0	227	269	1	0	270	1	0	0	1	0	498	498
02:30 PM	1	209	0	210	236	1	0	237	0	0	0	0	0	447	447
02:45 PM	1	226	0	227	255	2	0	257	1	0	0	1	0	485	485
Total	5	887	0	892	999	5	0	1004	2	0	0	2	0	1898	1898

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Groups Printed- PV - Duals - TTST - Twins - Pedestrians

	Sweeten Creek Road From North				Sweeten Creek Road From South				Carolina Day School Field Entrance From West						
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Exclu. Total	Inclu. Total	Int. Total
03:00 PM	0	221	0	221	239	4	0	243	2	0	0	2	0	466	466
03:15 PM	3	255	0	258	224	1	0	225	0	0	0	0	0	483	483
03:30 PM	2	248	0	250	259	1	0	260	1	1	0	2	0	512	512
03:45 PM	1	228	0	229	268	0	0	268	0	0	0	0	0	497	497
Total	6	952	0	958	990	6	0	996	3	1	0	4	0	1958	1958
04:00 PM	2	209	0	211	260	3	0	263	1	1	0	2	0	476	476
04:15 PM	7	270	0	277	292	0	0	292	0	1	0	1	0	570	570
04:30 PM	1	278	0	279	310	4	0	314	1	0	0	1	0	594	594
04:45 PM	5	278	0	283	357	3	0	360	1	1	0	2	0	645	645
Total	15	1035	0	1050	1219	10	0	1229	3	3	0	6	0	2285	2285
05:00 PM	0	277	0	277	307	0	0	307	1	2	0	3	0	587	587
05:15 PM	0	235	0	235	272	0	0	272	0	0	0	0	0	507	507
05:30 PM	0	285	0	285	304	0	0	304	0	0	0	0	0	589	589
05:45 PM	3	234	0	237	292	0	0	292	0	0	0	0	0	529	529
Total	3	1031	0	1034	1175	0	0	1175	1	2	0	3	0	2212	2212
06:00 PM	0	256	0	256	298	1	0	299	0	0	0	0	0	555	555
06:15 PM	1	198	0	199	267	0	0	267	0	0	0	0	0	466	466
06:30 PM	0	197	0	197	225	0	0	225	0	0	0	0	0	422	422
06:45 PM	2	167	0	169	186	3	0	189	2	1	0	3	0	361	361
Total	3	818	0	821	976	4	0	980	2	1	0	3	0	1804	1804
Grand Total	67	10203	0	10270	12095	42	0	12137	18	29	0	47	0	22454	22454
Apprch %	0.7	99.3			99.7	0.3			38.3	61.7					
Total %	0.3	45.4		45.7	53.9	0.2		54.1	0.1	0.1		0.2	0	100	
PV	44	9625		9669	11504	26		11530	16	29		45	0	0	21244
% PV	65.7	94.3	0	94.1	95.1	61.9	0	95	88.9	100	0	95.7	0	0	94.6
Duals	22	456		478	454	16		470	2	0		2	0	0	950
% Duals	32.8	4.5	0	4.7	3.8	38.1	0	3.9	11.1	0	0	4.3	0	0	4.2
TTST	1	122		123	133	0		133	0	0		0	0	0	256
% TTST	1.5	1.2	0	1.2	1.1	0	0	1.1	0	0	0	0	0	0	1.1
Twins	0	0		0	4	0		4	0	0		0	0	0	4
% Twins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0		0	0	0		0	0	0		0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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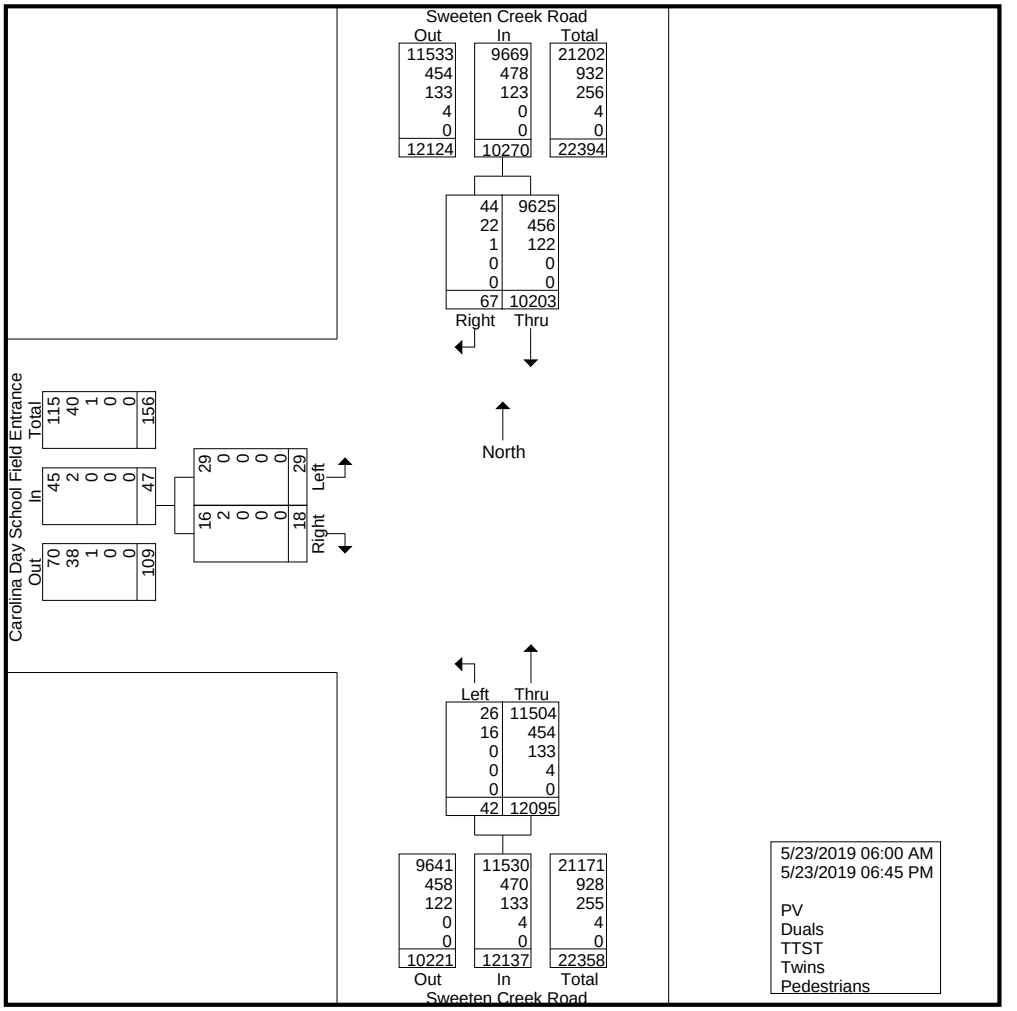

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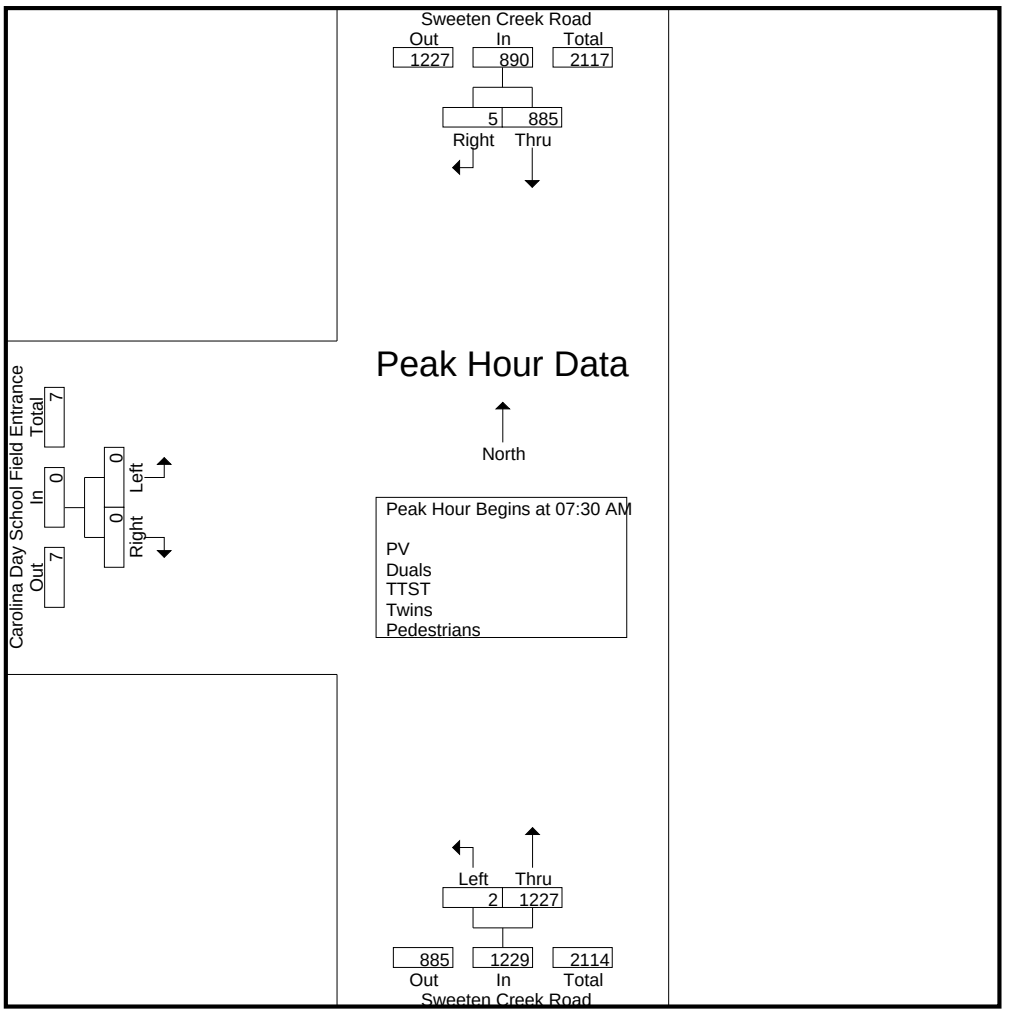
	Sweeten Creek Road From North			Sweeten Creek Road From South			Carolina Day School Field Entrance From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:30 AM										
07:30 AM	0	241	241	**319**	**1**	**320**	0	0	0	561
07:45 AM	0	**264**	**264**	307	0	307	0	0	0	**571**
08:00 AM	0	176	176	296	0	296	0	0	0	472
08:15 AM	**5**	204	209	305	1	306	0	0	0	515
Total Volume	5	885	890	1227	2	1229	0	0	0	2119
% App. Total	0.6	99.4		99.8	0.2		0	0		
PHF	.250	.838	.843	.962	.500	.960	.000	.000	.000	.928



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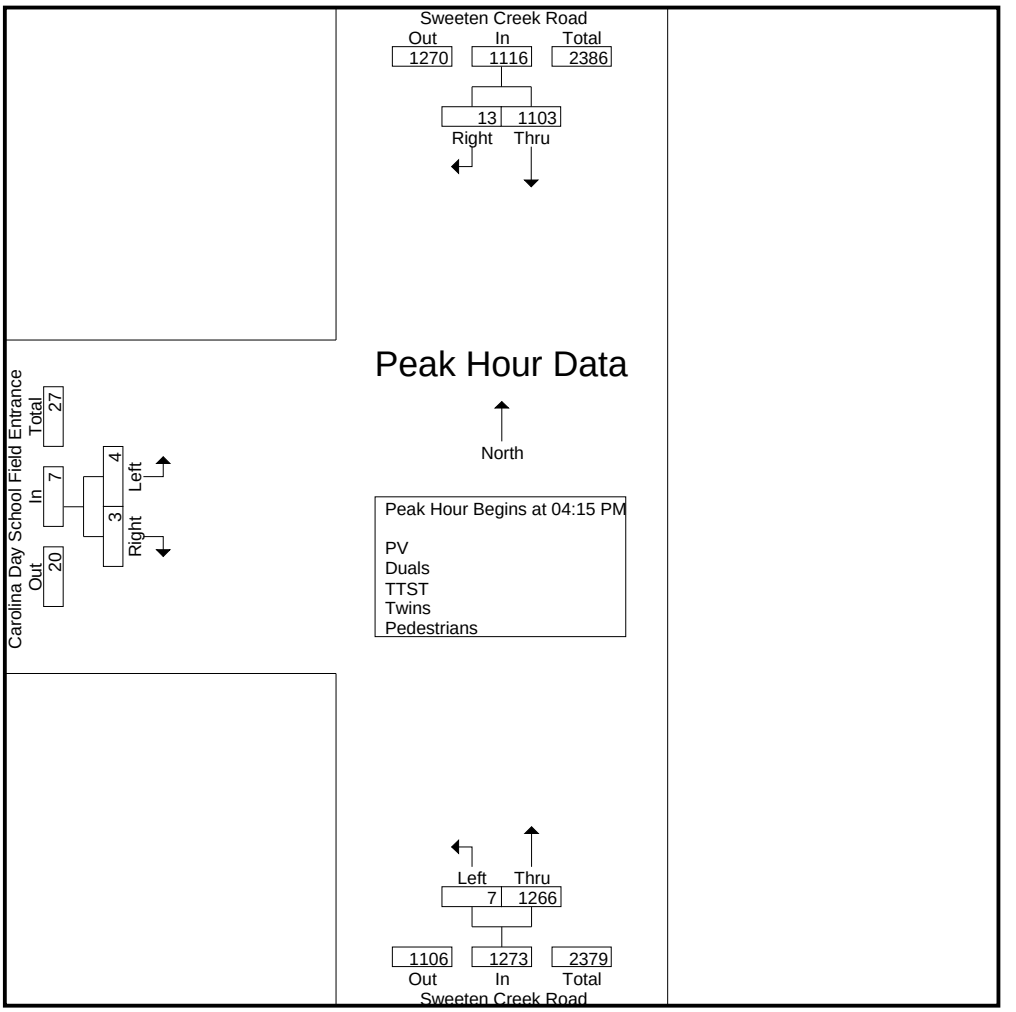
File Name : 13 Hour
Site Code : 3973-13
Start Date : 5/23/2019
Page No : 5

	Sweeten Creek Road From North			Sweeten Creek Road From South			Carolina Day School Field Entrance From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 06:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:15 PM										
04:15 PM	**7**	270	277	292	0	292	0	1	1	570
04:30 PM	1	**278**	279	310	**4**	314	**1**	0	1	594
04:45 PM	5	278	**283**	**357**	3	**360**	1	1	2	**645**
05:00 PM	0	277	277	307	0	307	1	**2**	**3**	587
Total Volume	13	1103	1116	1266	7	1273	3	4	7	2396
% App. Total	1.2	98.8		99.5	0.5		42.9	57.1		
PHF	.464	.992	.986	.887	.438	.884	.750	.500	.583	.929



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File Name : 9-AM
Site Code : 3973-AM
Start Date : 5/14/2019
Page No : 1

Groups Printed- PV - Duals - TTST - Twins - Pedestrians

	Sweeten Creek Road From North				Wesley Drive From East				Sweeten Creek Road From South						
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	157	5	0	162	4	2	0	6	5	270	0	275	0	443	443
07:15 AM	210	10	0	220	1	3	0	4	11	294	0	305	0	529	529
07:30 AM	214	10	0	224	3	2	0	5	15	292	0	307	0	536	536
07:45 AM	197	17	0	214	2	2	0	4	11	293	0	304	0	522	522
Total	778	42	0	820	10	9	0	19	42	1149	0	1191	0	2030	2030
08:00 AM	161	16	0	177	2	8	0	10	15	280	0	295	0	482	482
08:15 AM	168	20	0	188	6	2	0	8	17	248	0	265	0	461	461
08:30 AM	187	9	0	196	8	3	0	11	12	242	0	254	0	461	461
08:45 AM	159	10	0	169	4	8	0	12	9	182	0	191	0	372	372
Total	675	55	0	730	20	21	0	41	53	952	0	1005	0	1776	1776
Grand Total	1453	97	0	1550	30	30	0	60	95	2101	0	2196	0	3806	3806
Apprch %	93.7	6.3			50	50			4.3	95.7					
Total %	38.2	2.5		40.7	0.8	0.8		1.6	2.5	55.2		57.7	0	100	
PV	1379	92		1471	28	30		58	93	2015		2108	0	0	3637
% PV	94.9	94.8	0	94.9	93.3	100	0	96.7	97.9	95.9	0	96	0	0	95.6
Duals	60	4		64	2	0		2	2	67		69	0	0	135
% Duals	4.1	4.1	0	4.1	6.7	0	0	3.3	2.1	3.2	0	3.1	0	0	3.5
TTST	14	1		15	0	0		0	0	19		19	0	0	34
% TTST	1	1	0	1	0	0	0	0	0	0.9	0	0.9	0	0	0.9
Twins	0	0		0	0	0		0	0	0		0	0	0	0
% Twins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0		0	0	0		0	0	0		0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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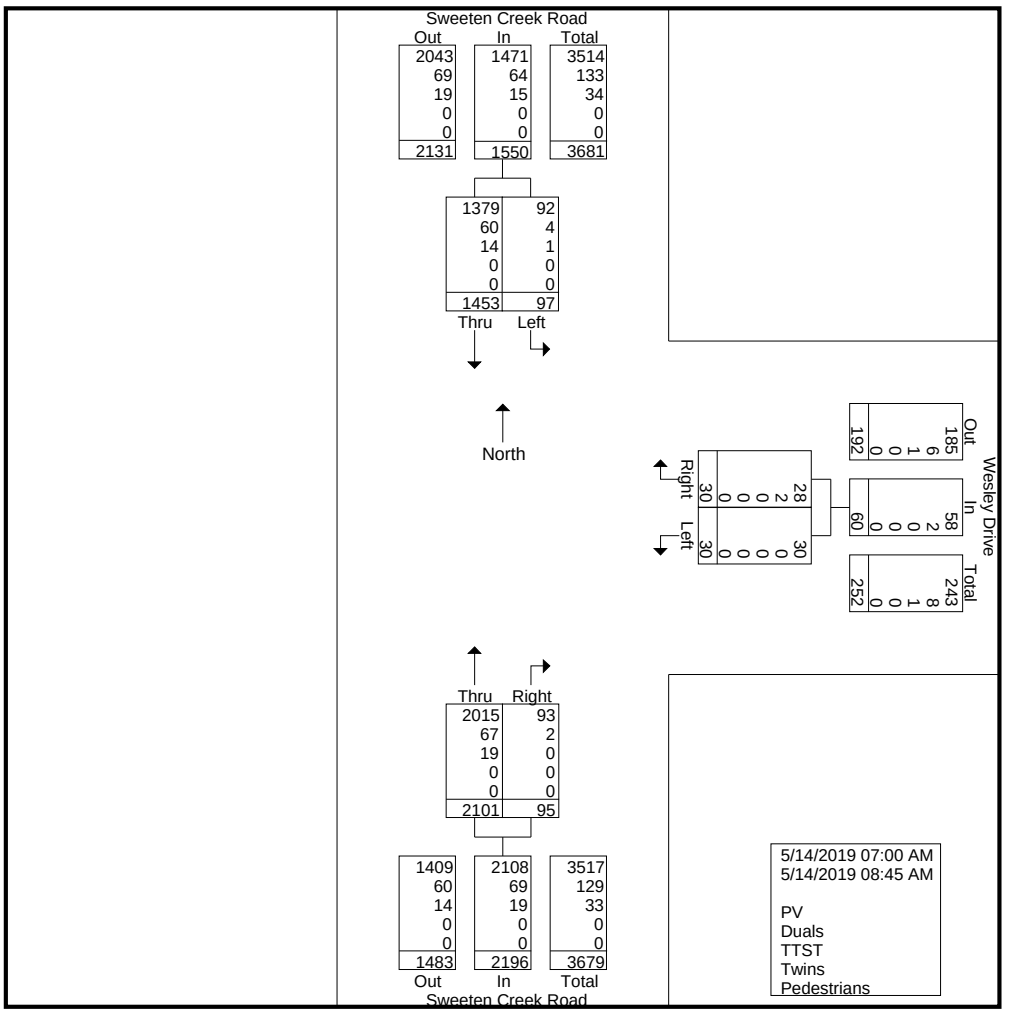
File Name : 9-AM
Site Code : 3973-AM
Start Date : 5/14/2019
Page No : 2



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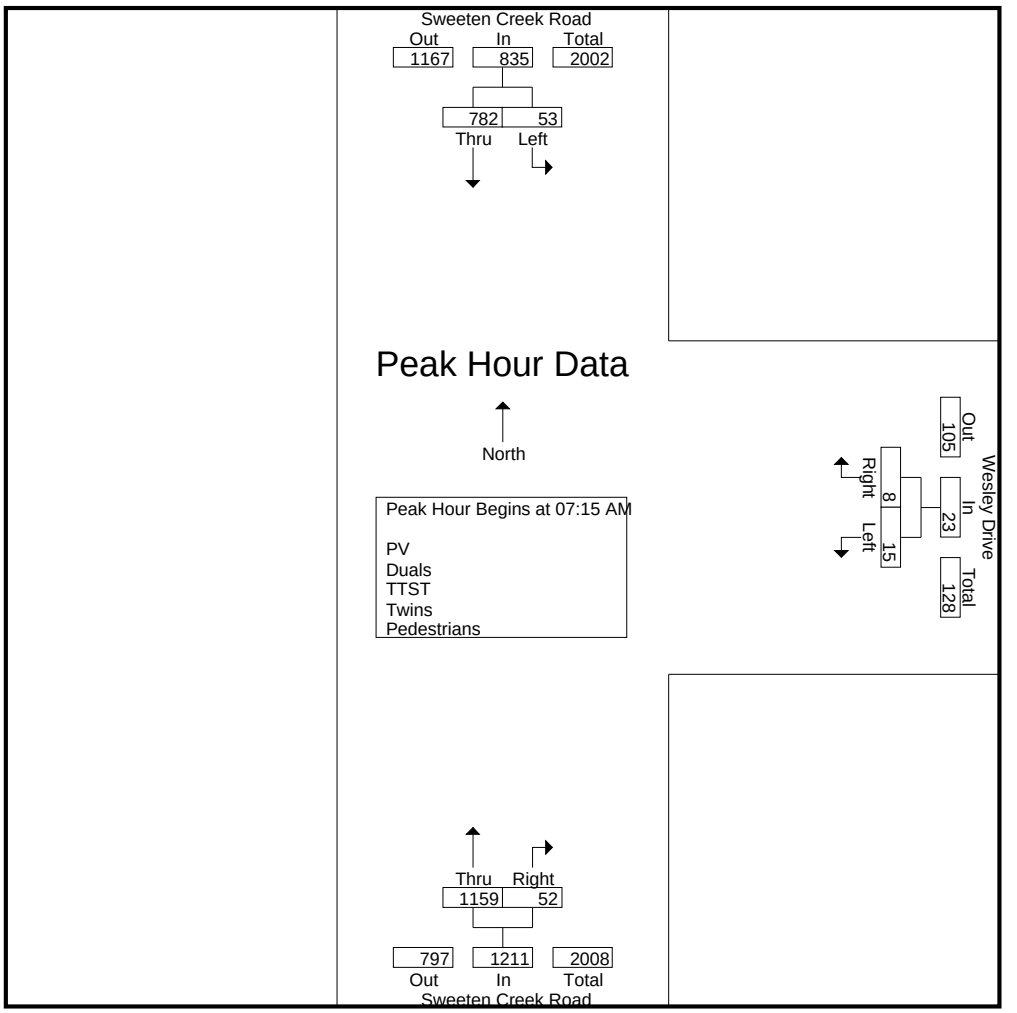
File Name : 9-AM
Site Code : 3973-AM
Start Date : 5/14/2019
Page No : 3

	Sweeten Creek Road From North			Wesley Drive From East			Sweeten Creek Road From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:15 AM										
07:15 AM	210	10	220	1	3	4	11	**294**	305	529
07:30 AM	**214**	10	**224**	**3**	2	5	**15**	292	**307**	**536**
07:45 AM	197	**17**	214	2	2	4	11	293	304	522
08:00 AM	161	16	177	2	**8**	**10**	15	280	295	482
Total Volume	782	53	835	8	15	23	52	1159	1211	2069
% App. Total	93.7	6.3		34.8	65.2		4.3	95.7		
PHF	.914	.779	.932	.667	.469	.575	.867	.986	.986	.965



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File Name : 9-PM
Site Code : 3973-PM
Start Date : 5/14/2019
Page No : 1

Groups Printed- PV - Duals - TTST - Twins - Pedestrians

	Sweeten Creek Road From North				Wesley Drive From East				Sweeten Creek Road From South						
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	221	8	0	229	19	27	0	46	11	255	0	266	0	541	541
04:15 PM	247	5	0	252	7	10	0	17	9	213	0	222	0	491	491
04:30 PM	259	6	0	265	16	23	0	39	10	258	0	268	0	572	572
04:45 PM	336	5	0	341	10	10	1	20	13	248	0	261	1	622	623
Total	1063	24	0	1087	52	70	1	122	43	974	0	1017	1	2226	2227
05:00 PM	236	6	0	242	13	13	0	26	10	256	0	266	0	534	534
05:15 PM	278	9	0	287	24	11	0	35	6	249	0	255	0	577	577
05:30 PM	267	4	0	271	11	10	0	21	7	269	0	276	0	568	568
05:45 PM	283	8	1	291	8	13	0	21	6	230	0	236	1	548	549
Total	1064	27	1	1091	56	47	0	103	29	1004	0	1033	1	2227	2228
Grand Total	2127	51	1	2178	108	117	1	225	72	1978	0	2050	2	4453	4455
Apprch %	97.7	2.3			48	52			3.5	96.5					
Total %	47.8	1.1		48.9	2.4	2.6		5.1	1.6	44.4		46	0	100	
PV	2065	51		2116	106	115		221	72	1906		1978	0	0	4315
% PV	97.1	100	0	97.1	98.1	98.3	0	97.8	100	96.4	0	96.5	0	0	96.9
Duals	49	0		49	2	0		2	0	51		51	0	0	102
% Duals	2.3	0	0	2.2	1.9	0	0	0.9	0	2.6	0	2.5	0	0	2.3
TTST	13	0		13	0	2		2	0	21		21	0	0	36
% TTST	0.6	0	0	0.6	0	1.7	0	0.9	0	1.1	0	1	0	0	0.8
Twins	0	0		0	0	0		0	0	0		0	0	0	0
% Twins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0		1	0	0		1	0	0		0	0	0	2
% Pedestrians	0	0	100	0	0	0	100	0.4	0	0	0	0	0	0	0

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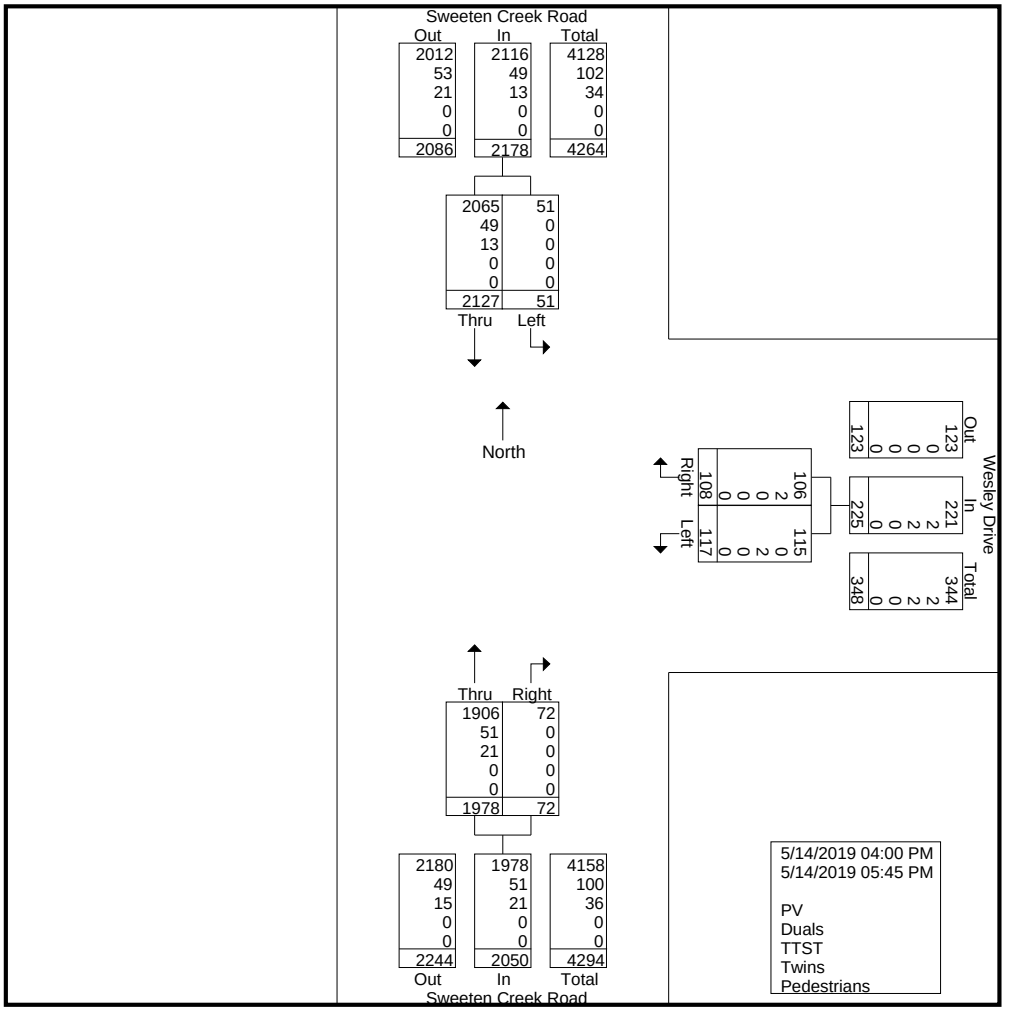
File Name : 9-PM
Site Code : 3973-PM
Start Date : 5/14/2019
Page No : 2



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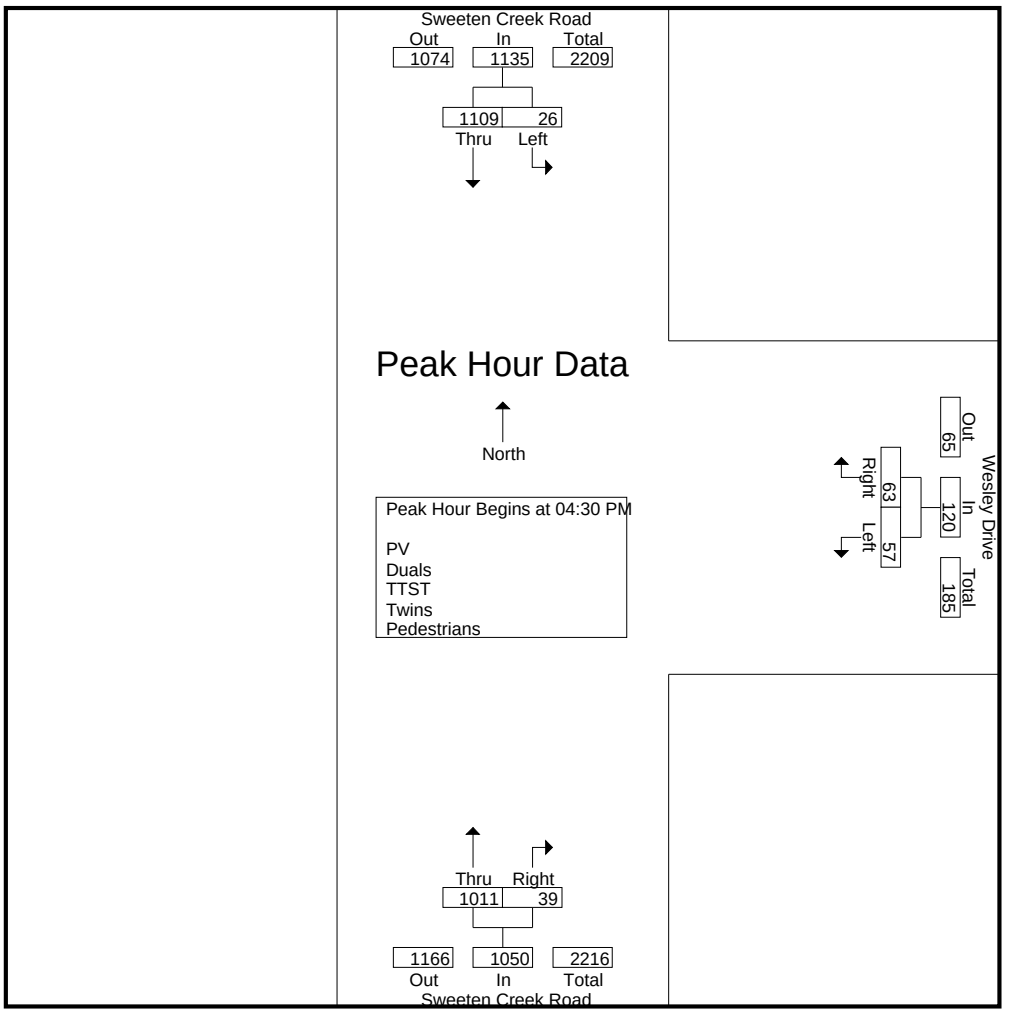
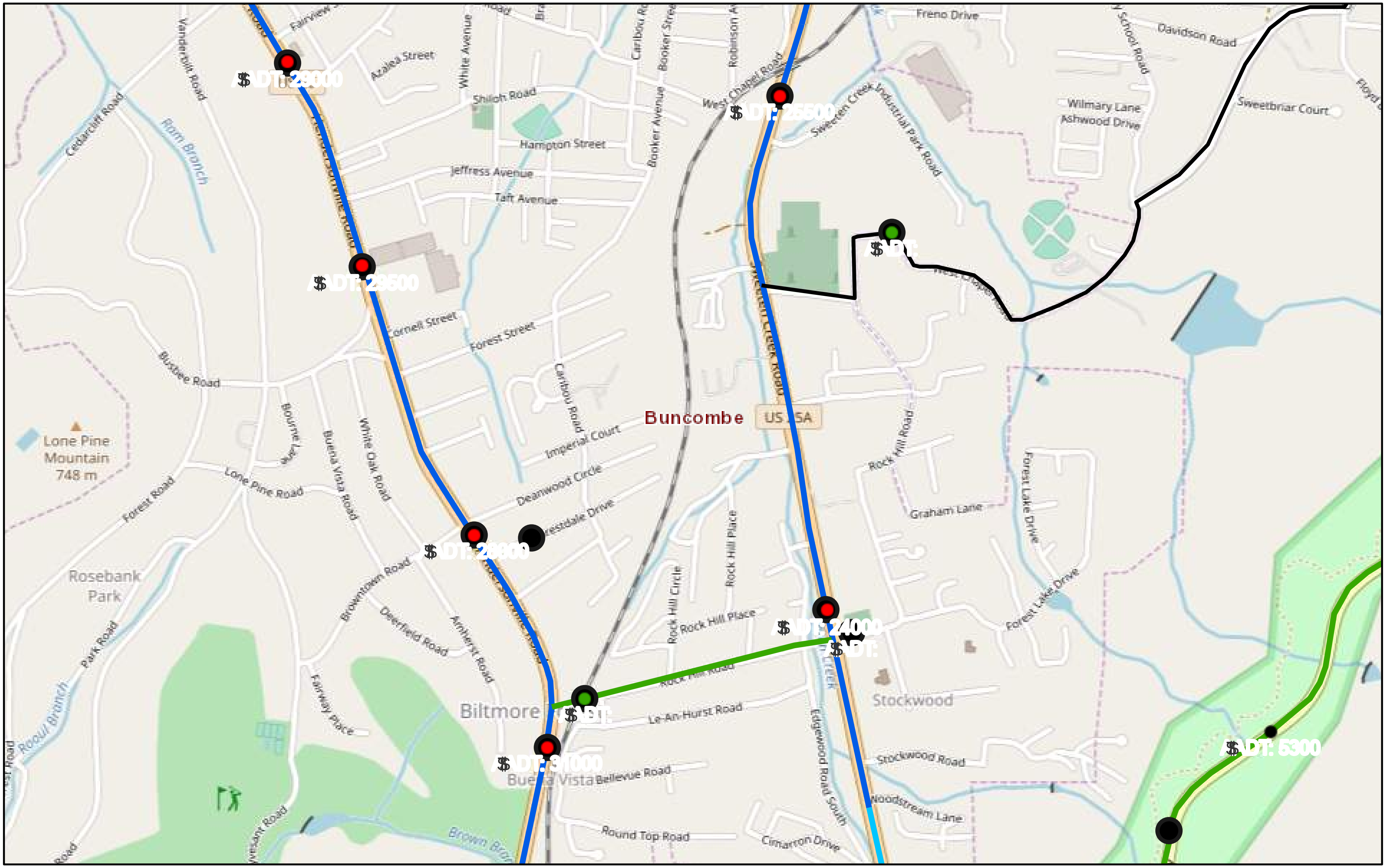
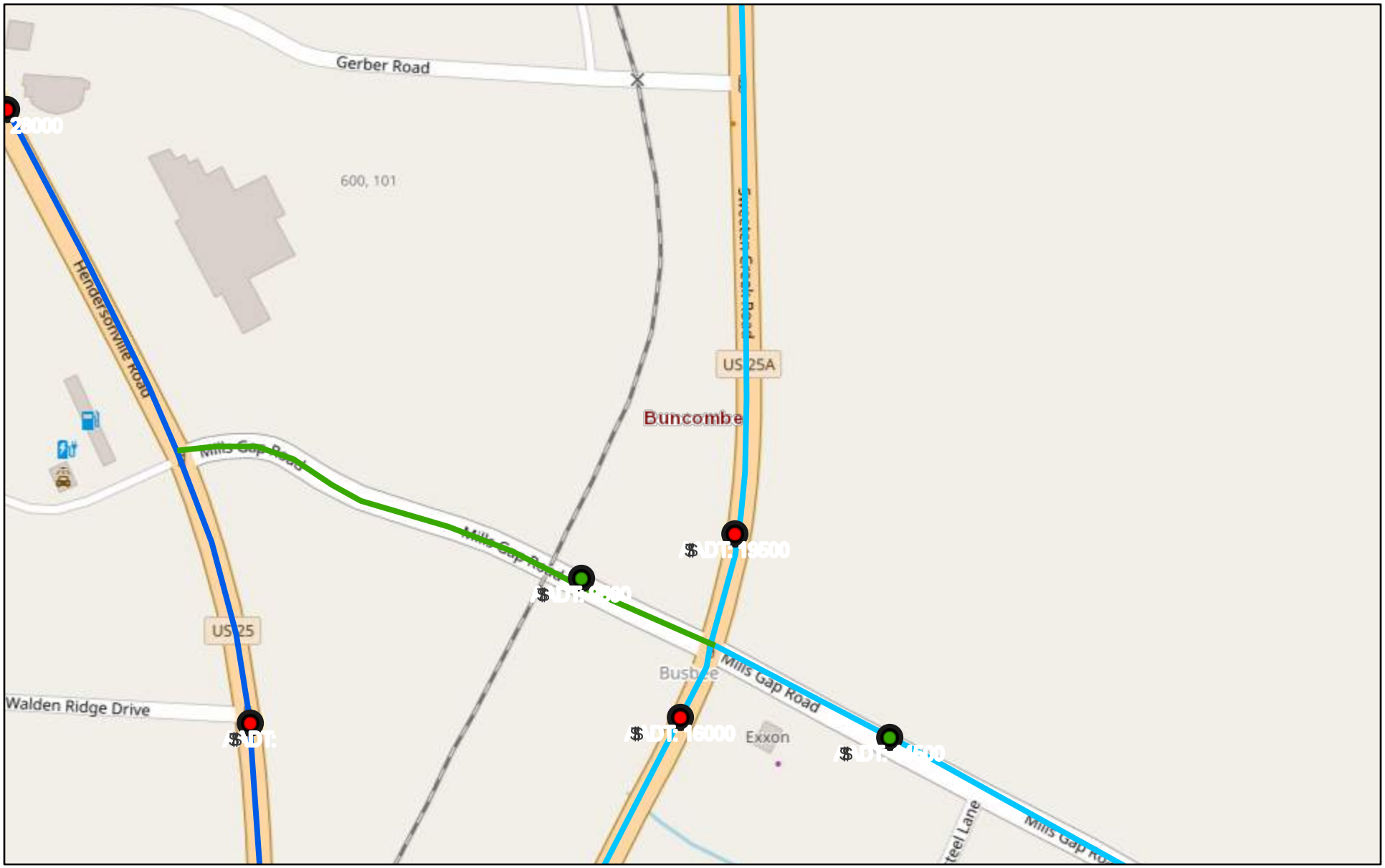
File Name : 9-PM
Site Code : 3973-PM
Start Date : 5/14/2019
Page No : 3

	Sweeten Creek Road From North			Wesley Drive From East			Sweeten Creek Road From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	259	6	265	16	**23**	**39**	10	**258**	**268**	572
04:45 PM	**336**	5	**341**	10	10	20	**13**	248	261	**622**
05:00 PM	236	6	242	13	13	26	10	256	266	534
05:15 PM	278	**9**	287	**24**	11	35	6	249	255	577
Total Volume	1109	26	1135	63	57	120	39	1011	1050	2305
% App. Total	97.7	2.3		52.5	47.5		3.7	96.3		
PHF	.825	.722	.832	.656	.620	.769	.750	.980	.979	.926



APPENDIX C


ADT: 29000
ADT: 25500
ADT: 29500
ADT: 29800
ADT: 24000
ADT: 31000
ADT: 5300
Buncombe
US SA
Biltmore
Buena Vista
Stockwood
Lone Pine Mountain 748 m
Rosebank Park
Vanderbilt Road
Cedarcliff Road
Busbee Road
Lone Pine Road
Forest Road
Park Road
Bourne Lane
Buena Vista Road
White Oak Road
Brownstown Road
Deerfield Road
Amherst Road
Fairway Place
Azalea Street
White Avenue
Shiloh Road
Hampton Street
Jeffress Avenue
Taft Avenue
Cornell Street
Forest Street
Caribou Road
Imperial Court
Deanwood Circle
Booker Avenue
Robinson Avenue
West Chapel Road
Sweeten Creek Industrial Park Road
Rock Hill Road
Rock Hill Circle
Rock Hill Place
Le-An-Hurst Road
Bellevue Road
Round Top Road
Cimarron Drive
Edgewood Road South
Stockwood Road
Woodstream Lane
Graham Lane
Forest Lake Drive
Freno Drive
Davidson Road
Wilmary Lane
Ashwood Drive
Sweetbriar Court
Ram Branch
Brown Branch



APPENDIX D

Busbee/Sweeten Creek Development Trip Generation as of 7/10/20

Land Use	ITE LUC	Amount	Units	Daily Trips	AM Pk Hr			PM Pk Hr		
					Total	Entering	Exiting	Total	Entering	Exiting
Apartments Mid-Rise	221	315	Units	1,715	105	27	78	133	81	52
Apartments Mid-Rise	221	315	Units	1,715	105	27	78	133	81	52
Apartments Sr-Adult	252	155	Units	598	31	11	20	39	21	18
Apartments Sr-Adult	252	56	Units	200	11	4	7	16	9	7
Single Family Homes	210	11	Units	136	13	3	10	12	7	5
Total		852		**4,364**	**265**	72	193	**333**	199	134

Multifamily Housing (Mid-Rise)
(221)

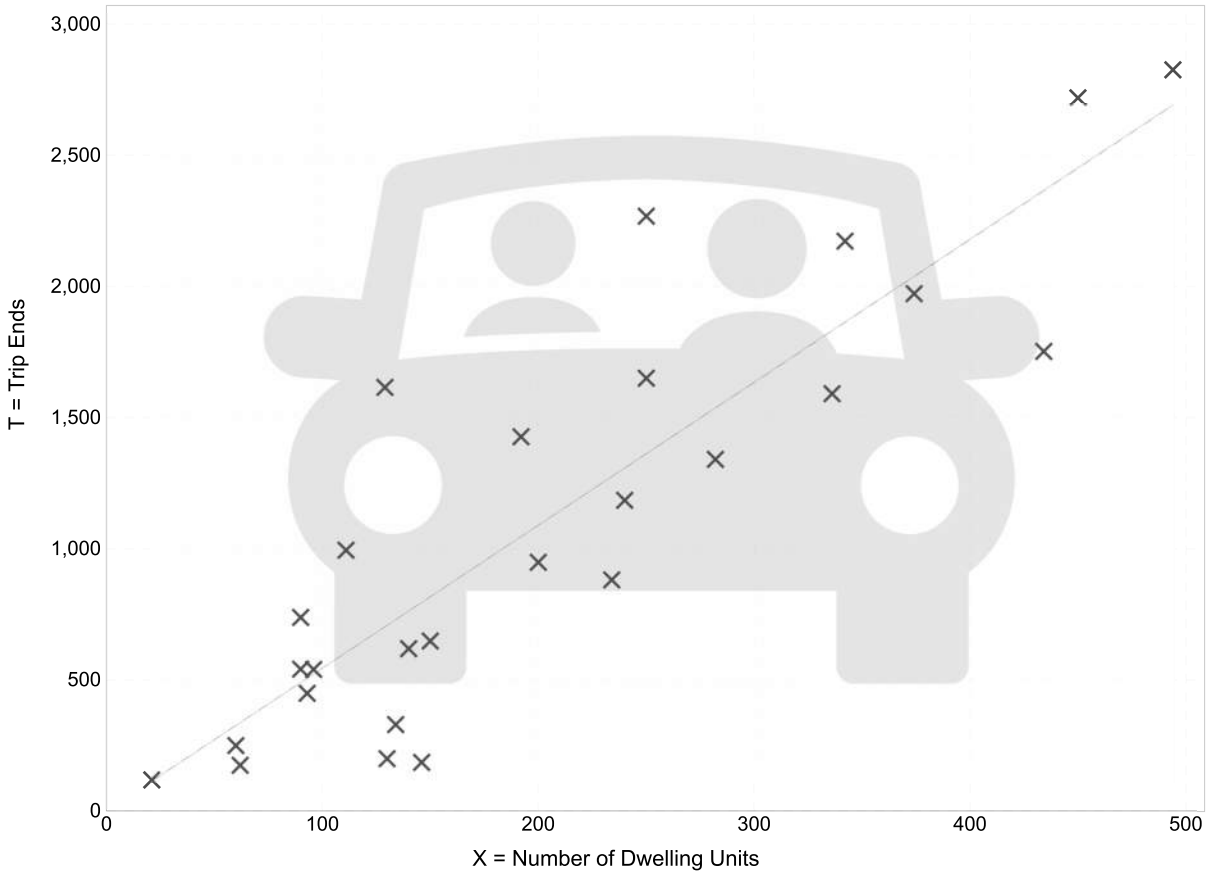
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 27
Avg. Num. of Dwelling Units: 205
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
5.44	1.27 - 12.50	2.03

Data Plot and Equation



Fitted Curve Equation: T = 5.45(X) - 1.75

R^2= 0.77

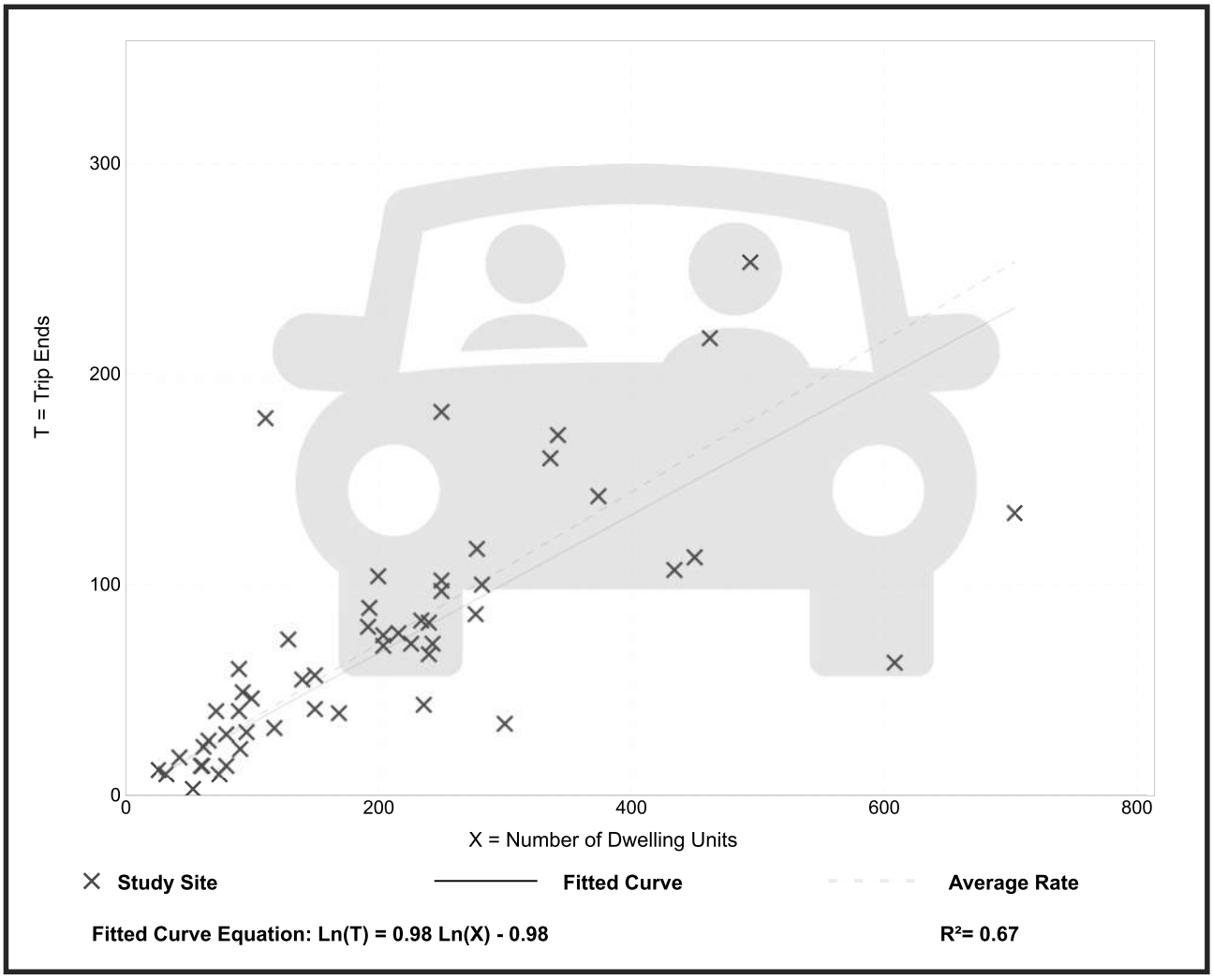
Multifamily Housing (Mid-Rise)
(221)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 53
Avg. Num. of Dwelling Units: 207
Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.36	0.06 - 1.61	0.19

Data Plot and Equation



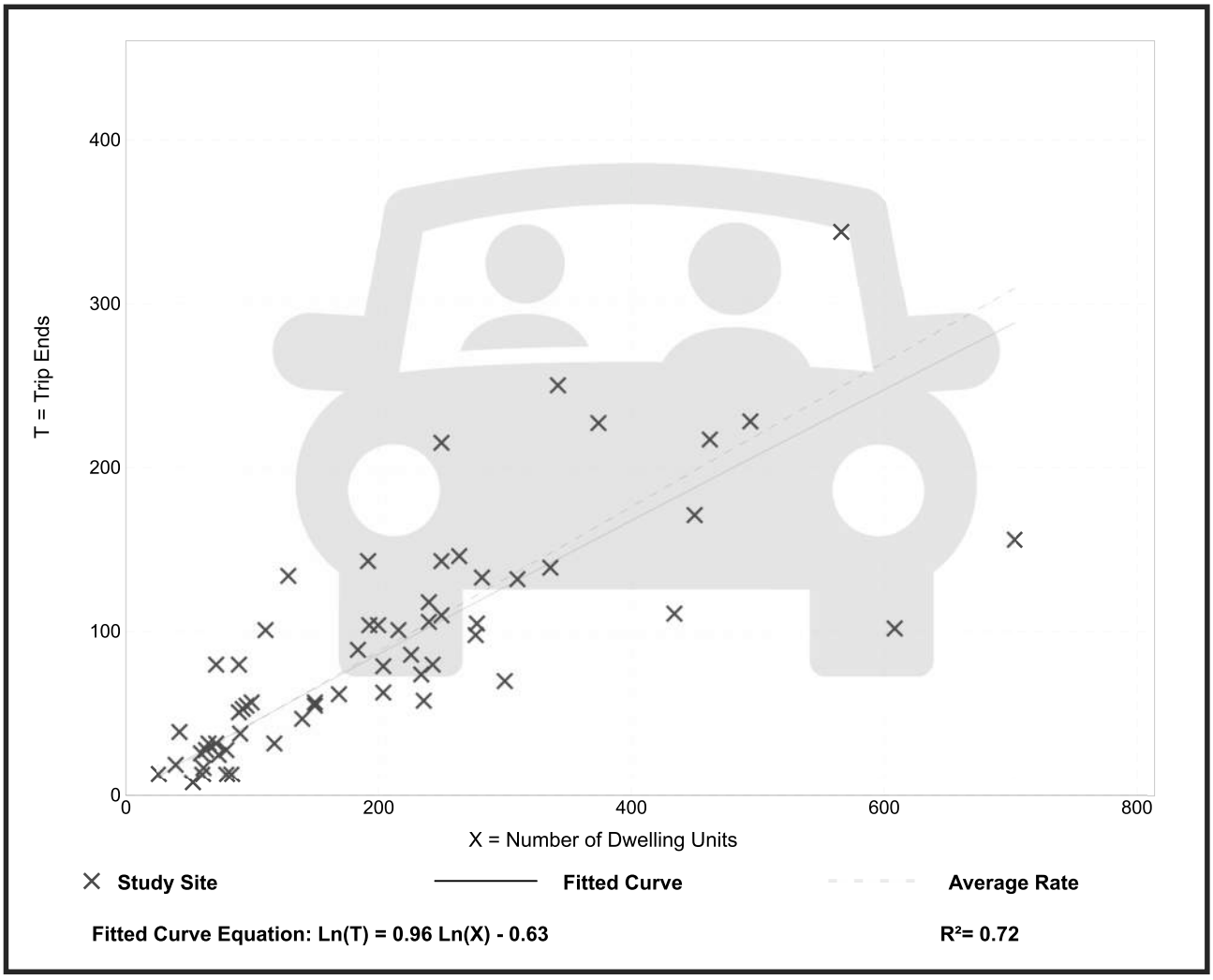
Multifamily Housing (Mid-Rise)
(221)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 60
Avg. Num. of Dwelling Units: 208
Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.44	0.15 - 1.11	0.19

Data Plot and Equation



Senior Adult Housing - Attached
(252)

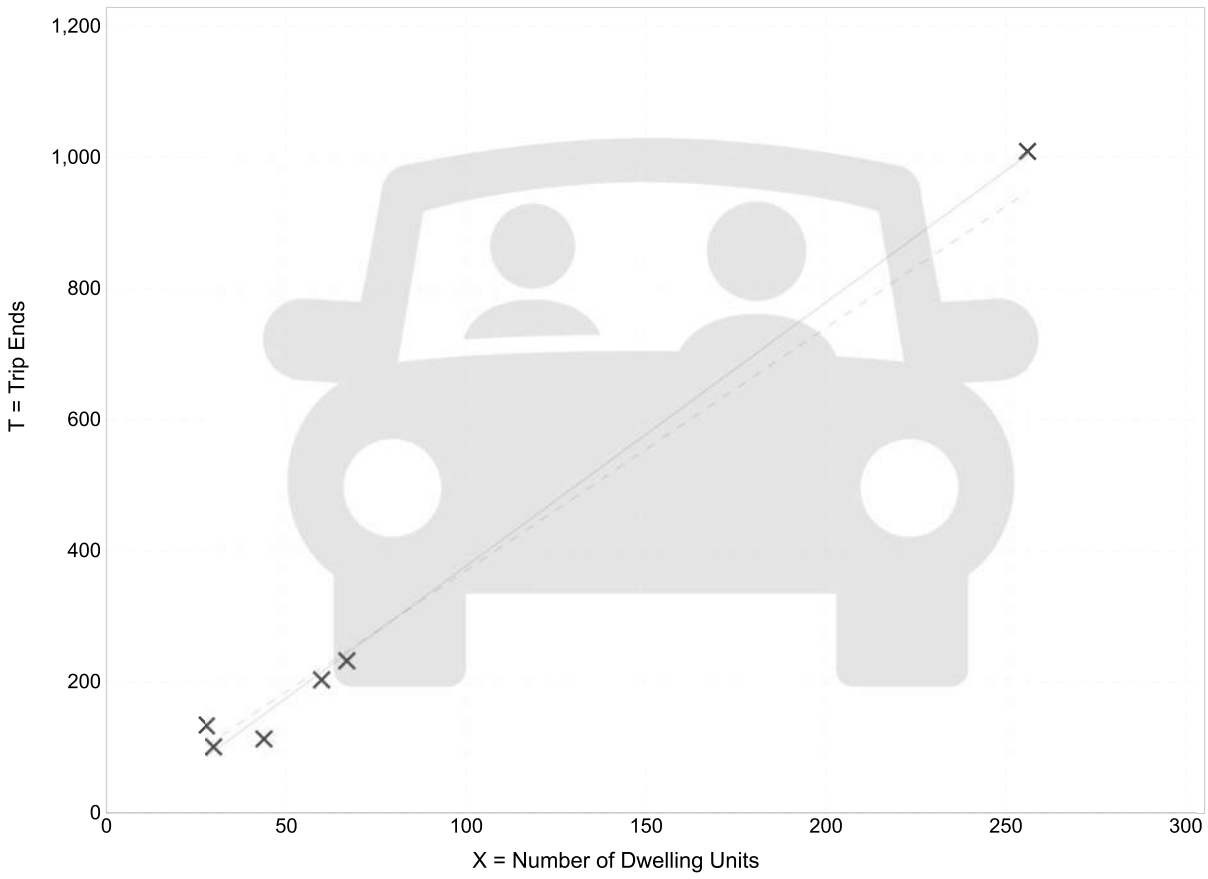
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 6
Avg. Num. of Dwelling Units: 81
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
3.70	2.59 - 4.79	0.53

Data Plot and Equation



Fitted Curve Equation: T = 4.02(X) - 25.37

R^2= 0.99

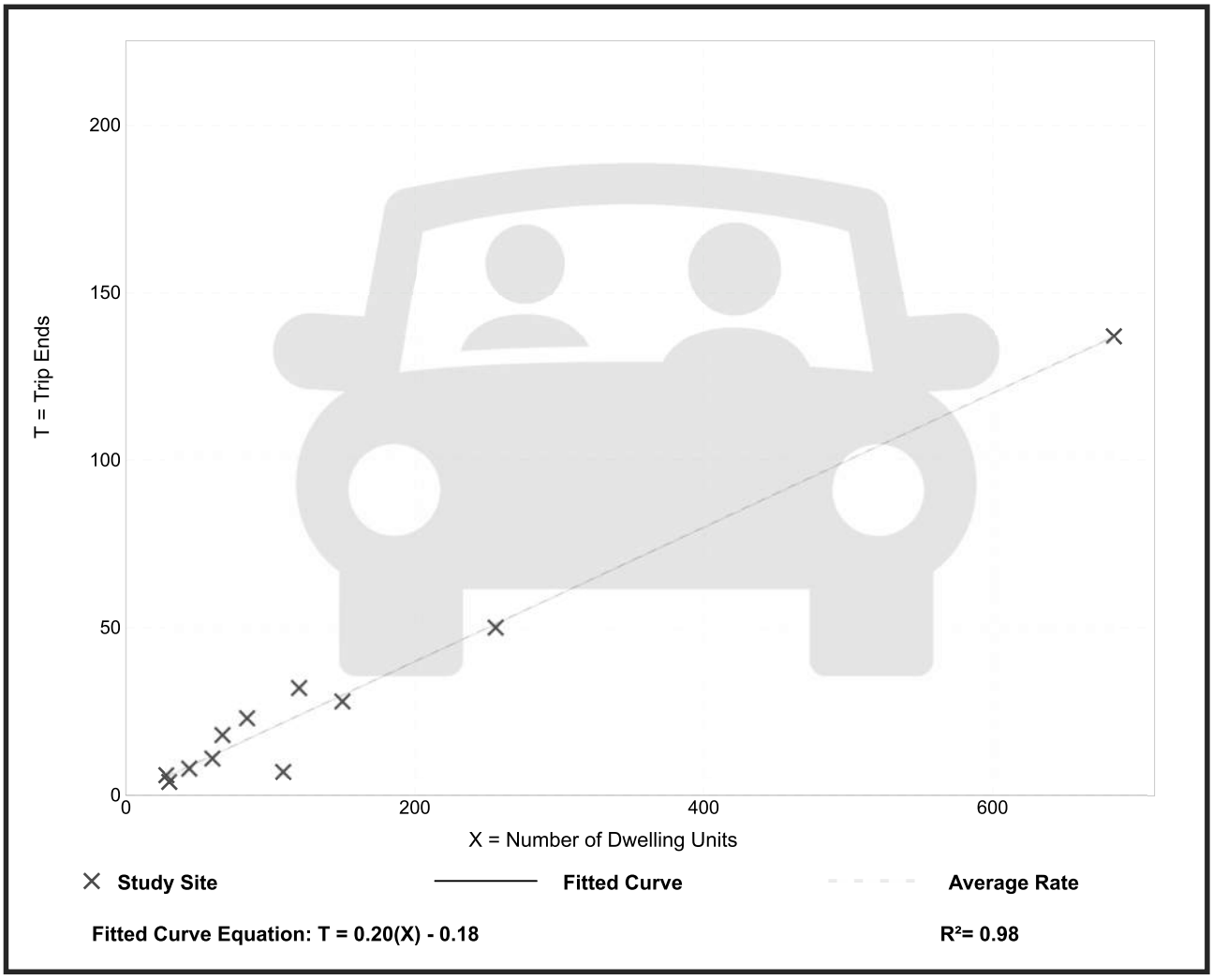
Senior Adult Housing - Attached
(252)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	11
Avg. Num. of Dwelling Units:	148
Directional Distribution:	35% entering, 65% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.20	0.06 - 0.27	0.05

Data Plot and Equation



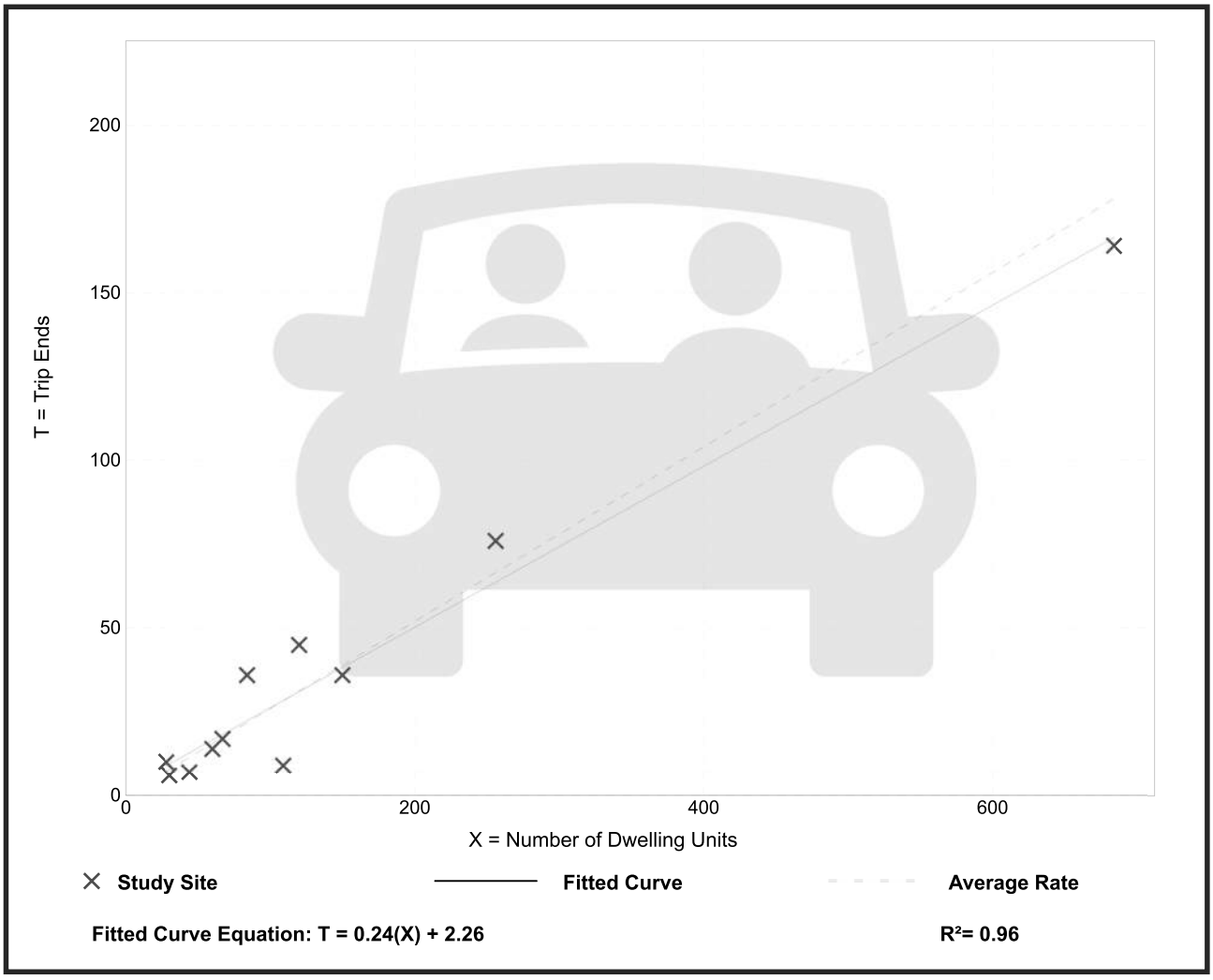
Senior Adult Housing - Attached
(252)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	11
Avg. Num. of Dwelling Units:	148
Directional Distribution:	55% entering, 45% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.26	0.08 - 0.43	0.08

Data Plot and Equation



Single-Family Detached Housing
(210)

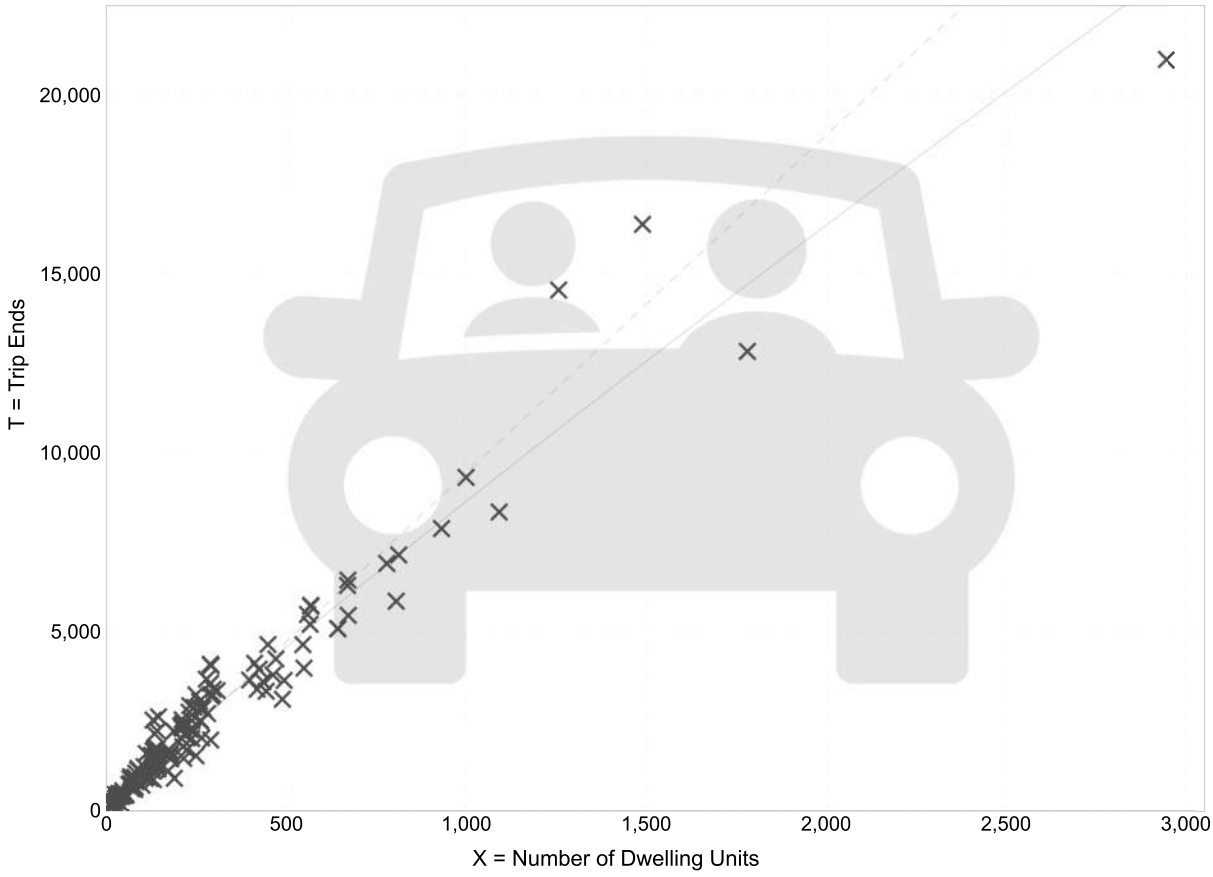
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 159
Avg. Num. of Dwelling Units: 264
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	4.81 - 19.39	2.10

Data Plot and Equation



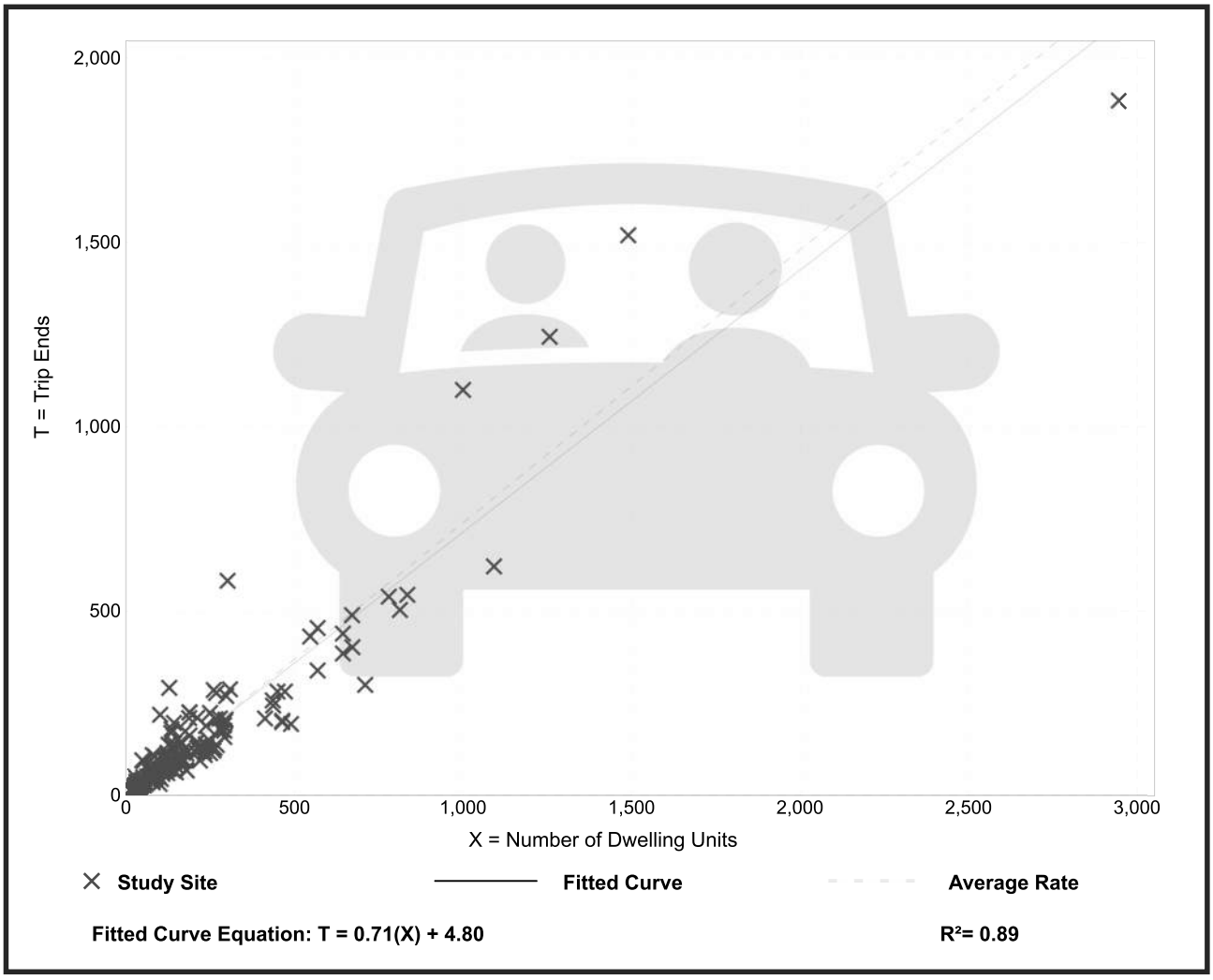
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 173
Avg. Num. of Dwelling Units: 219
Directional Distribution: 25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation



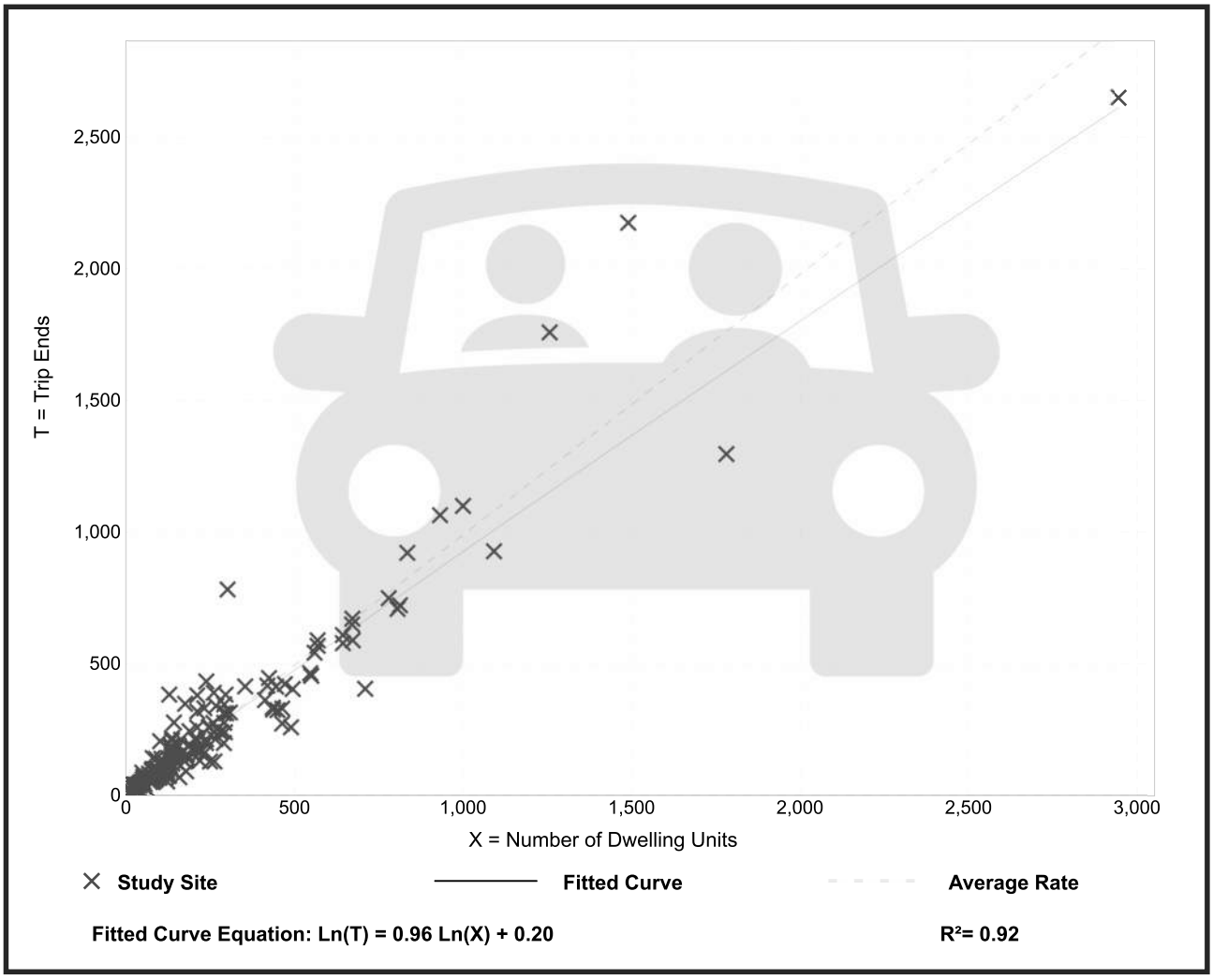
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 190
Avg. Num. of Dwelling Units: 242
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation



APPENDIX E

Lanes, Volumes, Timings
7: Sweeten Creek Road & Rock Hill Road

07/31/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	244	16	19	38	36	35	74	937	17	7	723	197
Future Volume (vph)	244	16	19	38	36	35	74	937	17	7	723	197
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		75	0		0	150		200	200		0
Storage Lanes	0		1	0		0	1		1	1		0
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.956			0.997			0.968	
Flt Protected		0.955			0.983		0.950			0.950		
Satd. Flow (prot)	0	1779	1583	0	1751	0	1770	3529	0	1770	3426	0
Flt Permitted		0.646			0.754		0.950			0.950		
Satd. Flow (perm)	0	1203	1583	0	1343	0	1770	3529	0	1770	3426	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			30			45			45	
Link Distance (ft)		2566			1218			512			4516	
Travel Time (s)		50.0			27.7			7.8			68.4	
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	271	18	21	42	40	39	82	1041	19	8	803	219
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	289	21	0	121	0	82	1060	0	8	1022	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0		7.0	12.0		7.0	12.0	
Minimum Split (s)	14.0	14.0	14.0	14.0	14.0		14.0	25.0		14.0	25.0	
Total Split (s)	74.0	74.0	74.0	74.0	74.0		22.0	92.0		14.0	84.0	
Total Split (%)	41.1%	41.1%	41.1%	41.1%	41.1%		12.2%	51.1%		7.8%	46.7%	
Maximum Green (s)	67.0	67.0	67.0	67.0	67.0		15.0	85.0		7.0	77.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0		-2.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lag	Lead		Lag	Lead	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min		None	Min	
Act Effct Green (s)		37.5	37.5		37.5		13.4	61.6		10.4	45.7	
Actuated g/C Ratio		0.33	0.33		0.33		0.12	0.55		0.09	0.41	
v/c Ratio		0.72	0.04		0.27		0.39	0.55		0.05	0.74	
Control Delay		46.1	28.8		31.4		59.5	20.6		59.9	33.0	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		46.1	28.8		31.4		59.5	20.6		59.9	33.0	
LOS		D	C		C		E	C		E	C	
Approach Delay		45.0			31.4			23.3			33.3	

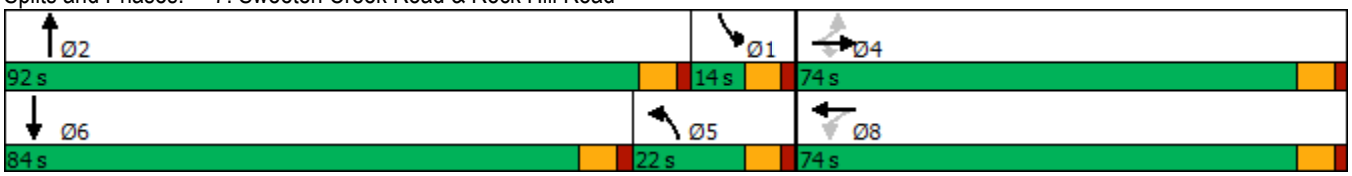
Lanes, Volumes, Timings
7: Sweeten Creek Road & Rock Hill Road

07/31/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		D			C			C			C	
Queue Length 50th (ft)		176	10		61		54	224		5	313	
Queue Length 95th (ft)		358	34		140		139	534		26	533	
Internal Link Dist (ft)		2486			1138			432			4436	
Turn Bay Length (ft)			75				150			200		
Base Capacity (vph)		787	1036		879		285	2793		163	2525	
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		0.37	0.02		0.14		0.29	0.38		0.05	0.40	

Intersection Summary			
Area Type:	Other		
Cycle Length: 180			
Actuated Cycle Length: 112.5			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 30.2		Intersection LOS: C	
Intersection Capacity Utilization 65.8%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 7: Sweeten Creek Road & Rock Hill Road



Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	4	4	1227	885	5
Future Vol, veh/h	4	4	4	1227	885	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	200	200	-	-	125
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	4	4	1363	983	6

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2354	983	989	0	-	0
Stage 1	983	-	-	-	-	-
Stage 2	1371	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	39	302	699	-	-	-
Stage 1	362	-	-	-	-	-
Stage 2	236	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	39	302	699	-	-	-
Mov Cap-2 Maneuver	39	-	-	-	-	-
Stage 1	360	-	-	-	-	-
Stage 2	236	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	63	0	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	699	-	39	302	-	-
HCM Lane V/C Ratio	0.006	-	0.114	0.015	-	-
HCM Control Delay (s)	10.2	-	108.8	17.1	-	-
HCM Lane LOS	B	-	F	C	-	-
HCM 95th %tile Q(veh)	0	-	0.4	0	-	-

Lanes, Volumes, Timings
9: Sweeten Creek Road & Wesley Drive

07/31/2020

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	15	8	1221	52	53	832
Future Volume (vph)	15	8	1221	52	53	832
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150	0		0	150	
Storage Lanes	1	1		0	1	
Taper Length (ft)	100				100	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850	0.994			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1852	0	1770	1863
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1583	1852	0	1770	1863
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	30		45			45
Link Distance (ft)	1130		1977			3708
Travel Time (s)	25.7		30.0			56.2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	17	9	1357	58	59	924
Shared Lane Traffic (%)						
Lane Group Flow (vph)	17	9	1415	0	59	924
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8				
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	12.0		7.0	12.0
Minimum Split (s)	14.0	14.0	25.0		14.0	25.0
Total Split (s)	14.0	14.0	152.0		14.0	166.0
Total Split (%)	7.8%	7.8%	84.4%		7.8%	92.2%
Maximum Green (s)	7.0	7.0	145.0		7.0	159.0
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Min		None	Min
Act Effct Green (s)	9.8	9.8	127.9		9.8	139.6
Actuated g/C Ratio	0.07	0.07	0.86		0.07	0.94
v/c Ratio	0.15	0.09	0.89		0.51	0.53
Control Delay	83.5	83.9	19.6		94.0	2.6
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	83.5	83.9	19.6		94.0	2.6
LOS	F	F	B		F	A
Approach Delay	83.7		19.6			8.1

Lanes, Volumes, Timings
9: Sweeten Creek Road & Wesley Drive

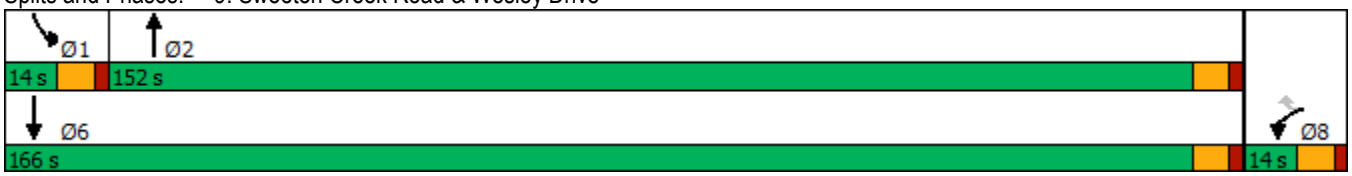
07/31/2020

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach LOS	F		B			A
Queue Length 50th (ft)	20	10	1128		70	166
Queue Length 95th (ft)	49	33	#1677		#146	211
Internal Link Dist (ft)	1050		1897			3628
Turn Bay Length (ft)	150				150	
Base Capacity (vph)	116	104	1648		116	1745
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	0.15	0.09	0.86		0.51	0.53

Intersection Summary			
Area Type:	Other		
Cycle Length: 180			
Actuated Cycle Length: 149			
Natural Cycle: 130			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 15.6		Intersection LOS: B	
Intersection Capacity Utilization 81.6%		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: 9: Sweeten Creek Road & Wesley Drive



Lanes, Volumes, Timings
7: Sweeten Creek Road & Rock Hill Road

07/31/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	220	43	50	19	29	19	56	903	16	30	875	279
Future Volume (vph)	220	43	50	19	29	19	56	903	16	30	875	279
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		75	0		0	150		200	200		0
Storage Lanes	0		1	0		0	1		1	1		0
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.962			0.997			0.964	
Flt Protected		0.960			0.986		0.950			0.950		
Satd. Flow (prot)	0	1788	1583	0	1767	0	1770	3529	0	1770	3412	0
Flt Permitted		0.729			0.869		0.950			0.950		
Satd. Flow (perm)	0	1358	1583	0	1557	0	1770	3529	0	1770	3412	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			30			45			45	
Link Distance (ft)		2566			1218			512			4516	
Travel Time (s)		50.0			27.7			7.8			68.4	
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	244	48	56	21	32	21	62	1003	18	33	972	310
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	292	56	0	74	0	62	1021	0	33	1282	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0		7.0	12.0		7.0	12.0	
Minimum Split (s)	14.0	14.0	14.0	14.0	14.0		14.0	25.0		14.0	25.0	
Total Split (s)	63.0	63.0	63.0	63.0	63.0		16.0	103.0		14.0	101.0	
Total Split (%)	35.0%	35.0%	35.0%	35.0%	35.0%		8.9%	57.2%		7.8%	56.1%	
Maximum Green (s)	56.0	56.0	56.0	56.0	56.0		9.0	96.0		7.0	94.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0		-2.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lag	Lead		Lag	Lead	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min		None	Min	
Act Effct Green (s)		36.3	36.3		36.3		11.1	58.0		15.8	59.5	
Actuated g/C Ratio		0.31	0.31		0.31		0.09	0.49		0.13	0.50	
v/c Ratio		0.70	0.12		0.16		0.37	0.59		0.14	0.75	
Control Delay		49.4	34.7		35.2		68.3	27.4		54.8	28.6	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		49.4	34.7		35.2		68.3	27.4		54.8	28.6	
LOS		D	C		D		E	C		D	C	
Approach Delay		47.1			35.2			29.8			29.3	

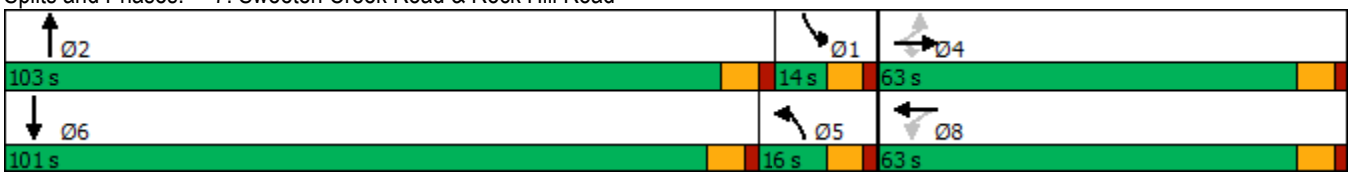
Lanes, Volumes, Timings
7: Sweeten Creek Road & Rock Hill Road

07/31/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		D			D			C			C	
Queue Length 50th (ft)		199	31		42		45	332		22	413	
Queue Length 95th (ft)		382	79		99		121	537		68	657	
Internal Link Dist (ft)		2486			1138			432			4436	
Turn Bay Length (ft)			75				150			200		
Base Capacity (vph)		722	842		828		178	2887		236	2748	
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		0.40	0.07		0.09		0.35	0.35		0.14	0.47	

Intersection Summary			
Area Type:	Other		
Cycle Length: 180			
Actuated Cycle Length: 118.5			
Natural Cycle: 75			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 31.8		Intersection LOS: C	
Intersection Capacity Utilization 72.5%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 7: Sweeten Creek Road & Rock Hill Road



Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	4	7	1266	1103	13
Future Vol, veh/h	4	4	7	1266	1103	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	200	200	-	-	125
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	4	8	1407	1226	14

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2649	1226	1240	0	-	0
Stage 1	1226	-	-	-	-	-
Stage 2	1423	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	25	218	562	-	-	-
Stage 1	277	-	-	-	-	-
Stage 2	222	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	25	218	562	-	-	-
Mov Cap-2 Maneuver	25	-	-	-	-	-
Stage 1	273	-	-	-	-	-
Stage 2	222	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	99.9	0.1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	562	-	25	218	-	-
HCM Lane V/C Ratio	0.014	-	0.178	0.02	-	-
HCM Control Delay (s)	11.5	-	177.9	21.9	-	-
HCM Lane LOS	B	-	F	C	-	-
HCM 95th %tile Q(veh)	0	-	0.5	0.1	-	-

Lanes, Volumes, Timings
9: Sweeten Creek Road & Wesley Drive

07/31/2020

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	57	63	1210	39	26	1077
Future Volume (vph)	57	63	1210	39	26	1077
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150	0		0	150	
Storage Lanes	1	1		0	1	
Taper Length (ft)	100				100	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850	0.996			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1855	0	1770	1863
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1583	1855	0	1770	1863
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	30		45			45
Link Distance (ft)	1130		1977			3708
Travel Time (s)	25.7		30.0			56.2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	63	70	1344	43	29	1197
Shared Lane Traffic (%)						
Lane Group Flow (vph)	63	70	1387	0	29	1197
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8				
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	12.0		7.0	12.0
Minimum Split (s)	14.0	14.0	25.0		14.0	25.0
Total Split (s)	18.0	18.0	148.0		14.0	162.0
Total Split (%)	10.0%	10.0%	82.2%		7.8%	90.0%
Maximum Green (s)	11.0	11.0	141.0		7.0	155.0
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Min		None	Min
Act Effct Green (s)	12.7	12.7	130.4		9.5	140.6
Actuated g/C Ratio	0.08	0.08	0.80		0.06	0.86
v/c Ratio	0.46	0.57	0.94		0.28	0.75
Control Delay	91.9	99.1	28.2		90.1	7.8
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	91.9	99.1	28.2		90.1	7.8
LOS	F	F	C		F	A
Approach Delay	95.7		28.2			9.7

Lanes, Volumes, Timings
9: Sweeten Creek Road & Wesley Drive

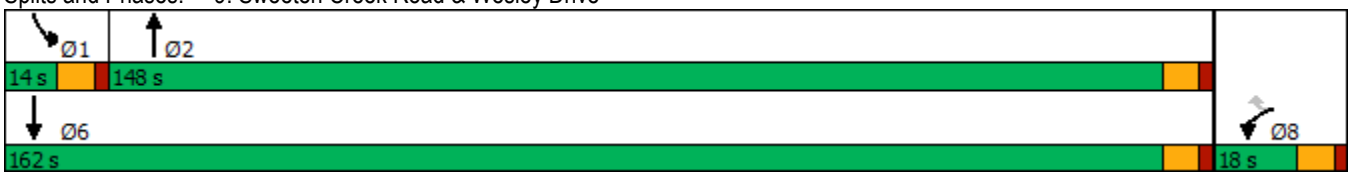
07/31/2020

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach LOS	F		C			A
Queue Length 50th (ft)	73	82	1184		34	396
Queue Length 95th (ft)	130	#151	#1854		74	517
Internal Link Dist (ft)	1050		1897			3628
Turn Bay Length (ft)	150				150	
Base Capacity (vph)	148	132	1549		102	1672
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	0.53	0.90		0.28	0.72

Intersection Summary			
Area Type:	Other		
Cycle Length: 180			
Actuated Cycle Length: 163.9			
Natural Cycle: 120			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.94			
Intersection Signal Delay: 23.2		Intersection LOS: C	
Intersection Capacity Utilization 80.2%		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: 9: Sweeten Creek Road & Wesley Drive



Lanes, Volumes, Timings
7: Sweeten Creek Road & Rock Hill Road

07/31/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	269	18	21	42	40	39	82	1035	19	8	798	218
Future Volume (vph)	269	18	21	42	40	39	82	1035	19	8	798	218
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		75	0		0	150		200	200		0
Storage Lanes	0		1	0		0	1		1	1		0
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.957			0.997			0.968	
Flt Protected		0.955			0.983		0.950			0.950		
Satd. Flow (prot)	0	1779	1583	0	1752	0	1770	3529	0	1770	3426	0
Flt Permitted		0.626			0.681		0.950			0.950		
Satd. Flow (perm)	0	1166	1583	0	1214	0	1770	3529	0	1770	3426	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			30			45			45	
Link Distance (ft)		2566			1218			512			4516	
Travel Time (s)		50.0			27.7			7.8			68.4	
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	299	20	23	47	44	43	91	1150	21	9	887	242
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	319	23	0	134	0	91	1171	0	9	1129	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0		7.0	12.0		7.0	12.0	
Minimum Split (s)	14.0	14.0	14.0	14.0	14.0		14.0	25.0		14.0	25.0	
Total Split (s)	74.0	74.0	74.0	74.0	74.0		22.0	92.0		14.0	84.0	
Total Split (%)	41.1%	41.1%	41.1%	41.1%	41.1%		12.2%	51.1%		7.8%	46.7%	
Maximum Green (s)	67.0	67.0	67.0	67.0	67.0		15.0	85.0		7.0	77.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0		-2.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lag	Lead		Lag	Lead	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min		None	Min	
Act Effct Green (s)		45.3	45.3		45.3		14.3	72.1		10.3	55.1	
Actuated g/C Ratio		0.35	0.35		0.35		0.11	0.55		0.08	0.42	
v/c Ratio		0.79	0.04		0.32		0.47	0.60		0.07	0.78	
Control Delay		55.6	32.0		35.9		71.6	24.1		71.9	38.3	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		55.6	32.0		35.9		71.6	24.1		71.9	38.3	
LOS		E	C		D		E	C		E	D	
Approach Delay		54.0			35.9			27.5			38.6	

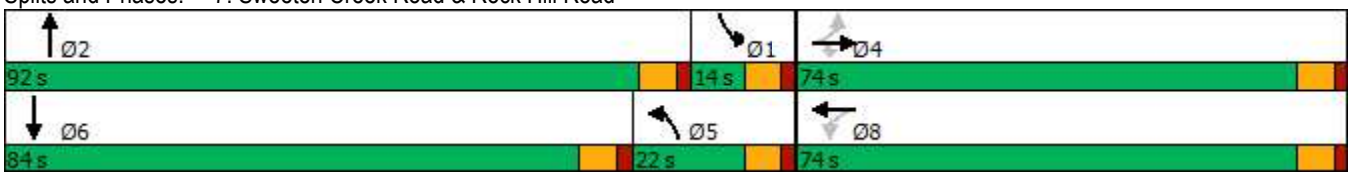
Lanes, Volumes, Timings
7: Sweeten Creek Road & Rock Hill Road

07/31/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		D			D			C			D	
Queue Length 50th (ft)		238	13		82		72	314		7	423	
Queue Length 95th (ft)		452	39		172		172	672		32	673	
Internal Link Dist (ft)		2486			1138			432			4436	
Turn Bay Length (ft)			75				150			200		
Base Capacity (vph)		657	893		685		246	2496		138	2213	
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		0.49	0.03		0.20		0.37	0.47		0.07	0.51	

Intersection Summary			
Area Type:	Other		
Cycle Length: 180			
Actuated Cycle Length: 130.8			
Natural Cycle: 75			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 35.5		Intersection LOS: D	
Intersection Capacity Utilization 70.1%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 7: Sweeten Creek Road & Rock Hill Road



Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	4	4	1355	977	6
Future Vol, veh/h	4	4	4	1355	977	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	200	200	-	-	125
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	4	4	1506	1086	7

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2600	1086	1093	0	-	0
Stage 1	1086	-	-	-	-	-
Stage 2	1514	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	27	263	638	-	-	-
Stage 1	324	-	-	-	-	-
Stage 2	201	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	27	263	638	-	-	-
Mov Cap-2 Maneuver	27	-	-	-	-	-
Stage 1	322	-	-	-	-	-
Stage 2	201	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	91	0	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	638	-	27	263	-	-
HCM Lane V/C Ratio	0.007	-	0.165	0.017	-	-
HCM Control Delay (s)	10.7	-	163	18.9	-	-
HCM Lane LOS	B	-	F	C	-	-
HCM 95th %tile Q(veh)	0	-	0.5	0.1	-	-

Lanes, Volumes, Timings
9: Sweeten Creek Road & Wesley Drive

07/31/2020

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	17	9	1348	57	59	919
Future Volume (vph)	17	9	1348	57	59	919
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150	0		0	150	
Storage Lanes	1	1		0	1	
Taper Length (ft)	100				100	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850	0.995			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1853	0	1770	1863
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1583	1853	0	1770	1863
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	30		45			45
Link Distance (ft)	1130		1977			3708
Travel Time (s)	25.7		30.0			56.2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	19	10	1498	63	66	1021
Shared Lane Traffic (%)						
Lane Group Flow (vph)	19	10	1561	0	66	1021
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8				
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	12.0		7.0	12.0
Minimum Split (s)	14.0	14.0	25.0		14.0	25.0
Total Split (s)	14.0	14.0	152.0		14.0	166.0
Total Split (%)	7.8%	7.8%	84.4%		7.8%	92.2%
Maximum Green (s)	7.0	7.0	145.0		7.0	159.0
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Min		None	Min
Act Effct Green (s)	9.0	9.0	147.2		9.0	163.4
Actuated g/C Ratio	0.05	0.05	0.84		0.05	0.94
v/c Ratio	0.21	0.12	1.00		0.73	0.59
Control Delay	87.3	85.1	37.1		121.2	3.1
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	87.3	85.1	37.1		121.2	3.1
LOS	F	F	D		F	A
Approach Delay	86.5		37.1			10.3

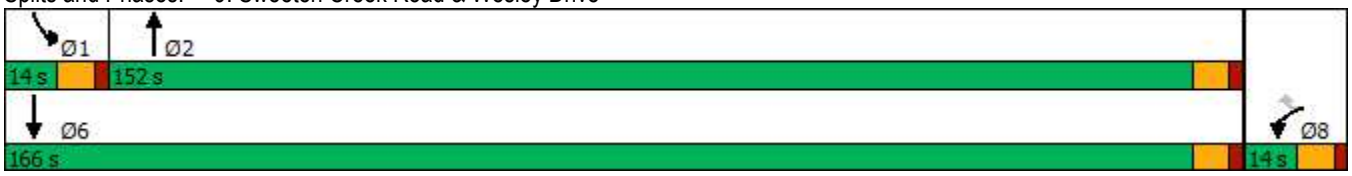
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach LOS	F		D			B
Queue Length 50th (ft)	22	12	~1967		79	205
Queue Length 95th (ft)	54	35	#2226		#168	260
Internal Link Dist (ft)	1050		1897			3628
Turn Bay Length (ft)	150				150	
Base Capacity (vph)	91	81	1564		91	1745
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.21	0.12	1.00		0.73	0.59

Intersection Summary			
Area Type:	Other		
Cycle Length: 180			
Actuated Cycle Length: 174.4			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.00			
Intersection Signal Delay: 26.8		Intersection LOS: C	
Intersection Capacity Utilization 88.6%		ICU Level of Service E	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: Sweeten Creek Road & Wesley Drive



Lanes, Volumes, Timings
7: Sweeten Creek Road & Rock Hill Road

07/31/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	243	47	55	21	32	21	62	997	18	33	966	308
Future Volume (vph)	243	47	55	21	32	21	62	997	18	33	966	308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		75	0		0	150		200	200		0
Storage Lanes	0		1	0		0	1		1	1		0
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.962			0.997			0.964	
Flt Protected		0.960			0.986		0.950			0.950		
Satd. Flow (prot)	0	1788	1583	0	1767	0	1770	3529	0	1770	3412	0
Flt Permitted		0.704			0.784		0.950			0.950		
Satd. Flow (perm)	0	1311	1583	0	1405	0	1770	3529	0	1770	3412	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			30			45			45	
Link Distance (ft)		2566			1218			512			4516	
Travel Time (s)		50.0			27.7			7.8			68.4	
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	270	52	61	23	36	23	69	1108	20	37	1073	342
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	322	61	0	82	0	69	1128	0	37	1415	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0		7.0	12.0		7.0	12.0	
Minimum Split (s)	14.0	14.0	14.0	14.0	14.0		14.0	25.0		14.0	25.0	
Total Split (s)	63.0	63.0	63.0	63.0	63.0		16.0	103.0		14.0	101.0	
Total Split (%)	35.0%	35.0%	35.0%	35.0%	35.0%		8.9%	57.2%		7.8%	56.1%	
Maximum Green (s)	56.0	56.0	56.0	56.0	56.0		9.0	96.0		7.0	94.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0		-2.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lag	Lead		Lag	Lead	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min		None	Min	
Act Effct Green (s)		42.7	42.7		42.7		11.0	73.1		16.4	71.2	
Actuated g/C Ratio		0.30	0.30		0.30		0.08	0.52		0.12	0.51	
v/c Ratio		0.81	0.13		0.19		0.50	0.62		0.18	0.82	
Control Delay		64.1	39.7		40.5		83.9	29.9		64.9	34.4	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		64.1	39.7		40.5		83.9	29.9		64.9	34.4	
LOS		E	D		D		F	C		E	C	
Approach Delay		60.2			40.5			33.0			35.2	

Lanes, Volumes, Timings
7: Sweeten Creek Road & Rock Hill Road

07/31/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		E			D			C			D	
Queue Length 50th (ft)		271	40		55		62	447		30	562	
Queue Length 95th (ft)		479	92		119		#154	622		81	784	
Internal Link Dist (ft)		2486			1138			432			4436	
Turn Bay Length (ft)			75				150			200		
Base Capacity (vph)		567	685		608		145	2571		206	2444	
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		0.57	0.09		0.13		0.48	0.44		0.18	0.58	

Intersection Summary			
Area Type:	Other		
Cycle Length: 180			
Actuated Cycle Length: 140.6			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.82			
Intersection Signal Delay: 37.6		Intersection LOS: D	
Intersection Capacity Utilization 77.5%		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: 7: Sweeten Creek Road & Rock Hill Road

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	4	8	1398	1218	14
Future Vol, veh/h	4	4	8	1398	1218	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	200	200	-	-	125
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	4	9	1553	1353	16

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2924	1353	1369	0	-	0
Stage 1	1353	-	-	-	-	-
Stage 2	1571	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	17	183	501	-	-	-
Stage 1	241	-	-	-	-	-
Stage 2	188	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	17	183	501	-	-	-
Mov Cap-2 Maneuver	17	-	-	-	-	-
Stage 1	237	-	-	-	-	-
Stage 2	188	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	152.5	0.1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	501	-	17	183	-	-
HCM Lane V/C Ratio	0.018	-	0.261	0.024	-	-
HCM Control Delay (s)	12.3	-	279.8	25.2	-	-
HCM Lane LOS	B	-	F	D	-	-
HCM 95th %tile Q(veh)	0.1	-	0.7	0.1	-	-

Lanes, Volumes, Timings
9: Sweeten Creek Road & Wesley Drive

07/31/2020

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	63	70	1336	43	29	1189
Future Volume (vph)	63	70	1336	43	29	1189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150	0		0	150	
Storage Lanes	1	1		0	1	
Taper Length (ft)	100				100	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850	0.996			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1855	0	1770	1863
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1583	1855	0	1770	1863
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	30		45			45
Link Distance (ft)	1130		1977			3708
Travel Time (s)	25.7		30.0			56.2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	70	78	1484	48	32	1321
Shared Lane Traffic (%)						
Lane Group Flow (vph)	70	78	1532	0	32	1321
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8				
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	7.0		7.0	12.0
Minimum Split (s)	14.0	14.0	14.0		14.0	25.0
Total Split (s)	18.0	18.0	148.0		14.0	162.0
Total Split (%)	10.0%	10.0%	82.2%		7.8%	90.0%
Maximum Green (s)	11.0	11.0	141.0		7.0	155.0
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Min		None	Min
Act Effct Green (s)	12.5	12.5	143.2		9.0	154.2
Actuated g/C Ratio	0.07	0.07	0.81		0.05	0.87
v/c Ratio	0.56	0.70	1.02		0.36	0.81
Control Delay	98.2	111.3	46.4		94.1	10.1
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	98.2	111.3	46.4		94.1	10.1
LOS	F	F	D		F	B
Approach Delay	105.1		46.4			12.1

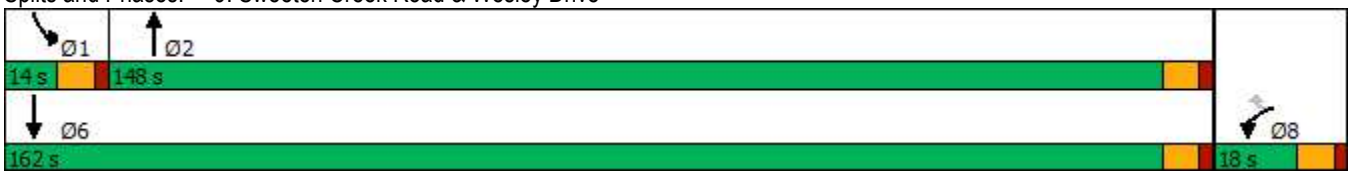
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach LOS	F		D			B
Queue Length 50th (ft)	82	92	~1944		37	537
Queue Length 95th (ft)	143	#176	#2204		80	727
Internal Link Dist (ft)	1050		1897			3628
Turn Bay Length (ft)	150				150	
Base Capacity (vph)	130	116	1503		90	1657
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.54	0.67	1.02		0.36	0.80

Intersection Summary			
Area Type:	Other		
Cycle Length: 180			
Actuated Cycle Length: 176.7			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.02			
Intersection Signal Delay: 33.9		Intersection LOS: C	
Intersection Capacity Utilization 87.1%		ICU Level of Service E	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: Sweeten Creek Road & Wesley Drive



Lanes, Volumes, Timings
7: Sweeten Creek Road & Rock Hill Road

07/31/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	269	18	21	42	40	39	82	1168	19	8	844	218
Future Volume (vph)	269	18	21	42	40	39	82	1168	19	8	844	218
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		75	0		0	150		200	200		0
Storage Lanes	0		1	0		0	1		1	1		0
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.957			0.998			0.969	
Flt Protected		0.955			0.983		0.950			0.950		
Satd. Flow (prot)	0	1779	1583	0	1752	0	1770	3532	0	1770	3429	0
Flt Permitted		0.625			0.682		0.950			0.950		
Satd. Flow (perm)	0	1164	1583	0	1216	0	1770	3532	0	1770	3429	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			30			45			45	
Link Distance (ft)		2566			1218			512			4516	
Travel Time (s)		50.0			27.7			7.8			68.4	
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	299	20	23	47	44	43	91	1298	21	9	938	242
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	319	23	0	134	0	91	1319	0	9	1180	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0		7.0	12.0		7.0	12.0	
Minimum Split (s)	14.0	14.0	14.0	14.0	14.0		14.0	25.0		14.0	25.0	
Total Split (s)	74.0	74.0	74.0	74.0	74.0		22.0	92.0		14.0	84.0	
Total Split (%)	41.1%	41.1%	41.1%	41.1%	41.1%		12.2%	51.1%		7.8%	46.7%	
Maximum Green (s)	67.0	67.0	67.0	67.0	67.0		15.0	85.0		7.0	77.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0		-2.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lag	Lead		Lag	Lead	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min		None	Min	
Act Effct Green (s)		46.4	46.4		46.4		14.4	72.4		9.9	57.5	
Actuated g/C Ratio		0.35	0.35		0.35		0.11	0.54		0.07	0.43	
v/c Ratio		0.79	0.04		0.32		0.48	0.69		0.07	0.80	
Control Delay		57.0	32.6		36.7		73.6	28.3		74.9	39.7	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		57.0	32.6		36.7		73.6	28.3		74.9	39.7	
LOS		E	C		D		E	C		E	D	
Approach Delay		55.3			36.7			31.2			40.0	

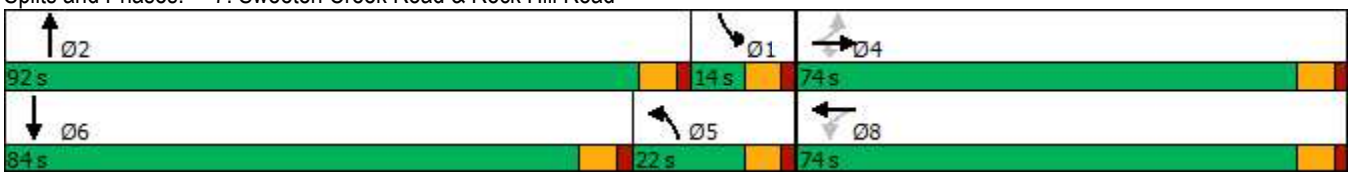
Lanes, Volumes, Timings
7: Sweeten Creek Road & Rock Hill Road

07/31/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		E			D			C			D	
Queue Length 50th (ft)		248	13		85		75	388		7	462	
Queue Length 95th (ft)		453	39		172		172	761		33	718	
Internal Link Dist (ft)		2486			1138			432			4436	
Turn Bay Length (ft)			75				150			200		
Base Capacity (vph)		637	867		666		239	2439		130	2150	
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		0.50	0.03		0.20		0.38	0.54		0.07	0.55	

Intersection Summary			
Area Type:	Other		
Cycle Length: 180			
Actuated Cycle Length: 134.2			
Natural Cycle: 80			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 37.5		Intersection LOS: D	
Intersection Capacity Utilization 73.7%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 7: Sweeten Creek Road & Rock Hill Road



Lanes, Volumes, Timings
8: Sweeten Creek Road & Carolina Day Athletic Complex/Driveway 1

07/31/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	4	4	62	4	104	2	1384	15	46	977	6
Future Volume (vph)	4	4	4	62	4	104	2	1384	15	46	977	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	150		0	150		150	300		150
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	100			100			100			100		
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		0.925			0.855				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1732	0	1787	1608	0	1770	1863	1599	1787	1863	1583
Flt Permitted	0.438			0.752			0.950			0.950		
Satd. Flow (perm)	816	1732	0	1415	1608	0	1770	1863	1599	1787	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			45			45	
Link Distance (ft)		520			651			1437			718	
Travel Time (s)		11.8			14.8			21.8			10.9	
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
Heavy Vehicles (%)	2%	1%	2%	1%	1%	1%	2%	2%	1%	1%	2%	2%
Adj. Flow (vph)	4	4	4	69	4	116	2	1538	17	51	1086	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	8	0	69	120	0	2	1538	17	51	1086	7
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	12.0	12.0	7.0	12.0	12.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	25.0	25.0	14.0	25.0	25.0
Total Split (s)	25.0	25.0		25.0	25.0		14.0	141.0	141.0	14.0	141.0	141.0
Total Split (%)	13.9%	13.9%		13.9%	13.9%		7.8%	78.3%	78.3%	7.8%	78.3%	78.3%
Maximum Green (s)	18.0	18.0		18.0	18.0		7.0	134.0	134.0	7.0	134.0	134.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0		-2.0	-2.0		-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag							Lead	Lead	Lead	Lag	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	C-Min	C-Min	None	C-Min	C-Min
Walk Time (s)	7.0	7.0		7.0	7.0			7.0	7.0		7.0	7.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0			0	0		0	0
Act Effct Green (s)	18.4	18.4		18.4	18.4		9.0	140.4	140.4	9.0	148.8	148.8
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.05	0.78	0.78	0.05	0.83	0.83
v/c Ratio	0.05	0.05		0.48	0.74		0.02	1.06	0.01	0.57	0.71	0.01
Control Delay	73.2	72.3		87.3	103.5		82.0	62.1	5.5	108.1	10.7	4.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lanes, Volumes, Timings
8: Sweeten Creek Road & Carolina Day Athletic Complex/Driveway 1

07/31/2020

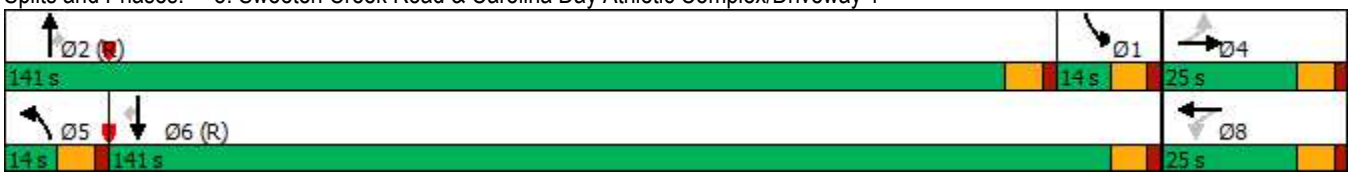
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	73.2	72.3		87.3	103.5		82.0	62.1	5.5	108.1	10.7	4.0
LOS	E	E		F	F		F	E	A	F	B	A
Approach Delay		72.6			97.6			61.5			15.0	
Approach LOS		E			F			E			B	
Queue Length 50th (ft)	4	9		78	139		2	~2040	5	60	435	1
Queue Length 95th (ft)	19	28		136	#224		13	#2299	11	#121	881	6
Internal Link Dist (ft)		440			571			1357			638	
Turn Bay Length (ft)	100			150			150		150	300		150
Base Capacity (vph)	90	192		157	178		88	1453	1247	89	1540	1309
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.04		0.44	0.67		0.02	1.06	0.01	0.57	0.71	0.01

Intersection Summary			
Area Type:	Other		
Cycle Length: 180			
Actuated Cycle Length: 180			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.06			
Intersection Signal Delay: 45.6		Intersection LOS: D	
Intersection Capacity Utilization 91.3%		ICU Level of Service F	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

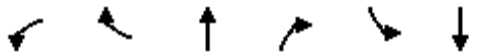
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Sweeten Creek Road & Carolina Day Athletic Complex/Driveway 1



Lanes, Volumes, Timings
9: Sweeten Creek Road & Wesley Drive

07/31/2020



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	17	9	1374	57	59	980
Future Volume (vph)	17	9	1374	57	59	980
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150	0		0	150	
Storage Lanes	1	1		0	1	
Taper Length (ft)	100				100	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850	0.995			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1853	0	1770	1863
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1583	1853	0	1770	1863
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	30		45			45
Link Distance (ft)	1130		1977			3708
Travel Time (s)	25.7		30.0			56.2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	19	10	1527	63	66	1089
Shared Lane Traffic (%)						
Lane Group Flow (vph)	19	10	1590	0	66	1089
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8				
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	12.0		7.0	12.0
Minimum Split (s)	14.0	14.0	25.0		14.0	25.0
Total Split (s)	14.0	14.0	152.0		14.0	166.0
Total Split (%)	7.8%	7.8%	84.4%		7.8%	92.2%
Maximum Green (s)	7.0	7.0	145.0		7.0	159.0
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Min		None	Min
Act Effct Green (s)	9.0	9.0	147.2		9.0	163.4
Actuated g/C Ratio	0.05	0.05	0.84		0.05	0.94
v/c Ratio	0.21	0.12	1.02		0.73	0.62
Control Delay	87.3	85.1	42.1		121.2	3.5
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	87.3	85.1	42.1		121.2	3.5
LOS	F	F	D		F	A
Approach Delay	86.5		42.1			10.2

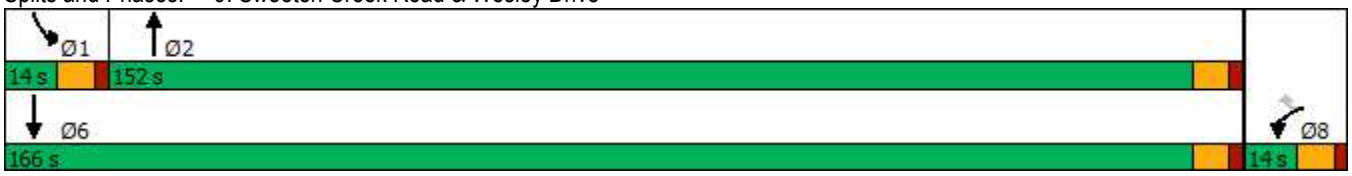
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach LOS	F		D			B
Queue Length 50th (ft)	22	12	~2038		79	237
Queue Length 95th (ft)	54	35	#2294		#168	305
Internal Link Dist (ft)	1050		1897			3628
Turn Bay Length (ft)	150				150	
Base Capacity (vph)	91	81	1564		91	1745
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.21	0.12	1.02		0.73	0.62

Intersection Summary			
Area Type:	Other		
Cycle Length: 180			
Actuated Cycle Length: 174.4			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.02			
Intersection Signal Delay: 29.3		Intersection LOS: C	
Intersection Capacity Utilization 89.9%		ICU Level of Service E	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: Sweeten Creek Road & Wesley Drive



Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	29	1372	11	0	1039
Future Vol, veh/h	0	29	1372	11	0	1039
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	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	0	32	1524	12	0	1154

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	1524	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.21	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.309	-	-	-	-
Pot Cap-1 Maneuver	0	146	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	146	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	36.5	0	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	146	-
HCM Lane V/C Ratio	-	-	0.221	-
HCM Control Delay (s)	-	-	36.5	-
HCM Lane LOS	-	-	E	-
HCM 95th %tile Q(veh)	-	-	0.8	-

Lanes, Volumes, Timings
7: Sweeten Creek Road & Rock Hill Road

07/31/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	243	47	55	21	32	21	62	1081	18	33	1087	308
Future Volume (vph)	243	47	55	21	32	21	62	1081	18	33	1087	308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		75	0		0	150		200	200		0
Storage Lanes	0		1	0		0	1		1	1		0
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.962			0.998			0.967	
Flt Protected		0.960			0.986		0.950			0.950		
Satd. Flow (prot)	0	1803	1583	0	1772	0	1770	3567	0	1787	3456	0
Flt Permitted		0.700			0.774		0.950			0.950		
Satd. Flow (perm)	0	1315	1583	0	1391	0	1770	3567	0	1787	3456	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			30			45			45	
Link Distance (ft)		2566			1218			512			1844	
Travel Time (s)		50.0			27.7			7.8			27.9	
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
Heavy Vehicles (%)	1%	2%	2%	2%	2%	1%	2%	1%	2%	1%	1%	1%
Adj. Flow (vph)	270	52	61	23	36	23	69	1201	20	37	1208	342
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	322	61	0	82	0	69	1221	0	37	1550	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0		7.0	12.0		7.0	12.0	
Minimum Split (s)	14.0	14.0	14.0	14.0	14.0		14.0	25.0		14.0	25.0	
Total Split (s)	63.0	63.0	63.0	63.0	63.0		16.0	103.0		14.0	101.0	
Total Split (%)	35.0%	35.0%	35.0%	35.0%	35.0%		8.9%	57.2%		7.8%	56.1%	
Maximum Green (s)	56.0	56.0	56.0	56.0	56.0		9.0	96.0		7.0	94.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0		-2.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lag	Lead		Lag	Lead	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min		None	Min	
Act Effct Green (s)		44.6	44.6		44.6		10.9	74.5		18.5	78.1	
Actuated g/C Ratio		0.30	0.30		0.30		0.07	0.50		0.12	0.52	
v/c Ratio		0.82	0.13		0.20		0.53	0.69		0.17	0.86	
Control Delay		68.3	42.0		43.0		90.2	34.0		68.5	37.3	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		68.3	42.0		43.0		90.2	34.0		68.5	37.3	
LOS		E	D		D		F	C		E	D	
Approach Delay		64.1			43.0			37.0			38.0	

Lanes, Volumes, Timings
7: Sweeten Creek Road & Rock Hill Road

07/31/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		E			D			D			D	
Queue Length 50th (ft)		297	44		61		68	524		33	681	
Queue Length 95th (ft)		478	92		120		#154	658		84	906	
Internal Link Dist (ft)		2486			1138			432			1764	
Turn Bay Length (ft)			75				150			200		
Base Capacity (vph)		532	641		564		136	2443		221	2318	
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		0.61	0.10		0.15		0.51	0.50		0.17	0.67	

Intersection Summary			
Area Type:	Other		
Cycle Length: 180			
Actuated Cycle Length: 149.3			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 40.7		Intersection LOS: D	
Intersection Capacity Utilization 80.8%		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: 7: Sweeten Creek Road & Rock Hill Road

Lanes, Volumes, Timings
8: Sweeten Creek Road & Carolina Day Athletic Complex/Driveway 1

07/31/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	4	4	50	4	66	8	1417	46	121	1218	14
Future Volume (vph)	4	4	4	50	4	66	8	1417	46	121	1218	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	150		0	150		150	300		150
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	100			100			100			100		
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		0.925			0.858				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1732	0	1787	1614	0	1770	1863	1599	1787	1863	1583
Flt Permitted	0.485			0.752			0.950			0.950		
Satd. Flow (perm)	903	1732	0	1415	1614	0	1770	1863	1599	1787	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			45			45	
Link Distance (ft)		520			651			1437			718	
Travel Time (s)		11.8			14.8			21.8			10.9	
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
Heavy Vehicles (%)	2%	1%	2%	1%	1%	1%	2%	2%	1%	1%	2%	2%
Adj. Flow (vph)	4	4	4	56	4	73	9	1574	51	134	1353	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	8	0	56	77	0	9	1574	51	134	1353	16
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	12.0	12.0	7.0	12.0	12.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	25.0	25.0	14.0	25.0	25.0
Total Split (s)	14.0	14.0		14.0	14.0		14.0	148.0	148.0	18.0	152.0	152.0
Total Split (%)	7.8%	7.8%		7.8%	7.8%		7.8%	82.2%	82.2%	10.0%	84.4%	84.4%
Maximum Green (s)	7.0	7.0		7.0	7.0		7.0	141.0	141.0	11.0	145.0	145.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0		-2.0	-2.0		-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	None	Min	Min
Act Effct Green (s)	9.0	9.0		9.0	9.0		9.0	143.0	143.0	13.0	155.4	155.4
Actuated g/C Ratio	0.05	0.05		0.05	0.05		0.05	0.79	0.79	0.07	0.86	0.86
v/c Ratio	0.09	0.09		0.80	0.96		0.10	1.06	0.04	1.04	0.84	0.01
Control Delay	86.0	84.1		143.0	171.4		84.4	61.9	4.0	166.2	14.2	2.6
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	86.0	84.1		143.0	171.4		84.4	61.9	4.0	166.2	14.2	2.6
LOS	F	F		F	F		F	E	A	F	B	A
Approach Delay		84.8			159.4			60.3			27.6	

Lanes, Volumes, Timings
8: Sweeten Creek Road & Carolina Day Athletic Complex/Driveway 1

07/31/2020

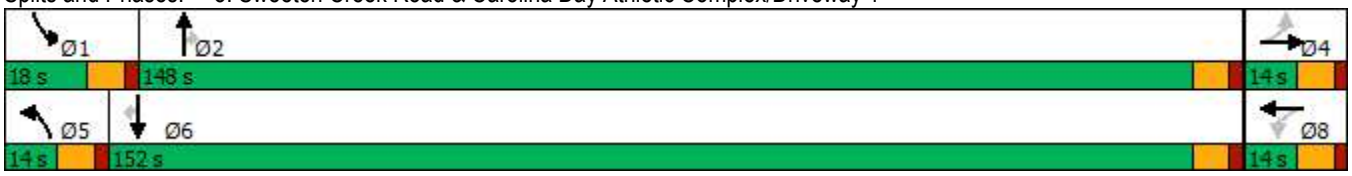
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		F			F			E			C	
Queue Length 50th (ft)	5	9		67	93		10	~2039	11	~170	448	1
Queue Length 95th (ft)	20	30		#158	#214		33	#2296	22	#324	1276	8
Internal Link Dist (ft)		440			571			1357			638	
Turn Bay Length (ft)	100			150			150		150	300		150
Base Capacity (vph)	45	86		70	80		88	1480	1270	129	1608	1366
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.09		0.80	0.96		0.10	1.06	0.04	1.04	0.84	0.01

Intersection Summary			
Area Type:	Other		
Cycle Length: 180			
Actuated Cycle Length: 180			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.06			
Intersection Signal Delay: 49.4		Intersection LOS: D	
Intersection Capacity Utilization 103.2%		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: 8: Sweeten Creek Road & Carolina Day Athletic Complex/Driveway 1



Lanes, Volumes, Timings
9: Sweeten Creek Road & Wesley Drive

07/31/2020

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	63	70	1414	43	29	1239
Future Volume (vph)	63	70	1414	43	29	1239
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150	0		0	150	
Storage Lanes	1	1		0	1	
Taper Length (ft)	100				100	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850	0.996			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1855	0	1770	1863
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1583	1855	0	1770	1863
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	30		45			45
Link Distance (ft)	1130		1977			3708
Travel Time (s)	25.7		30.0			56.2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	70	78	1571	48	32	1377
Shared Lane Traffic (%)						
Lane Group Flow (vph)	70	78	1619	0	32	1377
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8				
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	12.0		7.0	12.0
Minimum Split (s)	14.0	14.0	25.0		14.0	25.0
Total Split (s)	18.0	18.0	148.0		14.0	162.0
Total Split (%)	10.0%	10.0%	82.2%		7.8%	90.0%
Maximum Green (s)	11.0	11.0	141.0		7.0	155.0
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Min		None	Min
Act Effct Green (s)	12.5	12.5	143.2		9.0	154.2
Actuated g/C Ratio	0.07	0.07	0.81		0.05	0.87
v/c Ratio	0.56	0.70	1.08		0.36	0.85
Control Delay	98.2	111.3	66.1		94.1	12.1
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	98.2	111.3	66.1		94.1	12.1
LOS	F	F	E		F	B
Approach Delay	105.1		66.1			13.9

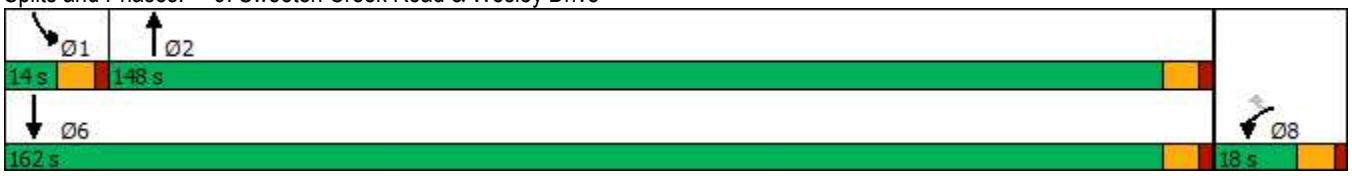
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach LOS	F		E			B
Queue Length 50th (ft)	82	92	~2157		37	626
Queue Length 95th (ft)	143	#176	#2414		80	867
Internal Link Dist (ft)	1050		1897			3628
Turn Bay Length (ft)	150				150	
Base Capacity (vph)	130	116	1503		90	1657
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.54	0.67	1.08		0.36	0.83

Intersection Summary			
Area Type:	Other		
Cycle Length: 180			
Actuated Cycle Length: 176.7			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.08			
Intersection Signal Delay: 44.8		Intersection LOS: D	
Intersection Capacity Utilization 91.2%		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: 9: Sweeten Creek Road & Wesley Drive



Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	19	1451	32	0	1267
Future Vol, veh/h	0	19	1451	32	0	1267
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	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	0	21	1612	36	0	1408

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	1612	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.21	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.309	-	-	-	-
Pot Cap-1 Maneuver	0	129	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	129	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	38.3	0	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	129	-
HCM Lane V/C Ratio	-	-	0.164	-
HCM Control Delay (s)	-	-	38.3	-
HCM Lane LOS	-	-	E	-
HCM 95th %tile Q(veh)	-	-	0.6	-

Intersection: 7: Sweeten Creek Road & Rock Hill Road

Movement	EB	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	374	175	274	249	362	300	26	456	438
Average Queue (ft)	176	39	100	65	162	160	1	293	246
95th Queue (ft)	298	131	178	163	328	311	9	439	429
Link Distance (ft)	2519		1169		442			4483	4483
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		75		150		200	200		
Storage Blk Time (%)	42			0	9	5		27	
Queuing Penalty (veh)	9			0	58	31		2	

Intersection: 8: Sweeten Creek Road & Carolina Day Athletic Complex

Movement	EB	EB	NB
Directions Served	L	R	L
Maximum Queue (ft)	30	30	28
Average Queue (ft)	3	4	3
95th Queue (ft)	16	20	16
Link Distance (ft)	476		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		200	200
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 9: Sweeten Creek Road & Wesley Drive

Movement	WB	WB	NB	SB	SB
Directions Served	L	R	TR	L	T
Maximum Queue (ft)	67	48	1494	170	217
Average Queue (ft)	13	12	692	84	52
95th Queue (ft)	41	39	1315	155	179
Link Distance (ft)		1091	1939		3646
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150			150	
Storage Blk Time (%)				7	1
Queuing Penalty (veh)				64	0

Network Summary

Network wide Queuing Penalty: 163

Intersection: 7: Sweeten Creek Road & Rock Hill Road

Movement	EB	EB	WB	NB	NB	NB	B32	SB	SB	SB
Directions Served	LT	R	LTR	L	T	TR	T	L	T	TR
Maximum Queue (ft)	505	175	144	249	533	300	1684	299	872	864
Average Queue (ft)	263	83	65	107	351	238	375	83	521	483
95th Queue (ft)	439	202	128	248	624	358	1149	264	913	872
Link Distance (ft)	2519		1169		442		4242		4483	4483
Upstream Blk Time (%)					14					
Queuing Penalty (veh)					202					
Storage Bay Dist (ft)		75		150		200		200		
Storage Blk Time (%)	61	2		1	27	21			39	
Queuing Penalty (veh)	34	5		6	159	118			13	

Intersection: 8: Sweeten Creek Road & Carolina Day Athletic Complex

Movement	EB	EB	NB
Directions Served	L	R	L
Maximum Queue (ft)	30	30	28
Average Queue (ft)	8	6	5
95th Queue (ft)	28	24	22
Link Distance (ft)	476		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		200	200
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 9: Sweeten Creek Road & Wesley Drive

Movement	WB	WB	NB	SB	SB
Directions Served	L	R	TR	L	T
Maximum Queue (ft)	140	196	775	74	296
Average Queue (ft)	73	100	497	35	108
95th Queue (ft)	128	178	789	75	278
Link Distance (ft)		1091	1939		3646
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150			150	
Storage Blk Time (%)	1	7			5
Queuing Penalty (veh)	0	5			1

Network Summary

Network wide Queuing Penalty: 543

Queuing and Blocking Report
2024 AM Peak Background

07/31/2020

Intersection: 7: Sweeten Creek Road & Rock Hill Road

Movement	EB	EB	WB	NB	NB	NB	B32	SB	SB	SB
Directions Served	LT	R	LTR	L	T	TR	T	L	T	TR
Maximum Queue (ft)	374	175	222	250	514	300	192	300	1004	962
Average Queue (ft)	210	30	105	59	199	169	6	24	394	336
95th Queue (ft)	310	112	179	155	373	288	63	146	759	730
Link Distance (ft)	2519		1169		442		4242		4483	4483
Upstream Blk Time (%)					1					
Queuing Penalty (veh)					9					
Storage Bay Dist (ft)		75		150		200		200		
Storage Blk Time (%)	51				10	4			34	
Queuing Penalty (veh)	12				71	25			3	

Intersection: 8: Sweeten Creek Road & Carolina Day Athletic Complex

Movement	EB	EB	NB
Directions Served	L	R	L
Maximum Queue (ft)	30	30	28
Average Queue (ft)	1	6	5
95th Queue (ft)	10	24	21
Link Distance (ft)	476		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		200	200
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 9: Sweeten Creek Road & Wesley Drive

Movement	WB	WB	NB	SB	SB
Directions Served	L	R	TR	L	T
Maximum Queue (ft)	49	48	1954	94	240
Average Queue (ft)	22	8	1502	48	74
95th Queue (ft)	50	29	2546	91	202
Link Distance (ft)		1091	1939		3646
Upstream Blk Time (%)			17		
Queuing Penalty (veh)			0		
Storage Bay Dist (ft)	150			150	
Storage Blk Time (%)					2
Queuing Penalty (veh)					1

Network Summary

Network wide Queuing Penalty: 121

Intersection: 7: Sweeten Creek Road & Rock Hill Road

Movement	EB	EB	WB	NB	NB	NB	B32	SB	SB	SB
Directions Served	LT	R	LTR	L	T	TR	T	L	T	TR
Maximum Queue (ft)	399	175	134	249	514	300	765	300	1614	1587
Average Queue (ft)	266	71	62	98	288	233	114	121	1023	990
95th Queue (ft)	404	176	122	216	531	350	478	346	1700	1656
Link Distance (ft)	2519		1169		442		4242		4483	4483
Upstream Blk Time (%)					7					
Queuing Penalty (veh)					102					
Storage Bay Dist (ft)		75		150		200		200		
Storage Blk Time (%)	57	9		0	23	17			54	
Queuing Penalty (veh)	35	28		5	150	103			20	

Intersection: 8: Sweeten Creek Road & Carolina Day Athletic Complex

Movement	EB	EB	NB
Directions Served	L	R	L
Maximum Queue (ft)	49	49	52
Average Queue (ft)	7	7	9
95th Queue (ft)	28	31	34
Link Distance (ft)	476		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		200	200
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 9: Sweeten Creek Road & Wesley Drive

Movement	WB	WB	NB	SB	SB
Directions Served	L	R	TR	L	T
Maximum Queue (ft)	155	216	1954	126	316
Average Queue (ft)	78	84	1484	25	123
95th Queue (ft)	152	163	2291	75	289
Link Distance (ft)		1091	1939		3646
Upstream Blk Time (%)			14		
Queuing Penalty (veh)			0		
Storage Bay Dist (ft)	150			150	
Storage Blk Time (%)	3	5			4
Queuing Penalty (veh)	3	3			1

Network Summary

Network wide Queuing Penalty: 450

Intersection: 7: Sweeten Creek Road & Rock Hill Road

Movement	EB	EB	WB	NB	NB	NB	B32	SB	SB	SB
Directions Served	LT	R	LTR	L	T	TR	T	L	T	TR
Maximum Queue (ft)	401	175	216	250	562	300	742	300	874	810
Average Queue (ft)	231	46	97	82	264	210	59	29	563	521
95th Queue (ft)	375	146	170	206	522	337	321	149	877	837
Link Distance (ft)	2519		1169		442		4242		4483	4483
Upstream Blk Time (%)					5					
Queuing Penalty (veh)					79					
Storage Bay Dist (ft)		75		150		200		200		
Storage Blk Time (%)	56	3		1	19	14			56	
Queuing Penalty (veh)	13	11		16	146	102			5	

Intersection: 8: Sweeten Creek Road & Carolina Day Athletic Complex/Driveway 1

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	30	28	249	258	28	1438	250	398	513	28
Average Queue (ft)	1	6	75	127	1	1022	26	64	193	1
95th Queue (ft)	10	23	149	213	11	1630	149	184	448	9
Link Distance (ft)		476		605		1359			656	
Upstream Blk Time (%)						3				
Queuing Penalty (veh)						50				
Storage Bay Dist (ft)	100		150		150		150	300		150
Storage Blk Time (%)			0	9		23			7	
Queuing Penalty (veh)			0	6		4			4	

Intersection: 9: Sweeten Creek Road & Wesley Drive

Movement	WB	WB	NB	SB	SB
Directions Served	L	R	TR	L	T
Maximum Queue (ft)	50	48	1978	249	426
Average Queue (ft)	16	11	1670	77	100
95th Queue (ft)	42	35	2304	160	296
Link Distance (ft)		1091	1939		3644
Upstream Blk Time (%)			13		
Queuing Penalty (veh)			0		
Storage Bay Dist (ft)	150			150	
Storage Blk Time (%)				1	3
Queuing Penalty (veh)				7	2

Intersection: 13: Sweeten Creek Road & Driveway 2

Movement	WB	NB
Directions Served	R	T
Maximum Queue (ft)	130	294
Average Queue (ft)	57	19
95th Queue (ft)	121	134
Link Distance (ft)	391	3644
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		1
Queuing Penalty (veh)		0

Network Summary

Network wide Queuing Penalty: 445

Intersection: 7: Sweeten Creek Road & Rock Hill Road

Movement	EB	EB	WB	NB	NB	NB	B32	SB	SB	SB
Directions Served	LT	R	LTR	L	T	TR	T	L	T	TR
Maximum Queue (ft)	441	175	140	249	524	300	1286	300	1848	1848
Average Queue (ft)	250	72	62	95	313	215	233	114	1441	1421
95th Queue (ft)	393	188	112	226	601	357	838	347	2180	2180
Link Distance (ft)	2519		1171		442		4242		1814	1814
Upstream Blk Time (%)					10				36	37
Queuing Penalty (veh)					165				0	0
Storage Bay Dist (ft)		75		150		200		200		
Storage Blk Time (%)	56	4		2	26	21			60	
Queuing Penalty (veh)	34	14		21	181	139			22	

Intersection: 8: Sweeten Creek Road & Carolina Day Athletic Complex/Driveway 1

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	51	28	135	152	244	840	250	399	522	27
Average Queue (ft)	5	6	67	110	16	497	52	234	153	2
95th Queue (ft)	24	24	119	154	89	750	215	354	424	11
Link Distance (ft)		476		605		1359			656	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	100		150		150		150	300		150
Storage Blk Time (%)			0	2		17		7	5	
Queuing Penalty (veh)			0	1		10		98	7	

Intersection: 9: Sweeten Creek Road & Wesley Drive

Movement	WB	WB	NB	SB	SB
Directions Served	L	R	TR	L	T
Maximum Queue (ft)	249	284	1999	92	316
Average Queue (ft)	83	132	1778	34	129
95th Queue (ft)	169	232	2427	73	300
Link Distance (ft)		1091	1939		3644
Upstream Blk Time (%)			25		
Queuing Penalty (veh)			0		
Storage Bay Dist (ft)	150			150	
Storage Blk Time (%)	1	15			5
Queuing Penalty (veh)	1	11			2

Intersection: 13: Sweeten Creek Road & Driveway 2

Movement	WB
Directions Served	R
Maximum Queue (ft)	46
Average Queue (ft)	10
95th Queue (ft)	32
Link Distance (ft)	391
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 707

APPENDIX F

Mattern and Craig, LLC

Engineers - Surveyors

Asheville, North Carolina

Study Name : **Sweeten Creek Rd and Site Driveway 1 Signal Warrant Study 2 lanes**

Study Date : **08/06/20**

Page No. : **1**

Signal Warrants - Summary

Major Street Approaches

Northbound: **Sweeten Creek Rd**

Number of Lanes: **2**

85% Speed > 40 MPH.

Total Approach Volume: **14,238**

Southbound: **Sweeten Creek Rd**

Number of Lanes: **2**

85% Speed > 40 MPH.

Total Approach Volume: **13,347**

Minor Street Approaches

Eastbound: **Carolina Day**

Number of Lanes: **2**

Total Approach Volume: **123**

Westbound: **Site Driveway 1**

Number of Lanes: **2**

Total Approach Volume: **1,710**

Warrant Summary **(Rural values apply.)**

Warrant 1 - Eight Hour Vehicular Volumes ..... **Satisfied**

Warrant 1A - Minimum Vehicular Volume ..... **Not Satisfied**

Required volumes reached for 3 hours, 8 are needed

Warrant 1B - Interruption of Continuous Traffic ..... **Satisfied**

Required volumes reached for 9 hours, 8 are needed

Warrant 1C - Combination of Warrants ..... **Not Satisfied**

Required 1A volumes reached for 4 hours, 8 are needed

Required 1B volumes reached for 15 hours, 8 are needed

Warrant 2 - Four Hour Volumes ..... **Satisfied**

Number of hours (8) volumes exceed minimum >= minimum required (4).

Warrant 3 - Peak Hour ..... **Satisfied**

Warrant 3A - Peak Hour Delay ..... **Satisfied**

Number of hours (8) volumes exceed minimum >= required (1). Delay data not evaluated.

Warrant 3B - Peak Hour Volumes ..... **Satisfied**

Volumes exceed minimums for at least one hour.

Warrant 4 - Pedestrian Volumes ..... **Not Evaluated**

Warrant 5 - School Crossing ..... **Not Evaluated**

Warrant 6 - Coordinated Signal System ..... **Not Evaluated**

Warrant 7 - Crash Experience ..... **Not Evaluated**

Warrant 8 - Roadway Network ..... **Satisfied**

Major Route conditions met. Volume requirements met.

Warrant 9 - Intersection Near a Grade Crossing ..... **Not Evaluated**

Mattern and Craig, LLC

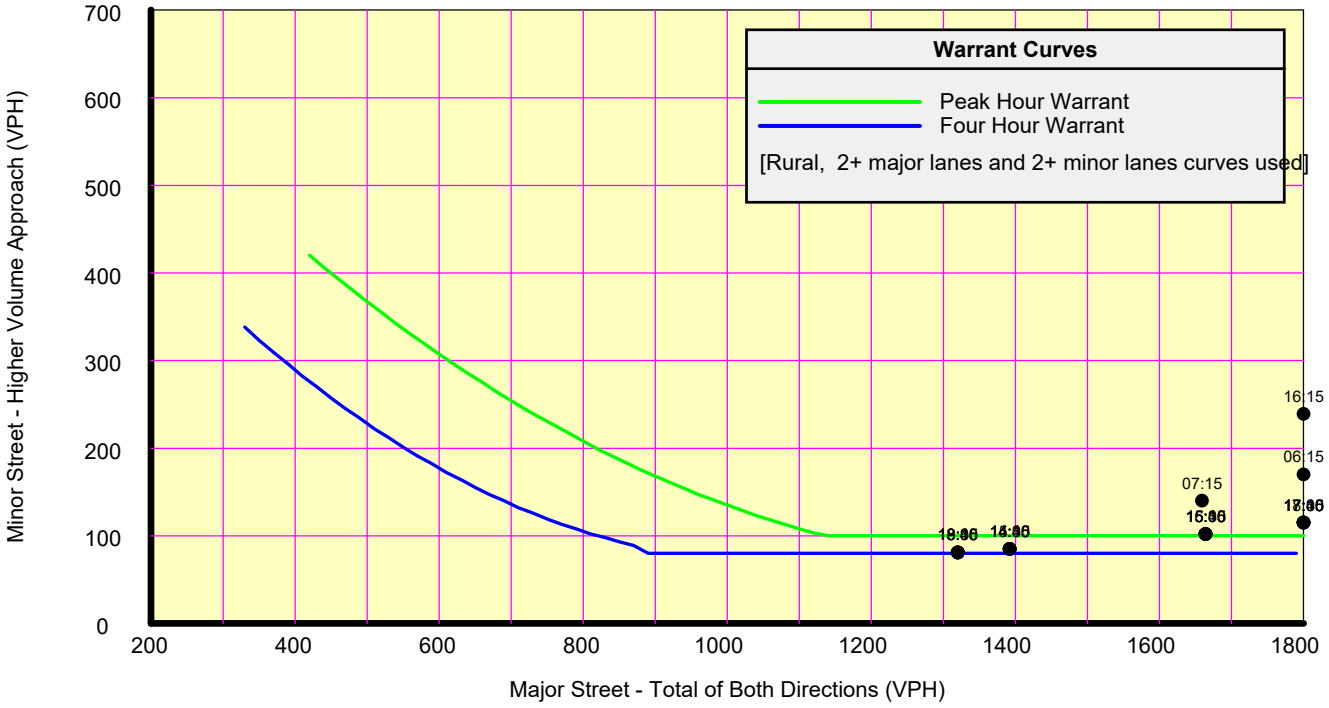
Engineers - Surveyors

Asheville, North Carolina

Study Name : **Sweeten Creek Rd and Site Driveway 1 Signal Warrant Study 2 lanes**

Study Date : **08/06/20**

Signal Warrants - Summary



Analysis of 8-Hour Volume Warrants:

War 1A-Minimum Volume

Hour Begin	Major Total	Minor Vol	Minor Dir	Maj 420	Min 140
16:15	4,759	239	W	Yes	Yes
06:15	2,432	170	W	Yes	Yes
07:15	1,659	140	W	Yes	Yes
18:00	1,867	115	W	Yes	No
17:45	1,867	115	W	Yes	No
17:30	1,867	115	W	Yes	No
17:15	1,867	115	W	Yes	No
16:00	1,664	102	W	Yes	No
15:45	1,664	102	W	Yes	No
15:30	1,664	102	W	Yes	No
15:15	1,664	102	W	Yes	No
15:00	1,392	85	W	Yes	No
14:45	1,392	85	W	Yes	No
14:30	1,392	85	W	Yes	No
14:15	1,392	85	W	Yes	No
19:00	1,320	81	W	Yes	No
18:45	1,320	81	W	Yes	No
18:30	1,320	81	W	Yes	No
18:15	1,320	81	W	Yes	No
09:00	1,287	67	W	Yes	No
08:45	1,287	67	W	Yes	No
08:30	1,287	67	W	Yes	No
08:15	1,287	67	W	Yes	No
14:00	1,154	71	W	Yes	No

War 1B-Interruption of Traffic

Hour Begin	Major Total	Minor Vol	Minor Dir	Maj 630	Min 70
16:15	4,759	239	W	Yes	Yes
06:15	2,432	170	W	Yes	Yes
17:15	1,867	115	W	Yes	Yes
15:15	1,664	102	W	Yes	Yes
07:15	1,659	140	W	Yes	Yes
14:15	1,392	85	W	Yes	Yes
18:15	1,320	81	W	Yes	Yes
13:15	1,154	71	W	Yes	Yes
05:15	1,067	89	W	Yes	Yes
09:00	1,287	67	W	Yes	No
08:45	1,287	67	W	Yes	No
08:30	1,287	67	W	Yes	No
08:15	1,287	67	W	Yes	No
20:00	1,094	67	W	Yes	No
19:45	1,094	67	W	Yes	No
19:30	1,094	67	W	Yes	No
19:15	1,094	67	W	Yes	No
13:00	1,052	65	W	Yes	No
12:45	1,052	65	W	Yes	No
12:30	1,052	65	W	Yes	No
12:15	1,052	65	W	Yes	No
12:00	1,052	65	W	Yes	No
11:45	1,052	65	W	Yes	No
11:30	1,052	65	W	Yes	No

War 1C-Combination of Warrants

Hour Begin	Major Total	Minor Vol	Minor Dir	1A Met	1B Met
16:15	4,759	239	W	Yes	Yes
06:15	2,432	170	W	Yes	Yes
17:15	1,867	115	W	Yes	Yes
15:15	1,664	102	W	No	Yes
07:15	1,659	140	W	Yes	Yes
14:15	1,392	85	W	No	Yes
18:15	1,320	81	W	No	Yes
08:15	1,287	67	W	No	Yes
13:15	1,154	71	W	No	Yes
19:15	1,094	67	W	No	Yes
05:15	1,067	89	W	No	Yes
12:15	1,052	65	W	No	Yes
11:15	1,052	65	W	No	Yes
10:15	1,052	65	W	No	Yes
09:15	917	56	W	No	Yes
16:00	1,664	102	W	No	-
15:45	1,664	102	W	No	-
15:30	1,664	102	W	No	-
15:00	1,392	85	W	No	-
14:45	1,392	85	W	No	-
14:30	1,392	85	W	No	-
19:00	1,320	81	W	No	-
18:45	1,320	81	W	No	-
18:30	1,320	81	W	No	-

APPENDIX G

Lance Hartland

From: Dorato, Nicholas K <nkdorato@ncdot.gov>
Sent: Wednesday, August 5, 2020 1:11 PM
To: Lance Hartland
Cc: Craig D. Justus; James Voso; Foster, Ryan; Reese, Michael P; Medlin, Christopher D; Olson, David W; Henderson, Anna G; Cannon, Steven L; Roberts, James P
Subject: RE: [External] Busbee/Sweeten Creek TIA: Revised Scoping Document
Attachments: Scoping Review REVISED SC-2019-141 Busbee Sweeten Creek.pdf; Busbee Sweeten Creek NCDOT TIA Checklist 7-24-20.pdf

Lance,
Hope you are well!

We have reviewed the scoping checklist for the proposed ***Busbee Sweeten Creek Development***. We find the provided information reasonable. The District office concurs with the scoping checklist for the proposed Development. This email concurrence may be used in lieu of the approval signature. Please submit TIA in accordance to NCDOT policies and procedures. See attachment for comments. Thanks in advance.

Thanks,

Nick Dorato
Engineering Technician III
North Carolina Department of Transportation
Division 13 District 2

8282982741 office
nkdorato@ncdot.gov

11 Old Charlotte Hwy
Asheville, NC 28803

From: Lance Hartland <dlhartland@matternandcraig.com>
Sent: Friday, July 24, 2020 5:07 PM
To: Dorato, Nicholas K <nkdorato@ncdot.gov>; Reese, Michael P <mikereese@ncdot.gov>
Cc: Craig D. Justus <cjustus@vwlawfirm.com>; James Voso <jbvoso@matternandcraig.com>; Foster, Ryan <Ryan.Foster@flournoydev.com>
Subject: [External] Busbee/Sweeten Creek TIA: Revised Scoping Document

Nick and Mike,
Attached is a updated scoping document for the revised TIA that we will be submitting for the Busbee/Sweeten Creek project. Two items that have changed are the land use has been modified slightly and the study area has been reduced. The later is based on own recent discussion that CMS was ok with us reducing our study area to the next signalized intersection to the north and to the south.

Thanks,

D. Lance Hartland, PE
Mattern & Craig | ENGINEERS • SURVEYORS
12 Broad Street | Asheville, NC 28801
(828) 254-2201 (Office) | (828) 254-4562 (Fax)
Virginia |Tennessee | North Carolina | South Carolina
www.matternandcraig.com

Engineering Solutions for Change and Growth

Busbee Sweeten Creek TIA SCOPING REVIEW

BULLET LIST OF NCDOT COMMENTS AND CONCERNS (SC-2019-141)

August 5, 2020

The Department (NCDOT) has performed a review of the scoping document for the revised proposed Busbee Sweeten Creek development prepared by Mattern & Craig (received July 24, 2020). According to the document, the proposed development is to be located along the east side of US-25 ALT (Sweeten Creek Rd), across from the Carolina Day School Athletic Complex Driveway in Asheville, Buncombe County. The scoping document states that the full build-out of the development is to be constructed by 2024 and is to consist of a variety of residential land uses. Based on our review, we have the following comments at this time:

General

- TIP projects U-2801 and U-5834 are in the immediate area of this project. The full build-out of this development project is anticipated to occur prior to the completion of either of these TIP projects. Construction of U-2801 will reconfigure site driveway connections to US-25 ALT (Sweeten Creek Rd),

Trip Generation

- The Trip Generation appears reasonable.

Trip Distribution and Growth Rate

- Trip Distribution contains a couple arithmetical errors in which total incoming or outgoing for AM or PM do not add up to 100%; otherwise, it appears reasonable.
- Growth factor of 2 percent appears reasonable.

Study Intersections

- Study Intersections appear reasonable.

Site Plan and Proposed Driveways

- Site Plan appears reasonable.
- Proposed Site Driveway #1 may have full movements in the interim until the commencement of construction of TIP Project U-2801, after which it will be restricted to a left-over (left-in/right-in/right-out only).
- Proposed Site Driveway #2 will be physically restricted to RIRO (right-in/right-out movements only) at all times.

NOTE: This list should not be considered all-inclusive. Further review may identify additional areas of concern.

NCDOT Traffic Impact Analysis Need Screening / Scoping Request

TIA Need Screening → TIA Scoping → TIA Submittal

A Traffic Impact Analysis (TIA) may be required for developments based on the site trip generation estimates, site context, or at the discretion of the NCDOT District Engineer. The Applicant or the TIA Consultant shall submit this form along with the site plan to the District Engineer to determine the TIA need and, if a TIA is required, initiate the TIA scoping process. Without an approved scope, the TIA is incomplete and will be rejected until the study is revised to conform to NCDOT's TIA requirements.

Project Name: Busbee Property Sweeten Creek **Previous Name:** If Applicable

Location: 72 Broadway, Asheville **County:** Buncombe **Municipality:** Asheville

Project Description: Residential Development consisting of apartments, condos, senior adult housing, and single family homes.

Project Contact:	Applicant	TIA Consultant
Company Name	Flournoy Development Group	Mattern & Craig Engineers - Surveyors
Contact Person	Ryan Foster	D. Lance Hartland, P. E.
Phone Number	706-243-9403	828-254-2201
Email	Ryan.Foster@flournoydev.com	dlhartland@matternandcraig.com
Mailing Address	P. O. Box 6566 Columbus, GA 31917	12 Broad Street Asheville, NC 28801

Site Plan Prepared By: WGLA Engineering **Site Plan Date:** 7/09/20

See site plan/vicinity map requirements on page 2.

Parcel Size: 331.82 Acre(s) **Anticipated Build-Out Year:** 2024

Weekday Site Trip Generation - Do NOT adjust for mode split, pass-by, internal capture, or diverted trips.

ITE LUC	Proposed Land Use	Size	Unit	Daily Trips	Peak Hour Type	AM Peak Hour Trips			PM Peak Hour Trips			Data Source
						Enter	Exit	Total	Enter	Exit	Total	
221	Multifamily Midrise	630	Dwelling	3430	Adj. Street	54	156	210	162	104	266	ITE Equation
252	Sr Adult Housing	211	Dwelling	798	Adj. Street	15	27	42	30	25	55	ITE Equation
210	Single-Family	11	Dwelling	136	Adj. Street	3	10	13	7	5	12	ITE Equation
Total				4364		72	193	265	199	134	333	

Refer to the current *NCDOT Congestion Management Capacity Analysis Guidelines* for acceptable trip calculation methods and data sources.

**Explain local or other data sources, if used:

☒ The estimated site trips meet NCDOT's TIA trip threshold of 3,000 daily trips.

☒ The estimated site trips meet the municipal TIA trip threshold of Buncombe County 75 Units

☒ This project is located in a known STIP and/ or local CIP project # U2801

☐ This project includes a rezoning request.

NCDOT Traffic Impact Analysis Need Screening / Scoping Request

TIA Need Screening → TIA Scoping → TIA Submittal

☐ The proposed site access is located within 1,000 feet of an interchange.

☐ The Applicant requests for a new or modified control-of-access break.

☐ The Applicant requests for a new or modified median break.

Applicant's Signature | Ryan Foster (Print Name) | 4/1/2020 (Date)

Site Plan/Vicinity Map Requirement for TIA Need Screening: While the site plan may not be finalized during the TIA scoping stage, the graphic representation of the proposed development shall provide adequate details on the development scope and context. More specifically, the site plan/map shall clearly show the location and type of each access point, spacing to adjacent and opposing driveways or intersections, internal street network, proposed buildings/parcels with their anticipated uses and sizes at full build-out and, if applicable, any nearby interstate, US, NC or Secondary Roads (SR).

Project Name: Busbee Property Sweeten Creek **Project Reference Number:** _____

☒ **A TIA is Required by the Local Government.** In addition, the study area is expected to include NCDOT maintained transportation facilities.

☒ **A TIA is Required by NCDOT,** per the *Policy on Street and Driveway Access to North Carolina Highways*.

If either or both of the boxes above are checked, the Applicant/TIA Consultant is hereby requested to fill out as much as possible of the following TIA scoping checklist, and return it along with the supporting documents to NCDOT prior to the scoping meeting.

☐ **A TIA is NOT required**. This decision is based on the development information presented above. Changes in the development plan will require re-evaluation of the TIA need, and may necessitate a TIA. The Applicant should inform the District Engineer of any significant changes in a timely fashion to avoid delays or rejections of the driveway permit / encroachment agreement applications.

Additional Comments:

The TIA need decision is made by the NCDOT Division 13 District 2 on _____.

NCDOT District Representative's Signature

Print Name

Email concurrence may be used in lieu of the signature.

NCDOT TIA Scoping Checklist

TIA Need Screening → TIA Scoping → TIA Submittal

Project Name: Busbee Property Sweeten Creek **TIA Scoping Date:** 07/24/20

☒ **TIA Need Screening Forms are Attached.** Project Reference #: _____ Decision Date: _____

☒ **Site Plan and Access**

☒ Provide a site plan illustrating site access, internal and external roadways, buildings and land uses.
Refer to NCDOT's *Policy on Street and Driveway Access to North Carolina Highways* pages 14 and 15 for site plan requirements.

☒ Identify site access.

New Access	On Road	Access Type		Driveway Spacing		
	Road Name	Permitted Movements	Traffic Control	Distance (ft)	Direction	Nearest Intersection / Access
Access A	US 25A	Conventional Full-Mvmt	Signal	0	East	Car Day Sch Ath Fld
Access B	US 25A	RIRO	2-Way Stop	1500	South	Car Day Sch Ath Fld
Access C						
Access D						
Access E						
Access F						
Access G						
Access H						

Existing Access	Existing Intersection of		Access Modification	Proposed Interconnectivity (If Applicable)		
	Road A	Road B		Connector #	Road Connected	Adjacent Development
Access 1			Please Select	Connector 1		
Access 2				Connector 2		
Access 3				Connector 3		
Access 4				Connector 4		

☐ Additional access clarifications and provisions (e.g., proposed control-of-access or median breaks, modifications of existing access, loading/unloading area access, bike/pedestrian accommodation).

☒ Access point geometry will be as per the attached NCDOT Cursory Review, dated 7/20/20

Proposed K-12 School Site

☐ NCDOT MSTA School Traffic Calculator for Select School Type shall be used.

☐ Peak Hour Factors (PHFs) shall be adjusted/weighted for new school trips (0.5 PHF by default).

☐ Internal school circulation analysis is required, and should be submitted in advance or concurrent with the TIA submittal.

☐ Clarify traffic operation plans (e.g. traffic circulation pattern, pedestrian access, drop-off/pick-up zone location and configuration, queue storage area and, if applicable, staggered start times).

☒ Trip Generation

The TIA Consultant shall prepare trip generation estimates following the current *NCDOT Congestion Management Capacity Analysis Guidelines*, and submit the calculation sheets and supporting information to the District Engineer for approval prior to capacity analysis.

ITE LUC	Proposed Land Use	Size	Unit	Daily Trips	Peak Hour Type	AM Peak Hour Trips			PM Peak Hour Trips			Data Source
						Enter	Exit	Total	Enter	Exit	Total	
221	Multifam Midrise*	630	Dwelling	3430	Adj. Street	54	156	210	162	102	266	ITE Equation
252	Sr. Adult Housing*	211	Dwelling	798	Adj. Street	15	27	42	30	25	55	ITE Equation
210	Single Family	11	Dwelling	136	Adj. Street	3	10	13	7	5	12	ITE Equation
Unadjusted Site Trips				4364		72	193	265	199	134	333	
Internal Capture Trips (Attach Calculation Sheets)												Please Select
Internal Capture % of Unadjusted Site Trips				%		%			%			
LUC	Proposed Land Use	Any Internal Trips?		Pass-By % of External Trips								
		Not Applicable		%		%			%			Please Select
				%		%			%			
				%		%			%			
				%		%			%			
				%		%			%			
Pass-By Trips (Attach Calculation Sheets)												
Adjacent Street Volumes												Please Select
Non-Pass-By Primary Trips												
Diverted Trips, if Applicable and Justifiable												Please Select

**Explain local or other data sources, if used:

*Trips were calculated for each building of each use. Both LUC 221 and 252 have two buildings.

☐ Existing Site Trip Information for Redevelopment Projects (Attach separate sheets as needed)

ITE LUC	Existing Land Use	Size	Unit	Daily Trips	Peak Hour Type	AM Peak Hour Trips			PM Peak Hour Trips			Data Source
						Enter	Exit	Total	Enter	Exit	Total	
					Please Select							Please Select
Total Existing Site Trips												

☒ **Trip Distribution**

☒ Trip distribution diagrams are submitted concurrently with this document (attach separate sheets).

☐ Trip distribution diagrams will be submitted separately, along with supporting information, to the District Engineer for review and approval prior to capacity analysis. The trip distribution shall be based on the current and anticipated traffic patterns, as well as instructions noted below.

If required by the District Engineer, the following additional diagrams shall also be submitted:

☐ Mixed-Use Developments (separate diagrams for residential, commercial, and office trips)

☐ Inter-Development Trips (if 'internal" trips cross public streets)

☐ Pass-By Trips

☐ Diverted Trips

☐ Each Analysis Period

☐ **Mode Split**

☐ Provide Data Source and Justification

Mode / Period	Auto		
AM Peak	%	%	%
PM Peak	%	%	%
Daily	%	%	%
	%	%	%

☐ Identify proper infrastructure and accommodation for other modes of travel.

☒ **Analysis Peak Periods:**

☒ Weekday AM Peak 7-9 AM

☒ Weekday PM Peak 4-6 PM

☐ Weekday Midday Peak _____

☐ Weekday PM School Peak _____

☐ Weekend _____ Peak _____

☐ Other _____

☒ Study Area Intersections and Data Collection

The study area shall include the site access intersections (both new and existing) identified under "Site Plan and Access" on page 1, as well as the following external and, if applicable, internal intersections.

External Intersection	Intersection of		Traffic Control	Intersection Turning Movement Counts			Notes
	Road A	Road B		New / Existing	Date of Counts	Growth Adjustment	
#1	US 25A	Rock Hill Rd	Signal	Use Existing Counts	5/2019	2%	
#2	US 25A	Carolina Day Sch	2-Way Stop	Use Existing Counts	5/2019	2%	
#3	US 25A	Wesley Dr	Signal	Use Existing Counts	5/2019	2%	
#4				Require New Counts			
#5				Require New Counts			
#6				Require New Counts			
#7				Require New Counts			
#8				Require New Counts			
#9				Require New Counts			
#10				Require New Counts			
#11				Require New Counts			
#12							

Internal Intersection	Intersection of		Access Type		Intersection Spacing		
	Road A	Road B	Traffic Control	Permitted Movements	Distance (ft)	Direction	Nearest Intersection
#101			Please Select	Please Select		Please Select	
#102							
#103							
#104							
#105							

The following data will be collected:

☒ New traffic turning movement counts in ☒ 15-min intervals ☐ 5-min intervals (near schools)
Unless otherwise noted above, new traffic counts shall be collected at the existing study intersections during the analysis periods. Weekday counts shall avoid Mondays, Fridays, holidays, school breaks, road closures, and major weather events.

☐ To account for the impact of existing and/or proposed school traffic, PHFs will be adjusted for:

intersections numbered: _____

and access points numbered: _____

☐ Traffic Forecast Data for TIP: _____

☒ Roadway/Intersection Configuration & Traffic Control

☒ Traffic Signal Phasing & Timing Data

☐ Crash Data: _____ Period: _____

☐ Other:

☒ **Future Year Conditions**

☒ Project Build-Out Year: 2024

☐ Future Analysis Year(s): _____

☒ Identify below any funded/committed future transportation improvements, as well as any approved but incomplete developments near the site.

Funded STIP / Local CIP Project	Project Description	Year Complete
U-2801	US 25A (SWEETEN CREEK RD)	2026

Nearby Approved Development	Location	Future Land Use (exclude any completed phases)	Committed Improvements

☒ Annual Growth Factor: 2 %

Justification/Data Source: _____

☐ **Local Comprehensive Transportation Plan Compliance**

☐ Identify Applicable Local Transportation Planning Documents

☐ Identify Applicable Roadways inside the Study Area

Road Name	Classification	Speed Limit	Proposed Cross-Section	Proposed Right-of-Way	Compliance Requirements	Affect Study Intersection #

☒ Study Method

The traffic analysis shall follow the current *NCDOT Congestion Management Capacity Analysis Guidelines*, *Policy on Street and Driveway Access to North Carolina Highways*, and use the current approved version of analysis software (e.g. Synchro/SimTraffic, HCS, Sidra Intersection, TransModeler).

The study shall include the following analysis scenarios for each analysis period.

1. Existing Conditions
2. Future No-Build Conditions (existing + background growth + approved developments + committed or funded improvements)
3. Future Build Conditions (future no-build + site trips)
4. Future Build with Improvements Conditions (future build traffic with improvements to mitigate the proposed development's impacts) and, if applicable:

☐ 5. TIP Design Year Analysis _____

☐ 6. Alternative Access Scenario (without proposed control-of-access or median break / modification)

The following additional analysis/outputs should be provided as warranted:

☒ Signal Warrant Analysis for accesses/intersections Sweeten Creek Rd at Carolina Day/Main Drive

☐ Multi-Modal Level of Service Analysis

☐ School Loading Zone Traffic Simulation

☐ Phasing Analysis (scope separately as needed)

☐ Safety/Crash Analysis

☐ Control-of-Access Modification Justification

☐ Median Break / Modification Justification

☐ Other _____

☐ Submittals

In addition to the hardcopies required below, the TIA Consultant shall provide the District Engineer and, if required, the local government an electronic copy of the study documents, including the latest site plan, figures and appendices, in searchable PDF files and the original traffic analysis files (e.g., Synchro, HCS). To expedite review, the NCDOT electronic submittals shall also be delivered concurrently to:

☐ Div. Traffic Engr ☐ Regional Traffic Engr ☐ Congestion Management ☐ Other _____

Submittals	NCDOT		Local Government	
	Electronic	Hardcopy	Electronic	Hardcopy
Trip Generation & Distribution	Required		Please Select	
Draft TIA Report	Required			
Final Sealed TIA Report	Required			

☐ **Additional Comments (**municipal TIA requirements, approved variations from NCDOT guidelines)

Agreement by All Parties

The undersigned agree to the contents and methodology described above for completing the required traffic impact analysis for the proposed development identified herein. Any changes to the above methodology contemplated by the Applicant or the TIA Consultant must be submitted to the District Engineer in writing. If approved by NCDOT, then such changes may be accepted for the TIA report. Subsequent revisions to the development plan (e.g. land use, density, site access, or schedule) may require additional scoping and analysis, and may modify the TIA requirements.

This agreement shall become effective on the date approved by NCDOT, and shall expire ____ months after the effective date or upon significant changes to the roadway network and/or development assumptions, whichever occurs first. Once expired, renewal or re-scoping will be required for subsequent TIA submittals.

APPLICANT

Signature	Ryan Foster Print Name	4/1/2020 Date

TIA CONSULTANT

Signature	D. Lance Hartland, P. E. Print Name	Date

LOCAL GOVERNMENT REPRESENTATIVE (If Applicable)

Signature	Print Name	Date

Email concurrence may be used in lieu of the signature.

NCDOT DISTRICT REPRESENTATIVE

Reviewed and approved by the NCDOT Division ____District____ on _____.

Signature	Print Name

Email concurrence may be used in lieu of the signature.

NCDOT TIA Submittal Checklist

TIA Need Screening → TIA Scoping → TIA Submittal

Submittal: Draft TIA Report **Document Date:** 3/30/20

Project Name: Busbee Property Sweeten Creek **Previous Name:** If Applicable

NCDOT Division: 13 **District:** 2 **County:** Buncombe **Municipality:** Asheville

TIA Consultant: Mattern & Craig Submitted By: D. Lance Hartland, P. E.

Phone Number: 828-254-2201 Email: dlhartland@matternandcraig.com

TIA Scoping Checklist Approval Date: **Unadjusted Daily Site Trips:**

☒ The approved TIA Scoping Checklist is included in this submittal.

☐ LOS D or better is expected at all study intersections after proposed mitigations.

☒ The study report is sealed by a NC Professional Engineer with expertise in traffic engineering.

☒ This study has identified all known deficiencies with and without the proposed development.

☒ This study has identified mitigation measures to adequately accommodate the site trips.

Explain here if any of the boxes above are unchecked:

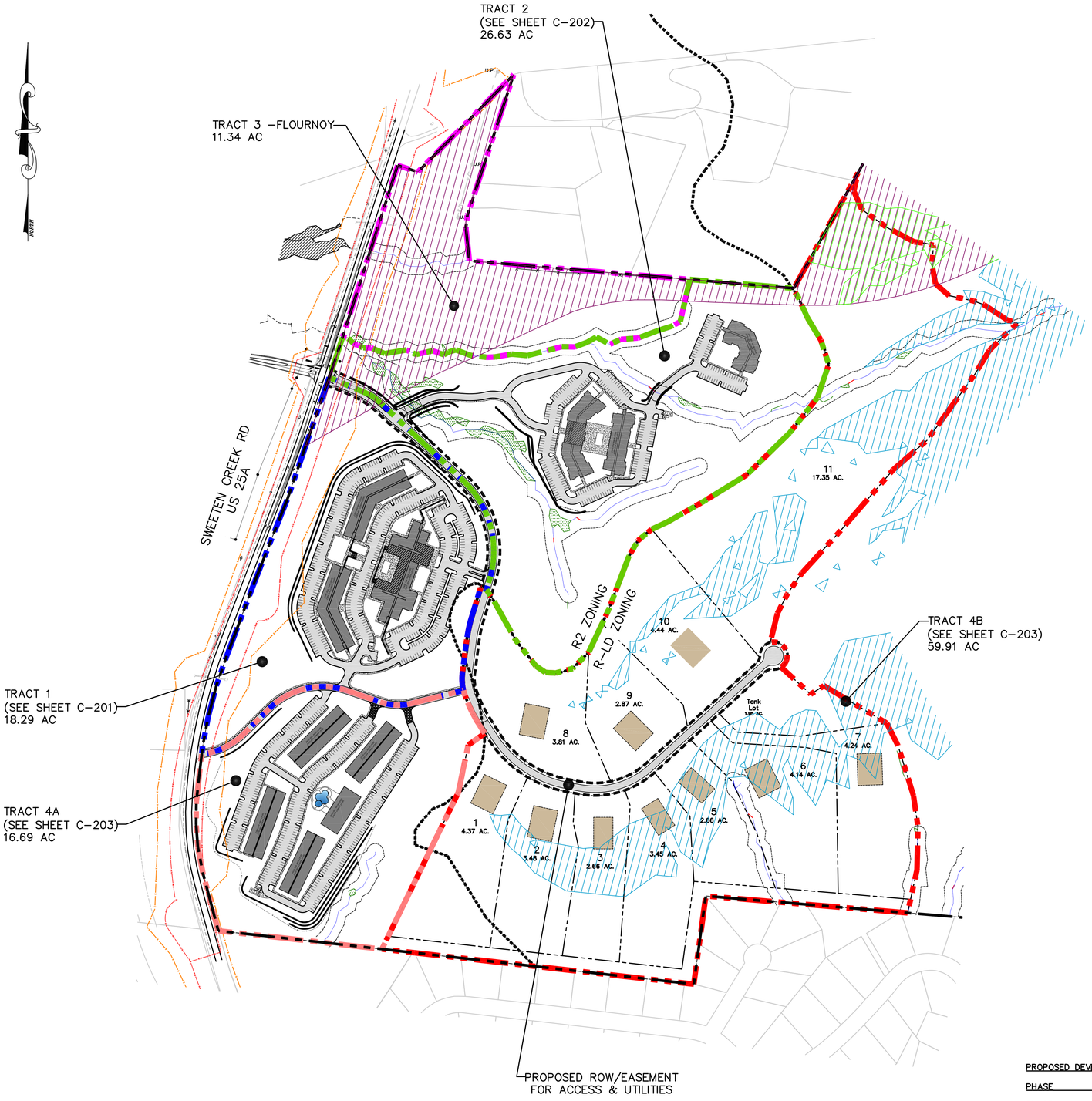
If the resulting LOS is below "D" discussion will be provided on possible improvement that would improve the LOS.

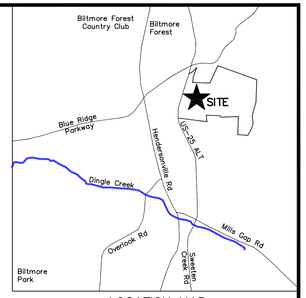
The undersigned affirms that, except for the deviations noted below, the TIA submittal conforms to the current *NCDOT Congestion Management Capacity Analysis Guidelines*, *Policy on Street and Driveway Access to North Carolina Highways*, and the TIA Scoping Checklist approved by the NCDOT District Office. The undersigned also acknowledges that the TIA will be rejected if the deviations and justifications are not properly documented and approved by NCDOT.

Deviations and Justifications (e.g., changes in site plan, development schedule, site trip and off-site trip estimates, study area, data collection, analysis period and method. Attached separate sheets if needed.)

NCDOT TIA Submittal Checklist

TIA Consultant's Signature (Professional Engineer of TIA Record)	D. Lance Hartland, P. E. Print Name	Date





LOCATION MAP
N.T.S.

PROJECT SUMMARY

PROJECT NAME:	BUSBEE
PIN #	9656-42-9538
DB/PG:	1222/0645
ZONING	R2 75.31 AC./RLD 256.69 AC. (BUNCOMBE COUNTY)
OWNER	BILTMORE FARMS, LLC ASHEVILLE, NC 28803
DEVELOPER	FLOURNOY DEVELOPMENT COMPANY
ENGINEER	WILLIAM R. BUIE, P.E. WGLA ENGINEERING, PLLC 724 5TH AVENUE WEST HENDERSONVILLE, NC 28739
ACREAGE	331.82 AC±
ALLOWABLE DENSITY	R2 - 75.13 AC. x 12 UNITS/AC. = 902 R-LD - 57.76 AC. x 2 UNITS/AC. = 116 TOTAL ALLOWABLE UNITS = 1018
WATER SYSTEM	ON SITE (PUBLIC) CITY OF ASHEVILLE
SEWER SYSTEM	ON SITE (PUBLIC) MSD OF BUNCOMBE COUNTY
BUILDING SETBACKS for R-LD	FRONT -10' SIDE -10' REAR -20'
BUILDING SETBACKS for R-2	FRONT -20' SIDE -10' REAR -20'

LEGEND

- BLUE RIDGE PARKWAY OVERLAY
- PROTECTED RIDGES OVERLAY
- STEEP SLOPE/HIGH ELEVATION OVERLAY
- SLOPE/HIGH PARKWAY OVERLAY
- CEC STREAM
- CEC CULVERT
- CEC WETLAND
- CEC BUFFER

PROPOSED DEVELOPMENT

PHASE	UNITS	NATURAL SLOPE	ACRES	UNITS/AC
TRACT 1	315 APARTMENT UNITS	21.03%	18.29 AC.	17.22 UNITS/AC.
TRACT 2	211 AGE TARGETED UNITS (Age 55+)	22.62%	26.67 AC.	7.91 UNITS/AC.
TRACT 3		16.50%	11.34 AC.	
TRACT 4A	315 APT UNITS	22.63%	16.69 AC.	18.87 UNITS/AC.
TRACT 4B	11 SINGLE FAMILY LOTS	31.09%	59.91 AC.	0.18 UNITS/AC.
	852	25.76%	132.90 AC.±	6.41 UNITS/AC.

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)

WGLA Engineering

WGLA ENGINEERING, PLLC
724 5th AVENUE WEST
HENDERSONVILLE, NC 28739
(828) 687-7177
WGLA.COM
NC LICENSE P-1342

Busbee

Limestone Township
Buncombe County
North Carolina

NORTH CAROLINA REGISTERED PROFESSIONAL ENGINEER 23985 WILLIAM R. BUIE

Preliminary Not For Construction

REVISIONS

DATE	DESCRIPTION
7-9-20	CONCEPTUAL PLAN SUBMITTAL

811 Know what's below. Call before you dig.

PROJECT NUMBER:	18181
DATE:	6/20
DRAWN BY:	KHC
CHECKED BY:	WRB

Master
Site Plan

C-200

SCALE: 1"=200'

BUSBEE SWEETEN CREEK TIA CURSORY REVIEW

BULLET LIST OF NCDOT COMMENTS AND CONCERNS (SC-2019-141)

JULY 20, 2020

The NCDOT has performed a cursory review of the Busbee Sweeten Creek traffic impact assessment (TIA) prepared by Mattern & Craig, sealed April 2, 2020. This proposed development is located along the east side of US-25 ALT (Sweeten Creek Rd), across from the Carolina Day School Athletic Complex Driveway in Asheville, Buncombe County. The traffic impact assessment states that the full build-out of the development is to be constructed by 2024 and is to consist of a variety of residential land uses. Based on our cursory review, we have the following comments at this time:

General

- TIP projects U-2801 and U-5834 are in the immediate area of this project. The full build-out of this development project is anticipated to occur prior to the completion of either of these TIP projects. Construction of U-2801 will reconfigure site driveway connections to US-25 ALT (Sweeten Creek Rd),

Trip Generation and Adjustments

- Trip generation appears reasonable
- NCHRP 684 Internal Capture calculations appear reasonable.
- Volume calculations appear reasonable.

Trip Distribution

- The trip distribution appears reasonable.

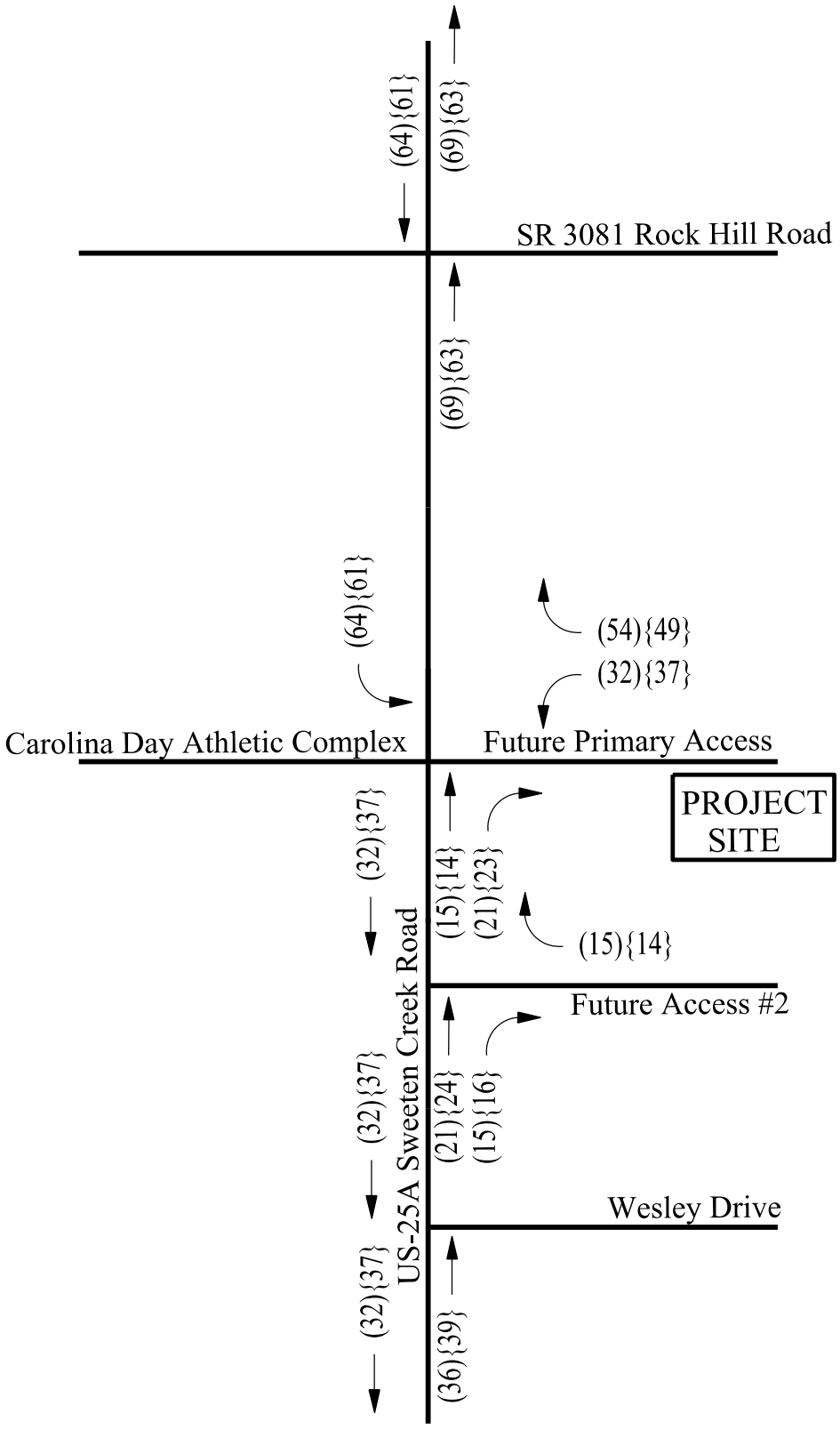
Synchro Coding

- Synchro coding and reports appear reasonable

Geometric Suggestions

- US-25 ALT (Sweeten Creek Rd) @ Carolina Day School Athletic Complex Driveway & Proposed Site Driveway #1:
    - Existing Three-Leg Stop-Controlled Intersection; Proposed Signalized Four-Leg Intersection
    - Must Obtain Separate Approval for Traffic Signal
    - NB US-25 ALT (Sweeten Creek Rd)
        - 150’ Left-Turn Lane
        - 150’ Right-Turn Lane
    - SB US-25 ALT (Sweeten Creek Rd)
        - 300’ Left-Turn Lane
        - 150’ Right-Turn Lane
    - EB Carolina Day School Athletic Complex Driveway
        - Three-lane cross-section: one ingress, two egress
        - Egress: 100’ Left-Turn Lane
        - Egress: Thru/Right Lane
    - WB Proposed Site Driveway #1
        - Three-lane cross-section: one ingress, two egress
        - Egress: 150’ Left-Turn Lane
        - Egress: Thru/Right Lane
        - 200’ Internal Protected Stem
- US-25 ALT (Sweeten Creek Rd) @ Proposed Site Driveway #2:
    - Proposed Stop-Controlled Intersection
    - NB US-25 ALT (Sweeten Creek Rd)
        - 100’ Right-Turn Lane
    - SB US-25 ALT (Sweeten Creek Rd)
        - Geometric enforcement of the right-in/right-out only movements.
    - WB Proposed Site Driveway #2
        - Two-lane cross-section: one ingress, one egress
        - Egress: Right-Turn Lane
        - 100’ Internal Protected Stem

□



LEGEND:

(XX) = Percentage AM Traffic

{XX} = Percentage PM Traffic

2024 SITE TRIP DISTRIBUTION

Busbee Property Sweeten Creek
Asheville, NC

Comm. No. 3973

Mattern & Craig
ENGINEERS - SURVEYORS
FIRM LICENSE No. C-1154
12 BROAD STREET
ASHEVILLE, NORTH CAROLINA 28801
PHONE (828) 254-2201
FAX (828) 254-4562

Figure:

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