Traffic Impact Analysis for
Charlotte Chestnut Masterplan
Asheville, North Carolina

Prepared for:

Civil Design Concepts, PA
Asheville, North Carolina

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1.0 Executive Summary

The purpose of this Traffic Impact Analysis (TIA) is to review vehicular traffic impacts as a result of the proposed Charlotte Chestnut Masterplan project. The objectives of the study are:

- To estimate trip generation and distribution for the proposed development;
- To perform intersection capacity analyses for the identified study area;
- To determine the potential traffic impacts of the proposed development; and
- To develop recommendations for needed roadway and operational improvements to accommodate the proposed development's traffic impacts.

The proposed Charlotte Chestnut Masterplan project is located in Asheville, North Carolina in the northeast quadrant of the Charlotte Street and Chestnut Street intersection. As currently envisioned, the proposed project will consist of the following uses:

- 20,000 square feet (SF) shopping center
  - 12,445 SF in Buildings A-C
  - 7,555 SF in Building D
- 175 apartments
- 26,900 SF office
- 30 townhomes
  - 20 townhomes in Building E
  - 10 townhomes in Building F

Development of this site will include demolition of approximately 16 single family homes and an existing business.

For the purposes of this TIA, the development is assumed to be completed (built-out) in 2025. Under build-out conditions, the proposed development is envisioned to be accessed by two (2) proposed driveways and two (2) existing driveways. The four (4) locations and assumed access configurations are as follows:

- An existing full-movement, unsignalized driveway connection on Chestnut Street at Asheville Arms Driveway
- An existing full-movement, unsignalized driveway connection on Furman Avenue at Asheville Arms Driveway
- A proposed full-movement, unsignalized driveway connection on Chestnut Street approximately 300 feet east of Charlotte Street
- A proposed full-movement, unsignalized driveway connection on Baird Street approximately 150 feet east of Charlotte Street

Through coordination with the City of Asheville and the North Carolina Department of Transportation (NCDOT), this TIA evaluated the impacts of the proposed site during the AM and PM peak hours at the following intersections:

1. Charlotte Street and Hillside Street
2. Charlotte Street and Baird Street
3. Charlotte Street and Broad Street
4. Charlotte Street and Chestnut Street

5. Charlotte Street and I-240 WB Ramp
6. Charlotte Street and I-240 EB Ramp/Woodfin Place
7. Charlotte Street and College Street
8. Chestnut Street and Merrimon Avenue
9. Chestnut Street and Asheville Arms Driveway
10. Furman Avenue and Asheville Arms Driveway
11. Chestnut Street and Access A
12. Baird Street and Access B

The potential traffic impacts to these intersections by this development were evaluated in accordance with the traffic study guidelines set forth by the City of Asheville and NCDOT including the identification of transportation improvements that may be required to accommodate future traffic conditions. Recommendations for improvements to intersection lane geometry for intersections in the study area are summarized below.

Charlotte Street and Chestnut Street

- Construct a westbound left-turn lane along Chestnut Street with storage maximized to the proposed left-turn lane at Access A (creating a three-lane section).

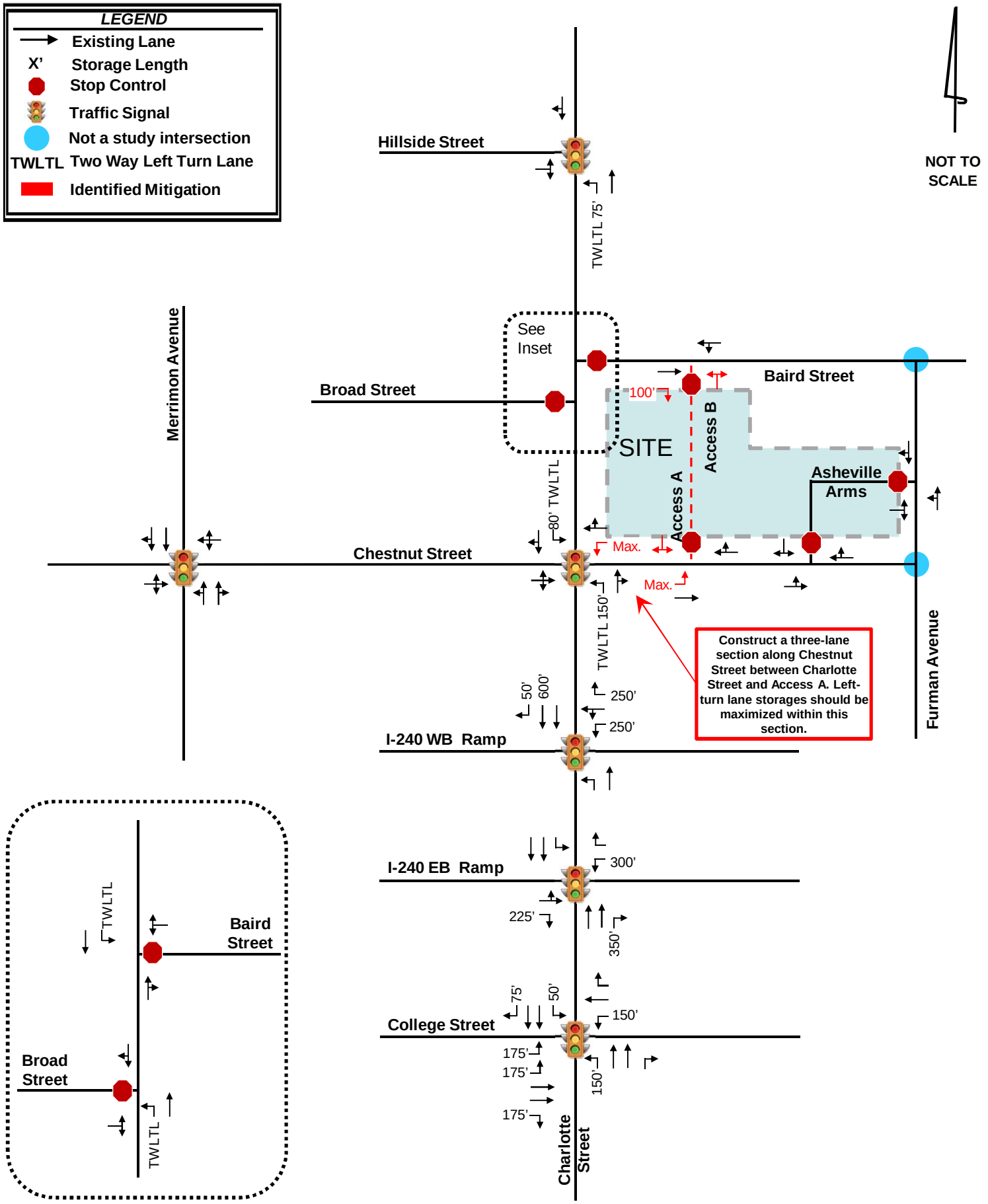
Chestnut Street and Access A

- Construct the site driveway with a single lane approach.
- Construct an eastbound left-turn lane along Chestnut Street with storage maximized to the proposed left turn lane at Charlotte Street (creating a three-lane section).

Baird Street and Access B

- Construct the site driveway with a single lane approach.
- Construct an eastbound right-turn lane along Baird Street with 100’ of storage and appropriate taper.

Pedestrian facility requirements along the site frontage should be coordinated and confirmed with the City of Asheville and NCDOT through the site development process. The mitigation improvements identified within the study area are shown in **Figure 1.1**. The improvements shown on this figure are subject to approval by NCDOT and the City of Asheville. All additions and attachments to the State and City roadway system shall be properly permitted, designed and constructed in conformance to standards maintained by the agencies.



Kimley»Horn	Charlotte Chestnut Masterplan Traffic Impact Analysis	Identifed Roadway Mitigation	Figure 1.1

2.0 Introduction

The proposed Charlotte Chestnut Masterplan project is located in Asheville, North Carolina in the northeast quadrant of the Charlotte Street and Chestnut Street intersection. As currently envisioned, the proposed project will consist of the following uses:

- 20,000 square feet (SF) shopping center
  - 12,445 SF in Buildings A-C
  - 7,555 SF in Building D
- 175 apartments
- 26,900 SF office
- 30 townhomes
  - 20 townhomes in Building E
  - 10 townhomes in Building F

Development of this site will include demolition of approximately 16 single family homes and an existing business.

For the purposes of this TIA, the development is assumed to be completed (built-out) in 2025. Under build-out conditions, the proposed development is envisioned to be accessed by two (2) proposed driveways and two (2) existing driveways. The four (4) locations and assumed access configurations are as follows:

- An existing full-movement, unsignalized driveway connection on Chestnut Street at Asheville Arms Driveway
- An existing full-movement, unsignalized driveway connection on Furman Avenue at Asheville Arms Driveway
- A proposed full-movement, unsignalized driveway connection on Chestnut Street approximately 300 feet east of Charlotte Street
- A proposed full-movement, unsignalized driveway connection on Baird Street approximately 150 feet east of Charlotte Street

Kimley-Horn was retained to determine the potential traffic impacts of this redevelopment project in accordance with the traffic study guidelines set forth by the City of Asheville and NCDOT to identify transportation improvements that may be required to accommodate future traffic conditions. This report presents trip generation, distribution, capacity analyses, and recommendations for transportation improvements required to meet anticipated traffic demands in build-out year 2025.

Coordination occurred with the City of Asheville and NCDOT to develop and agree on the scope and parameters to be covered in this TIA. The scoping package is included in the **Appendix**.

3.0 Existing Traffic Conditions

Existing traffic conditions were coordinated with the City of Asheville and NCDOT staff and collected through field observations and turning-movement counts to establish the existing conditions baseline analysis.

3.1 STUDY AREA

Based on discussions with the City of Asheville and NCDOT staff, the study area for this TIA includes the following intersections:

1. Charlotte Street and Hillside Street
2. Charlotte Street and Baird Street
3. Charlotte Street and Broad Street
4. Charlotte Street and Chestnut Street
5. Charlotte Street and I-240 WB Ramp
6. Charlotte Street and I-240 EB Ramp/Woodfin Place
7. Charlotte Street and College Street
8. Chestnut Street and Merrimon Avenue
9. Chestnut Street and Asheville Arms Driveway
10. Furman Avenue and Asheville Arms DWriveway
11. Chestnut Street and Access A
12. Baird Street and Access B

Figure 3.1 shows the study area intersections and the site location, **Figure 3.2** shows the proposed site plan for the development and **Figure 3.3** shows the existing roadway geometry at the study intersections.

The roadways in the vicinity of the site are I-240, Charlotte Street, Chestnut Street, Merrimon Avenue, College Street, and Hillside Street.

I-240 is a four-lane, divided interstate facility with a posted speed limit of 55 miles per hour (mph) through the study area. I-240 has a 2019 NCDOT annual average daily traffic (AADT) volume of 84,500 vehicles per day (vpd) in the vicinity of the proposed site.

Charlotte Street is a three-lane, undivided minor arterial with a posted speed limit of 25 mph and bike lanes on either side of the roadway and a 2019 AADT of 11,500 vpd north of Chestnut Street. South of the Chestnut Street, Charlotte Street expands to a four-lane, undivided minor arterial with a posted speed limit of 35 mph. South of I-240, Charlotte Street expands to a 5-lane, undivided minor arterial with a posted speed limit of 35 mph and a 2019 AADT of 23,000 vpd. In 2020, Charlotte Street was converted from a four-lane section to a three-lane section with bike lakes (sometimes known as a “road diet”) between the I-240 WB Ramp and Hillside Street. The analysis contained herein reflects the current roadway conditions.

Chestnut Street is a two-lane, undivided minor collector with a posted speed limit of 25 mph west of Charlotte Street. East of Charlotte Street, Chestnut Street is a two-lane, undivided local road with a posted speed limit of 25 mph. There is no posted NCDOT AADT for Chestnut Street.

Merrimon Avenue is a four-lane, undivided minor arterial with a posted speed limit of 35 mph through the study area. Merrimon Avenue has a 2019 NCDOT AADT of 22,000 vpd north of Chestnut Street and 24,500 vpd south of Chestnut Street.

College Street is a 5-lane, undivided principal arterial with a speed limit of 35 mph and a 2019 AADT of 15,500 vpd east of Charlotte Street. West of Charlotte Street, College Street is a 5-lane, divided principal arterial with a posted speed limit of 20 mph and a 2019 NCDOT AADT of 12,500 vpd.

Hillside Street is a two-lane, undivided minor arterial with a posted speed limit of 25 mph and a 2019 NCDOT AADT of 3,200 vpd.

Transit within the City of Asheville is provided by Asheville Rides Transit (ART). Transit along Charlotte Street in the vicinity of the proposed Charlotte Chestnut Masterplan site is provided by Route N5. Route N5 runs between downtown Asheville and the Grove Park Inn just over one mile north of the site. Bus stops are located at the Charlotte Street and Chestnut Street intersection traveling both into and out of Downtown Asheville.

Charlotte Street has recently become a bicycle corridor within Asheville. North of the I-240 WB Ramp, bicycle “sharrows” exist within the roadways, providing bicycles the ability to use the full lane for travel. North of Chestnut Street, bike lanes are striped along the corridor, providing bicyclists a safe lane of travel.

Sidewalks are located along both sides of Charlotte Street, Chestnut Street, Merrimon Street, College Street, Broad Street, and Hillside Street throughout the study area. Sidewalks are also located along the north side of Baird Street within the study area.

Kimley»Horn	**Charlotte Chestnut Masterplan Traffic Impact Analysis**	**Study Area/Site Location**	**Figure 3.1**

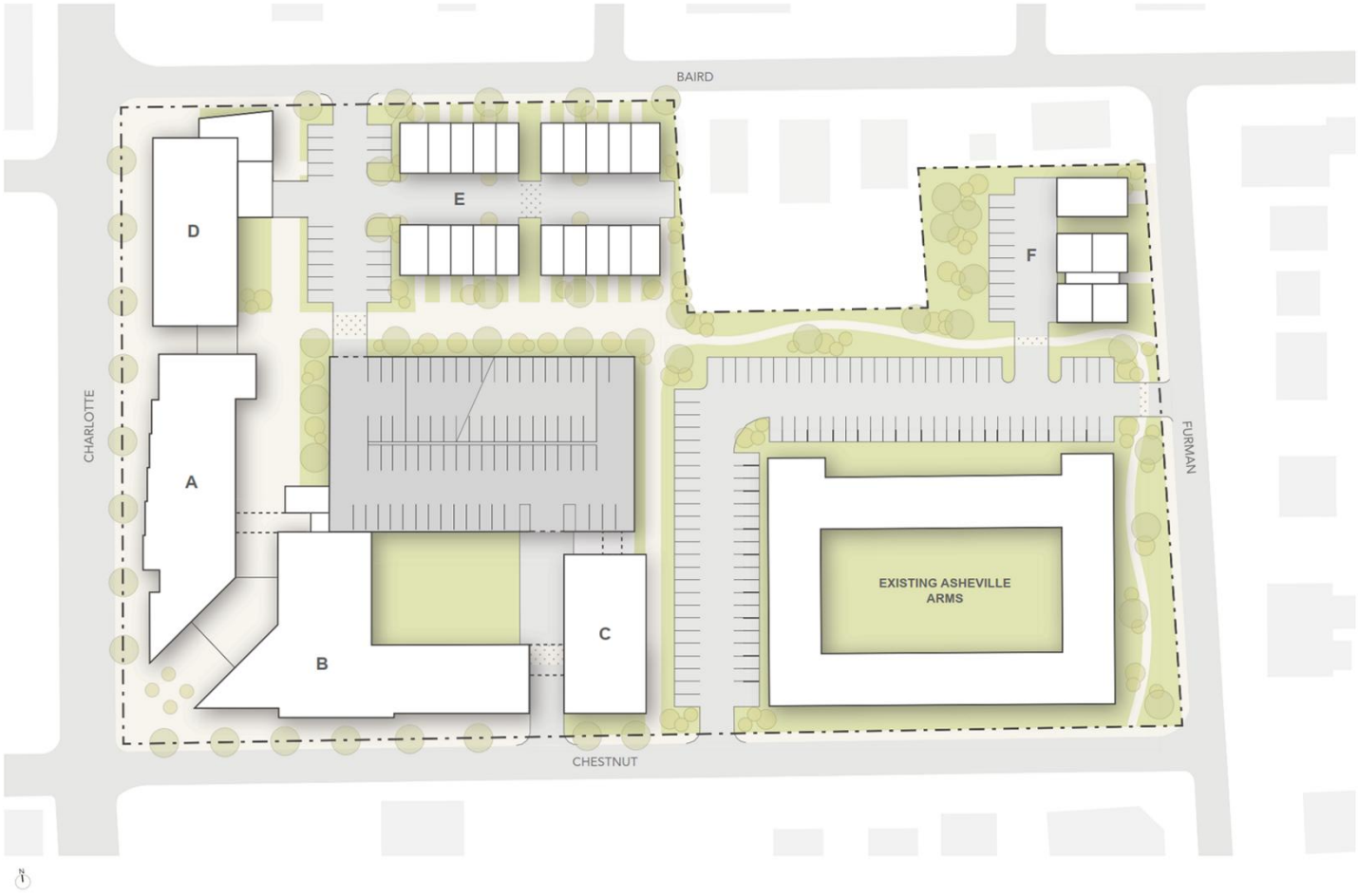
Kimley»Horn

Charlotte Chestnut Masterplan
Traffic Impact Analysis

Proposed Site Plan

Figure 3.2

ILLUSTRATIVE MASTERPLAN



BUILDING A
Mixed-use Residential
1 Level Commercial
4 Levels Residential

9,700 SF Commercial
44,300 SF Residential

54,000 SF TOTAL
48 Residential Units

BUILDING B
Mixed-use Residential
1 Level Commercial (at Plaza)B
4 Levels Residential B

1,300 SF Commercial
71,200 SF Residential

72,500 SF TOTAL

BUILDING C
Residential
3 Levels Residential

19,500 SF TOTAL
108 Residential Units (B and C)

BUILDING D
Mixed-use Office
1 Level Commercial
3 Levels Office

7,555 SF Commercial
26,900 SF Office

34,455 SF TOTAL

GROUP E
20 Rowhouses
3 Levels

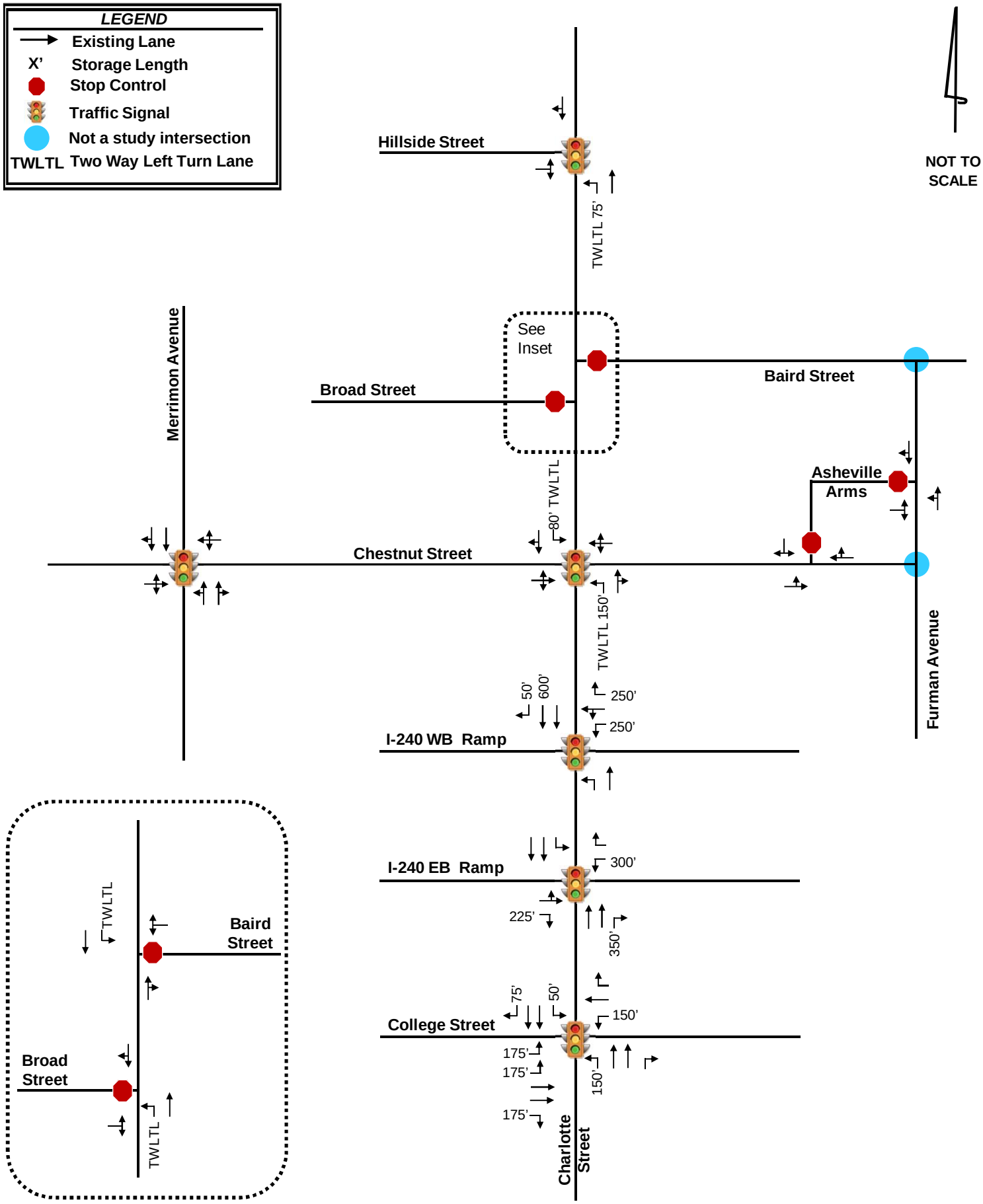
1,700SF - 2,100 SF each

GROUP F
+/- 10 Residential Units

700SF - 1,400 SF each

mcmillan | pazdan | smith ARCHITECTURE
RCG + CSP
SDS SITE DESIGN STUDIO
CDC Civil Design Concepts, PA

CHARLOTTE CHESTNUT MASTERPLAN



Kimley»Horn	Charlotte Chestnut Masterplan Traffic Impact Analysis	Existing Roadway Laneage	Figure 3.3

3.2 EXISTING TRAFFIC VOLUME DEVELOPMENT

Due to COVID-19 and its associated impacts to work and school schedules at the time of this TIA, it was determined that new peak-hour turning movement counts may not be indicative of "typical" traffic operations. Existing traffic volumes were determined based on the alternative methodology outlined below and as documented in the approved scoping package (included in the **Appendix**).

Peak-hour intersection turning-movement, heavy-vehicle, and pedestrian counts were performed by Quality Counts, LLC from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM on Tuesday, November 10, 2020 at the following study intersections:

1. Charlotte Street and Hillside Street
2. Charlotte Street and Baird Street
3. Charlotte Street and Broad Street
4. Charlotte Street and Chestnut Street
5. Charlotte Street and I-240 WB Ramp
6. Charlotte Street and I-240 EB Ramp/Woodfin Place
7. Charlotte Street and College Street
8. Chestnut Street and Merrimon Avenue
9. Chestnut Street and Asheville Arms Driveway
10. Furman Avenue and Asheville Arms Driveway

During the scoping process, it was determined that these counts would be grown by a "COVID factor" to determine the 2020 peak-hour volumes. The new 2020 counts were compared to previously collected counts at the following intersections:

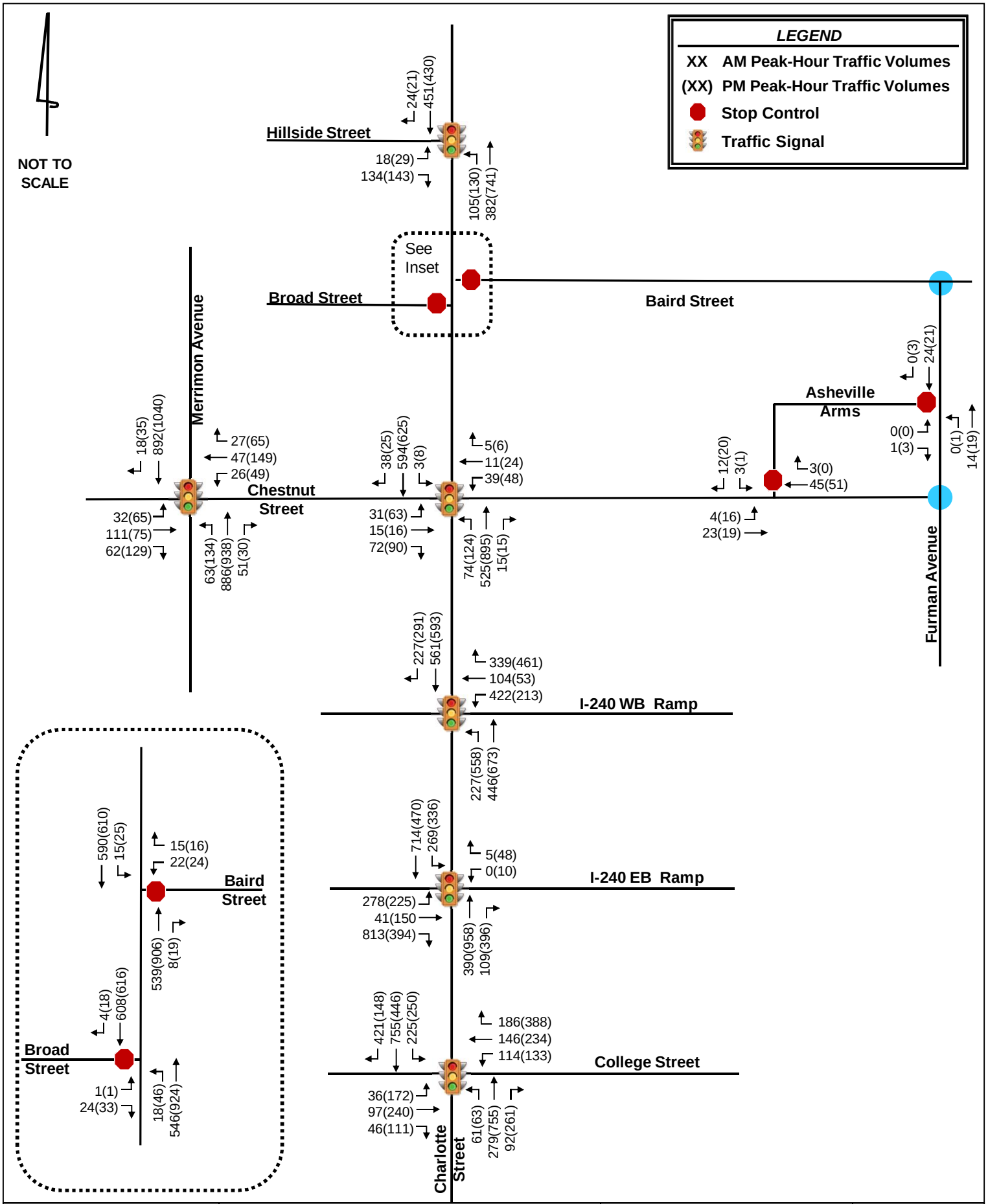
1. Charlotte Street and Merrimon Street (March 2019)
2. Charlotte Street and I-240 WB Ramp (March 2019)
3. Charlotte Street and I-240 EB Ramp/Woodfin Place (March 2019)
4. Charlotte Street and Broad Street/Baird Street (March 2018)

Based on a review of these volumes, the AM peak hour has experienced a more significant decrease in traffic volume during the COVID-19 pandemic than the PM peak hour at all intersections. Therefore, separate factors were calculated for the AM and PM peak hours.

Based on a comparison of the historic and 2020 turning movement volumes at these intersections, the total entering volume in the historic counts were 35% higher during the AM peak hour and 25% higher during the PM peak hour compared to the 2020 counts. Therefore, the new 2020 turning-movement counts were factored by 1.35 in the AM peak hour and 1.25 in the PM peak hour. COVID factor calculations can be found in the **Appendix**.

Turning-movement count data and the corresponding peak-hour factors and heavy-vehicle percentages are provided in the **Appendix**. A low volume (i.e., less than 10 during the peak hours) of U-turns were observed at study area intersections; therefore, they were included as left-turn movements in the analysis. Volumes were balanced between Broad/Baird Street and the I-240 ramps. Volumes were not balanced between the remaining study area intersections due to the presence of driveways and spacing between intersections.

Figure 3.4 shows the 2020 existing AM and PM peak-hour traffic volumes.



Kimley»Horn	Charlotte Chestnut Masterplan Traffic Impact Analysis	2020 Existing AM & PM Peak-Hour Traffic Volumes	Figure 3.4

4.0 Background Traffic Volume Development

Projected background (non-project) traffic is defined as the expected growth or change in traffic volumes on the surrounding roadway network between the year the existing counts were collected (2020) and the expected build-out year (2025), absent the opening of the proposed project.

4.1 HISTORICAL BACKGROUND GROWTH TRAFFIC

The historical background growth is the increase in existing traffic volumes due to usage increases and non-specific growth throughout the area. The historical background growth also accounts for growth that is independent of the specific approved developments and future connections listed above. Historical background growth traffic is calculated using an annual growth rate, which is applied to the existing traffic volumes up to the future horizon year. As shown in the attached scoping document, an annual growth rate of a half percent (0.5%) was applied to the 2020 existing peak-hour traffic volumes for five years to calculate base 2025 background traffic volumes.

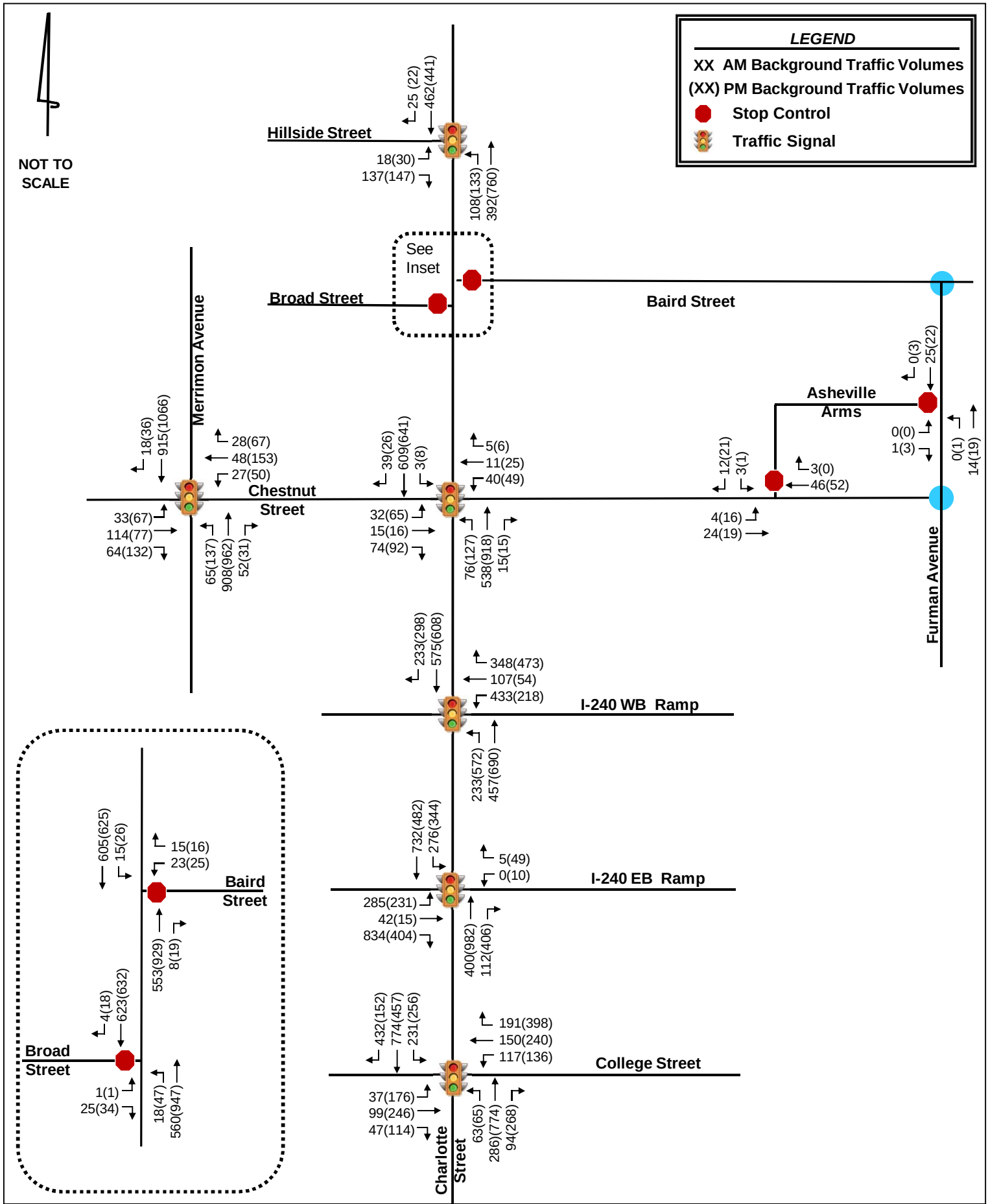
4.2 APPROVED DEVELOPMENTS

As indicated by the City of Asheville and NCDOT staff, there are no approved developments in the vicinity of the proposed project. Therefore, no approved development volumes were included in this analysis and background traffic was determined based upon the annual growth rate.

4.3 PLANNED TRANSPORTATION PROJECTS

Based upon a review of the NCDOT STIP, there are no capacity enhancing improvement projects located within the project study area.

Figure 4.1 shows the projected 2025 background AM and PM peak-hour traffic volumes.



Kimley»Horn	**Charlotte Chestnut Masterplan Traffic Impact Analysis**	**2025 Background AM & PM Peak-Hour Traffic Volumes**	**Figure 4.1**

5.0 Site Traffic Volume Development

Site traffic developed for this TIA is defined as the vehicle trips expected to be generated and added to the study area by the construction of the proposed redevelopment project. The site traffic was distributed and assigned throughout the study area network.

5.1 SITE ACCESS

Based on the current site plan, and as assumed in the build-out condition, the proposed development is expected to be accessed via the following driveways:

- An existing full-movement, unsignalized driveway connection on Chestnut Street at Asheville Arms Driveway
- An existing full-movement, unsignalized driveway connection on Furman Avenue at Asheville Arms Driveway
- A proposed full-movement, unsignalized driveway connection on Chestnut Street approximately 300 feet east of Charlotte Street
- A proposed full-movement, unsignalized driveway connection on Baird Street approximately 150 feet east of Charlotte Street

5.2 TRAFFIC GENERATION

The traffic generation potential of the proposed project was determined using the trip generation rates published in *Trip Generation Manual* (Institute of Transportation Engineers, Tenth Edition, 2017). As currently envisioned, the proposed project will consist of the following uses:

- 20,000 square feet (SF) shopping center
  - 12,445 SF in Buildings A-C
  - 7,555 SF in Building D
- 175 apartments
- 26,900 SF office
- 30 townhomes
  - 20 townhomes in Building E
  - 10 townhomes in Building F

Development of this site will include demolition of approximately 16 single family homes and an existing business.

Internally captured trips are trips that begin and end within the project site and do not access the external roadway network. The National Cooperative Highway Research Program (NCHRP) *Report 684 Enhancing Internal Trip Capture Estimation for Mixed-Use Developments,* produced by the Transportation Research Board, was used to calculate the internal capture for the development. Internal capture calculations are included in the **Appendix**.

Pass-by trips are trips already on the roadway network that turn into the site as they pass-by on the adjacent street. Pass-by volumes were calculated for the proposed site based on the equations and data presented in the ITE *Trip Generation Handbook*. Per NCDOT guidelines, pass-by volumes were limited to ten percent of the adjacent street traffic. Pass-by calculations are included in the **Appendix**.

Multi-modal trips are trips that are achieved via a mode of travel other than a passenger car. For this site, due to the existing bus route and bike lanes along Charlotte Street, a 5% reduction was applied to the trip generation. This reduction factor was coordinated with City and NCDOT staff during the scoping process.

Table 5.1 summarizes the estimated traffic generation for the proposed development. As shown, the proposed development has the potential to generate a total of 407 and 316 net new external trips during the AM and PM peak hours, respectively, at total project build-out.

Table 5.1 - Trip Generation (Proposed Land Use)											Trip Gen Methodology
Land Use	Intensity		Daily	AM Peak Hour			PM Peak Hour			
				Total	In	Out	Total	In	Out	
Shopping Center [ITE 820] - Building A-C	12,445	SF	1,458	158	98	60	116	56	60	ADJACENT EQ
Multifamily Housing Mid-Rise - (Apartments) [ITE 221] - Building A-C	175	DU	952	59	15	44	76	46	30	ADJACENT EQ
General Office [ITE 710] - Building D	26,900	SF	297	52	46	6	95	17	78	GENERATOR EQ
Shopping Center [ITE 820] - Building D	7,555	SF	1,038	156	97	59	80	38	42	ADJACENT EQ
Multifamily Housing Low-Rise - (Townhomes) [ITE 220] - Building E	20	DU	110	10	2	8	14	9	5	ADJACENT EQ
Multifamily Housing Low-Rise - (Townhomes) [ITE 220] - Building F	10	DU	35	5	1	4	8	5	3	ADJACENT EQ
Subtotal			**3,890**	**440**	**259**	**181**	**389**	**171**	**218**	
Internal Capture			**660**	**12**	**6**	**6**	**18**	**9**	**9**	
ITE 820 Pass-By - 0% AM / 34% PM			*38*	*0*	*0*	*0*	*38*	*19*	*19*	
ITE Pass-By			*38*	*0*	*0*	*0*	*38*	*19*	*19*	
Adjacent Street Traffic				*1,287*			*1,747*			
10% Adjacent Street Traffic			*306*	*130*	*65*	*65*	*176*	*88*	*88*	
Pass-By^^			**38**	**0**	**0**	**0**	**38**	**19**	**19**	
Multi-modal Reduction (5%)*			**160**	**21**	**13**	**9**	**17**	**7**	**10**	
Net New External Trips			**3,032**	**407**	**240**	**166**	**316**	**136**	**180**	

* Per the City of Asheville, a 20% multi-modal reduction has been used for developments located downtown in the vicinity of the transit center. Given the location of the proposed development and the current push to provide multimodal transportation options, a 5% multimodal reduction is considered for this development.

Table 5.2 summarizes the estimated traffic generation for the existing development which will be demolished when the proposed site is constructed. As shown, the existing development is estimated to generate a total of 20 and 22 net new external trips during the AM and PM peak hours, respectively. These trips are referred to as “demo trips” throughout this report.

Table 5.2 - Trip Generation (Existing Land Use)										Trip Gen Methodology
Land Use	Intensity		Daily	AM Peak Hour			PM Peak Hour			
				Total	In	Out	Total	In	Out	
Nursing Home (Caring for Children) [ITE 620]^	4,469	SF	43	4	3	1	5	2	3	GENERATOR EQ
Single-Family Homes [ITE 210]	16	DU	193	16	4	12	17	11	6	ADJACENT EQ
Subtotal			**236**	**20**	**7**	**13**	**22**	**13**	**9**	
Internal Capture			**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Pass-By			**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Net New External Trips			**236**	**20**	**7**	**13**	**22**	**13**	**9**	

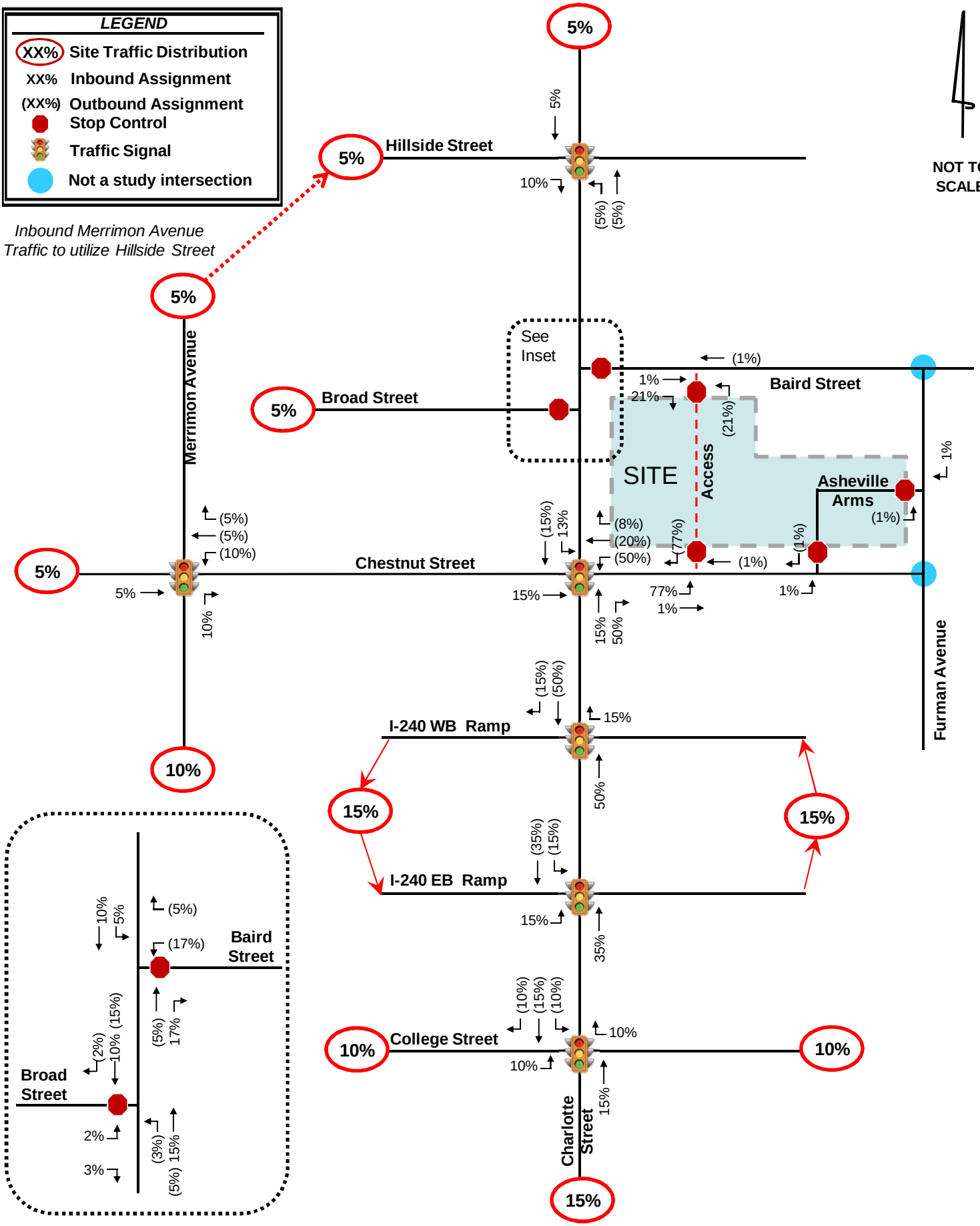
^ Rooms is the preferred trip generation methodology of NCDOT Congestion Management. Since the number of rooms is not known, square footage was instead used.

5.3 SITE TRAFFIC DISTRIBUTION

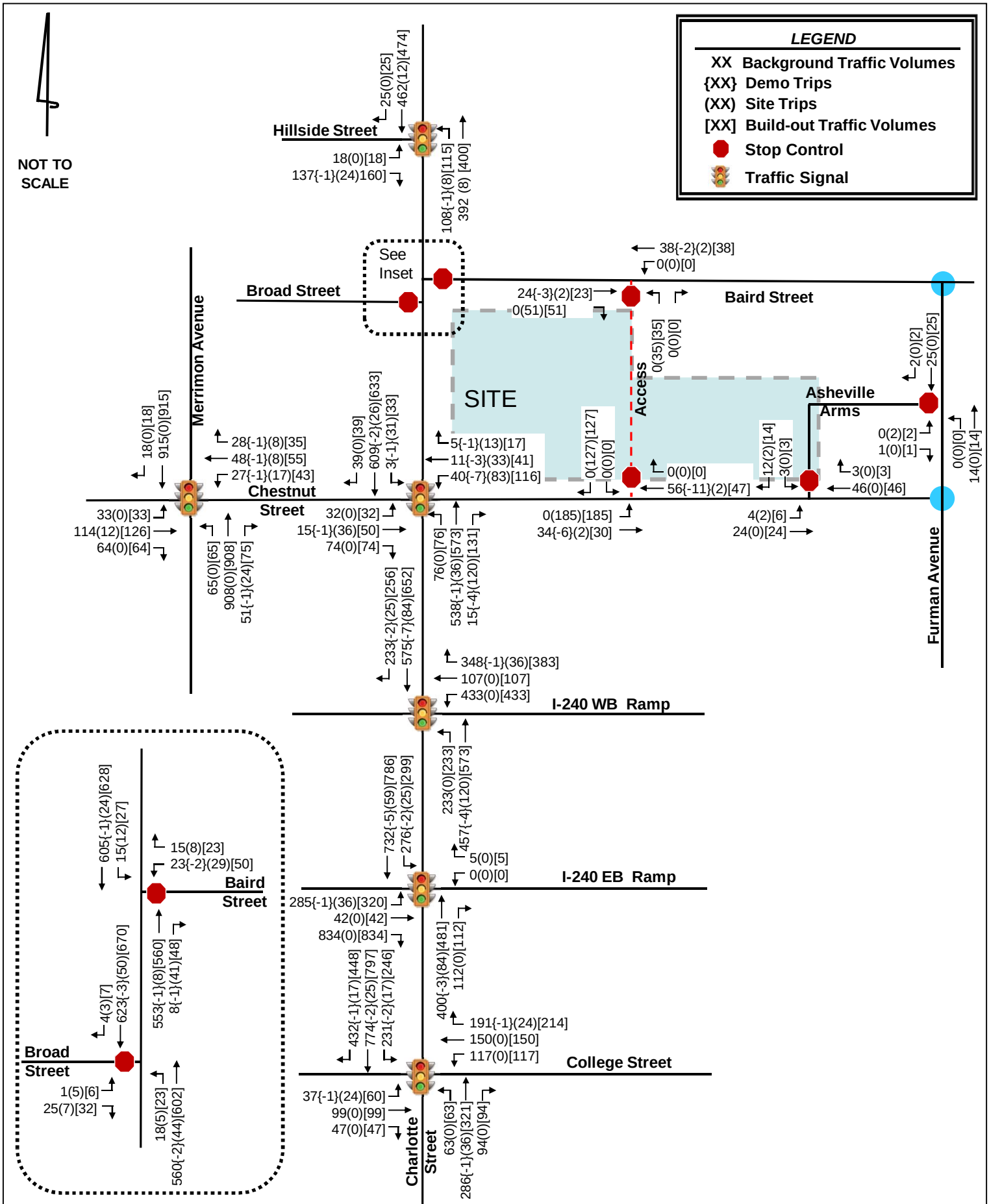
The proposed redevelopment project's trips were assigned to the surrounding network based on existing peak-hour turning movements, future connections, surrounding land uses, and locations of similar land use and population densities in the area. The project site trip distribution was coordinated with the City of Asheville and NCDOT staff.

The overall distribution and assignment are shown in **Figure 5.1. Figure 5.2** and **Figure 5.3** show the projected 2025 build-out AM and PM peak-hour traffic volumes, respectively.

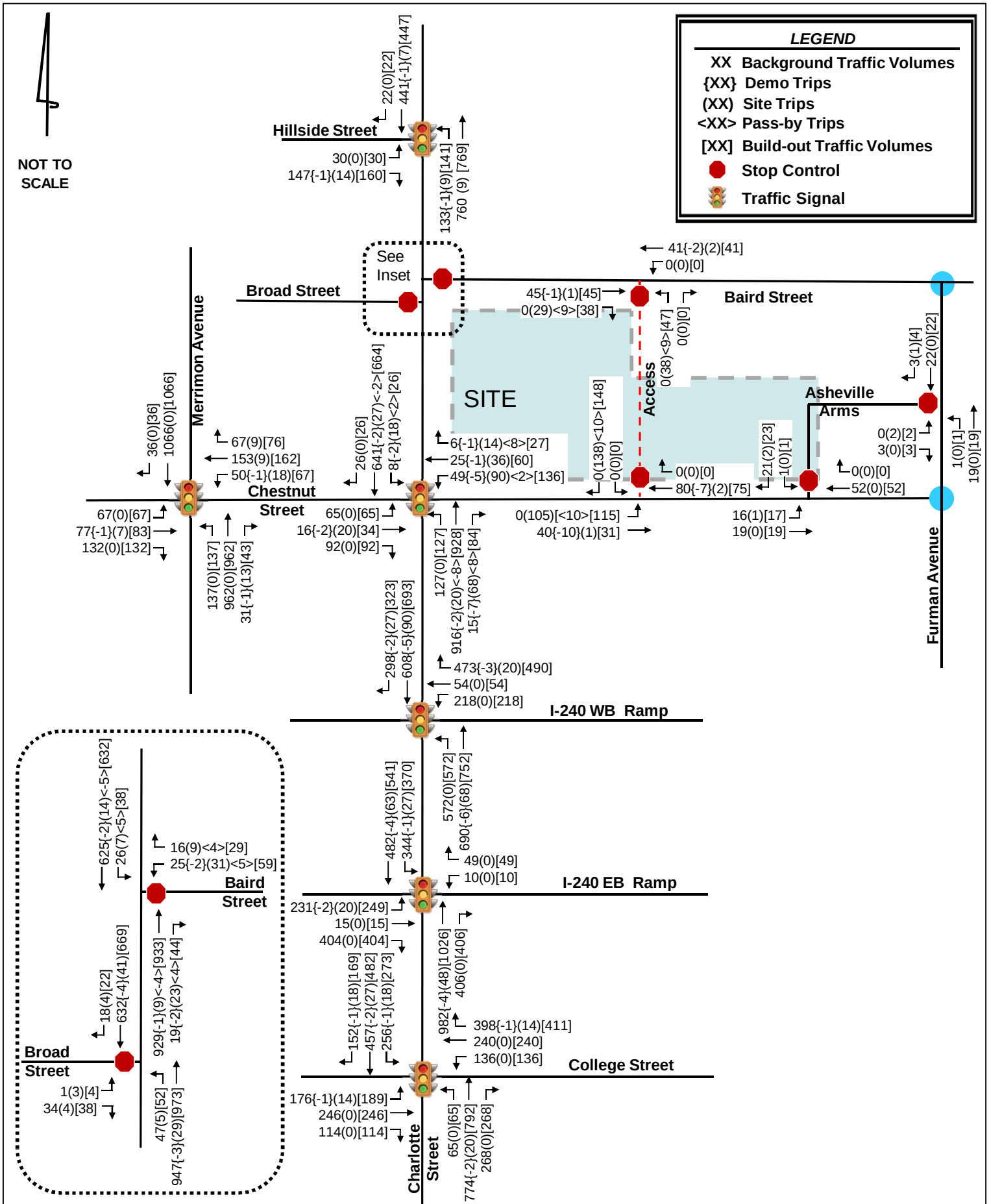
Intersection volume development worksheets and calculations are included in the **Appendix**.



Kimley»Horn	Charlotte Chestnut Masterplan Traffic Impact Analysis	Site Traffic Distribution and Assignment	Figure 5.1



Kimley»Horn	Charlotte Chestnut Masterplan Traffic Impact Analysis	2025 Build AM Peak-Hour Traffic Volumes	Figure 5.2



Kimley»Horn	Charlotte Chestnut Masterplan Traffic Impact Analysis	2025 Build PM Peak-Hour Traffic Volumes	Figure 5.3

6.0 Capacity Analysis

Capacity analyses were performed for the AM and PM peak hours using the Synchro Version 10 software to determine the operating characteristics at the signalized and stop-controlled intersections of the adjacent street network and to evaluate the impacts of the proposed development. SimTraffic Version 10 was used to review network queues. Capacity is defined as the maximum number of vehicles that can pass over a particular road segment, or through a particular intersection, within a specified period of time under prevailing operational, geometric and controlling conditions within a set time duration. This software program uses methodologies contained in the *Highway Capacity Manual* (HCM) to determine the operating characteristics of an intersection.

The *Highway Capacity Manual* (HCM) defines LOS as a "quantitative stratification of a performance measure or measures representing quality of service" and is used to "translate complex numerical performance results into a simple A-F system representative of travelers' perceptions of the quality of service provided by a facility or service". The HCM defines six levels of service, LOS A through LOS F, with A having the best operating conditions from the traveler's perspective and F having the worst. However, it must be understood that "the LOS letter result hides much of the complexity of facility performance", and that "the appropriate LOS for a given system element in the community is a decision for local policy makers". According to the HCM, "for cost, environmental impact, and other reasons, roadways are typically designed not to provide LOS A conditions during peak periods but instead to provide some lower LOS that balances individual travers' desires against society's desires and financial resources. Nevertheless, during low-volume periods of the day, a system element may operate at LOS A."

LOS for a two-way stop-controlled (TWSC) intersection is determined by the control delay at the side-street approaches, typically during the highest volume periods of the day, the AM and PM peak periods. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. With respect to field measurements, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue to the time the vehicle departs from the stop line. It is typical for stop sign-controlled side streets and driveways intersecting major streets to experience long delays during peak hours, particularly for left-turn movements. The majority of the traffic moving through the intersection on the major street experiences little or no delay.

LOS for signalized intersections is reported for the intersection as a whole, and typically during the highest volume periods of the day, the AM and PM peak periods. One or more movements at an intersection may experience a low level-of-service, while the intersection as a whole may operate acceptably.

Tables 6.0A and **6.0B** list the LOS control delay thresholds published in the HCM for unsignalized and signalized intersections, respectively, as well as the unsignalized operational descriptions assumed herein.

Table 6.0A Level of Service Control Delay Thresholds for Unsignalized Intersections		
Level of Service	**Average Control Delay per Vehicle [sec/veh]**	
A	≤ 10	Short Delays
B	> 10 – 15	
C	> 15 – 25	
D	> 25 – 35	Moderate Delays
E	> 35 – 50	
F	> 50	Long Delays

Table 6.0B Level-of-Service Control Delay Thresholds for Signalized Intersections	
Level-of-Service	**Control Delay per Vehicle [sec/veh]**
A	≤ 10
B	> 10 – 20
C	> 20 – 35
D	> 35 – 55
E	> 55 – 80
F	> 80

NCDOT staff provided the traffic signal plans for the intersections of:

- Charlotte Street and I-240 WB Ramp
- Charlotte Street and I-240 EB Ramp/Woodfin Place
- Charlotte Street and College Street
- Chestnut Street and Merrimon Avenue

City of Asheville staff provided traffic signal plans for the uncoordinated, signalized intersections of:

- Charlotte Street and Hillside Street.
- Charlotte Street and Chestnut Street

All signal plans were used in the development of the existing conditions Synchro network. The cycle lengths, splits, and offsets for the existing conditions Synchro network were optimized. Splits and offsets were optimized in the background condition and carried forward to the build-out condition. Splits and offsets were optimized in the build-improved conditions, where applicable. Signal plans for the study area intersections are included in the **Appendix**.

Per NCDOT Congestion Management guidelines, the following considerations were made in this analysis:

- Right-turn on red (RTOR) operations were not allowed in this analysis.
- Permitted-protected left-turn movements were modeled as protected-only in future years.
- Lost time adjust was added to the yellow and red times provided in the signal plans to maintain a total lost time of 5 seconds for each movement.

Additionally, allowable movements with traffic volumes under four vehicles were changed to four vehicles per hour, with the exception of movements into and out of the project site.

Observed peak-hour factors (PHFs) were used in existing conditions analysis. A weighted PHF was used during the AM peak hour for all scenarios. A PHF of 0.90 was used in all future year analysis in the PM peak-hour.

Field-observed heavy vehicle percentages were used subject to a two-percent minimum.

Capacity analyses were performed for the 2020 existing traffic conditions, 2025 background traffic conditions, and 2025 build-out traffic conditions. In conditions where mitigation is required, build-out improved conditions are shown as well. The capacity analyses for each intersection are summarized in the following subsections. Capacity analysis reports generated by Synchro and SimTraffic Version 10 software are included in the **Appendix**.

NCDOT Mitigation Requirements

Mitigation for traffic impacts caused by the proposed development were noted and recommended based on NCDOT mitigation requirements. When determining the proposed development's traffic impact to the study area intersections, the 2025 background and 2025 build-out conditions were compared. Based on the NCDOT's *Policy on Street and Driveway Access to North Carolina Highways*, "the applicant shall be required to identify mitigation improvements to the roadway network if at least one of the following conditions exists when comparing base network conditions to project conditions:

- the total average delay at an intersection or individual approach increases by 25% or greater, while maintaining the same level of service;
- the Level of Service degrades by at least one level; and
- or Level of Service is 'F'."

6.1 CHARLOTTE STREET AND HILLSIDE STREET

Table 6.1 summarizes the LOS, control delay, and 95th percentile queue lengths at the signalized intersection of Charlotte Street and Hillside Street.

Table 6.1 - Charlotte Street and Hillside Street						
Condition	Measure	EB	NB		SB	Intersection
		EBLR	NBL	NBT	SBTR	LOS (Delay)
AM Peak Hour						
2020 Existing	LOS (Delay)	D (46.1)	A (6.4)		B (13.8)	B (15.7)
	Synchro 95th Q	115'	42'	151'	293'	
2025 Background	LOS (Delay)	D (48.0)	B (16.1)		B (18.1)	C (21.9)
	Synchro 95th Q	119'	115'	150'	343'	
2025 Build-out	LOS (Delay)	D (50.5)	B (17.1)		B (19.7)	C (23.8)
	Synchro 95th Q	132'	122'	154'	365'	
PM Peak Hour						
2020 Existing	LOS (Delay)	D (46.0)	B (10.8)		B (15.7)	B (17.2)
	Synchro 95th Q	126'	55'	407'	287'	
2025 Background	LOS (Delay)	D (47.3)	B (16.0)		B (18.3)	C (20.3)
	Synchro 95th Q	168'	138'	397'	334'	
2025 Build-out	LOS (Delay)	D (48.7)	B (16.9)		B (19.1)	C (21.4)
	Synchro 95th Q	181'	145'	406'	339'	
Existing/Background Storage			75'			
	Exceeds storage					

As shown in **Table 6.1**, in both peak hours, the overall intersection currently operates at LOS B and is expected to operate at LOS C under background conditions. With the addition of site traffic, the overall intersection is projected to remain at LOS C in both peak hours. Since the proposed development is not expected to have a significant impact on operations at this intersection, no mitigation improvements are recommended for capacity purposes.

Based on the Synchro 95th percentile queue length, the northbound left-turn lane is expected to exceed the existing storage under background and build-out conditions during both peak-hour. This left-turn lane extends into a two-way, left-turn lane (TWLTL); queues that exceed the storage length could queue in the TWLTL. Further, the projected queue length under build conditions is only 7 feet longer than background conditions in both peak hours. Therefore, this turn lane is not recommended to be extended by this development.

6.2 CHARLOTTE STREET AND BAIRD STREET

Table 6.2 summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized, stop-controlled intersection of Charlotte Street and Baird Street.

Table 6.2 - Charlotte Street and Baird Street					
Condition	Measure	WB	NB	SB	
		WBLR	NBTR	SBL	SBT
AM Peak Hour					
2020 Existing	LOS (Delay)	C (15.1)	A (0.0)	A (0.3)	
	Synchro 95th Q	16'	0'	2'	0'
2025 Background	LOS (Delay)	C (15.5)	A (0.0)	A (0.3)	
	Synchro 95th Q	17'	0'	2'	0'
2025 Build-out	LOS (Delay)	C (17.2)	A (0.0)	A (0.5)	
	Synchro 95th Q	26'	0'	3'	0'
PM Peak Hour					
2020 Existing	LOS (Delay)	C (24.0)	A (0.0)	A (0.5)	
	Synchro 95th Q	30'	0'	4'	0'
2025 Background	LOS (Delay)	C (23.6)	A (0.0)	A (0.5)	
	Synchro 95th Q	17'	0'	5'	0'
2025 Build-out	LOS (Delay)	D (32.2)	A (0.0)	A (0.8)	
	Synchro 95th Q	50'	0'	8'	0'

As shown in **Table 6.2**, the stop-controlled, westbound approach currently operates with short delays during both peak hours and is expected to continue to operate with short delays under background conditions. Upon build-out of the site, the stop-controlled, westbound approach is expected to continue to operate with short delays in the AM peak hour and operate with moderate delays in the PM peak hour, with the LOS projected to drop from LOS C to LOS D.

Due to this drop in LOS, mitigation was considered at this intersection. However, neither the addition of a westbound right-turn lane nor a northbound right-turn lane improves the westbound approach to LOS C. In addition, construction of a northbound right-turn lane may be limited by the existing bike lanes, sidewalk, and brick wall.

As the proposed development is not expected to have a significant adverse impact on operations at this intersection (adds less than 10 seconds of delay in the PM peak hour), no mitigation improvements are recommended for capacity purposes.

6.3 CHARLOTTE STREET AND BROAD STREET

Table 6.3 summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized, stop-controlled intersection of Charlotte Street and Broad Street.

Table 6.3 - Charlotte Street and Broad Street					
Condition	Measure	EB	NB		SB
		EBLR	NBL	NBT	SBTR
AM Peak Hour					
2020 Existing	LOS (Delay)	B (14.7)	A (0.3)		A (0.0)
	Synchro 95th Q	10'	2'	0'	0'
2025 Background	LOS (Delay)	B (14.8)	A (0.3)		A (0.0)
	Synchro 95th Q	10'	2'	0'	0'
2025 Build-out	LOS (Delay)	C (15.6)	A (0.4)		A (0.0)
	Synchro 95th Q	11'	3'	0'	0'
PM Peak Hour					
2020 Existing	LOS (Delay)	C (18.0)	A (0.5)		A (0.0)
	Synchro 95th Q	17'	6'	0'	0'
2025 Background	LOS (Delay)	C (15.9)	A (0.5)		A (0.0)
	Synchro 95th Q	9'	5'	0'	0'
2025 Build-out	LOS (Delay)	C (17.1)	A (0.5)		A (0.0)
	Synchro 95th Q	11'	6'	0'	0'

As shown in **Table 6.3**, the stop-controlled, eastbound approach currently operates with short delays during both peak hours and is expected to continue to operate with short delays under background conditions. Upon build-out of the site, the stop-controlled eastbound approach is expected to continue to operate with short delays during both peak hours.

In the AM peak hour, the eastbound approach is expected to drop from LOS B to LOS C. However, this drop in LOS is due to an anticipated increase in delay of 0.8 seconds. As the proposed development is not expected to have a significant adverse impact on operations at this intersection, no mitigation improvements are recommended for capacity purposes.

6.4 CHARLOTTE STREET AND CHESTNUT STREET

Table 6.4 summarizes the LOS, control delay, and 95th percentile queue lengths at the signalized intersection of Charlotte Street and Chestnut Street.

Table 6.4 - Charlotte Street and Chestnut Street										
Condition	Measure	EB	WB		NB			SB		Intersection
		EBLTR	WBL	WBTR	NBL	NBT	NBR	SBL	SBTR	LOS (Delay)
AM Peak Hour										
2020 Existing	LOS (Delay)	D (51.7)	D (50.8)		A (7.1)			B (16.9)		B (19.2)
	Synchro 95th Q	94'	-	59'	26'	205'	-	5'	412'	
2025 Background	LOS (Delay)	E (55.1)	D (54.6)		B (14.1)			B (18.6)		C (23.3)
	Synchro 95th Q	98'	-	61'	89'	203'	-	5'	442'	
2025 Build-out	LOS (Delay)	D (52.0)	F (136.6)		B (16.4)			C (21.2)		C (34.4)
	Synchro 95th Q	#185'	-	#251'	89'	335'	-	26'	470'	
2025 Build-out IMP	LOS (Delay)	D (47.8)	E (64.9)		B (17.4)			C (21.9)		C (27.3)
(WBL)	Synchro 95th Q	170'	#139'	61'	#90'	380'	-	28'	496'	
2025 Build-out IMP	LOS (Delay)	D (45.5)	E (59.3)		B (14.4)			C (22.9)		C (25.6)
(WBL+NBR)	Synchro 95th Q	164'	121'	59'	#90'	275'	56'	28'	#574'	
PM Peak Hour										
2020 Existing	LOS (Delay)	E (60.5)	D (41.9)		B (16.1)			B (19.6)		C (23.6)
	Synchro 95th Q	97'	-	100'	44'	581'	-	8'	420'	
2025 Background	LOS (Delay)	E (57.9)	D (40.0)		C (21.1)			C (20.5)		C (24.9)
	Synchro 95th Q	#198'	-	91'	#171'	561'	-	10'	460'	
2025 Build-out	LOS (Delay)	E (60.2)	F (150.7)		C (27.8)			C (22.9)		D (41.0)
	Synchro 95th Q	#235'	-	#317'	#171'	#833'	-	28'	489'	
2025 Build-out IMP	LOS (Delay)	E (59.9)	E (68.9)		C (26.8)			C (22.3)		C (32.3)
(WBL)	Synchro 95th Q	#228'	#198'	92'	#171'	#833'	-	28'	489'	
2025 Build-out IMP	LOS (Delay)	D (50.6)	D (54.0)		C (22.0)			C (25.5)		C (28.7)
(WBL+NBR)	Synchro 95th Q	185'	#168'	87'	#171'	#754'	34'	28'	#596'	
Existing/Background Storage					150'			80'		

Exceeds storage

95th percentile volume exceeds capacity, queue may be longer

As shown in **Table 6.4**, the overall intersection currently operates at LOS B during the AM peak hour and LOS C during the PM peak hour. Under background conditions, the intersection is expected to operate at LOS C during both peak hours. With the addition of site traffic, the overall intersection is projected to remain at LOS C in the AM peak hour and drop to LOS D in the PM peak-hour. Further, the westbound approach is expected to drop to LOS F with the addition of site traffic in both peak hours.

To mitigate the addition of site traffic, construction of a westbound left-turn lane is recommended. With this improvement in place, the overall intersection is expected to return to LOS C in both peak hours. The westbound approach is expected to improve to LOS E in both peak hours; still below the background LOS on this approach.

The construction of a northbound right-turn lane was considered in addition to the westbound left-turn lane. The addition of this lane improves the westbound approach to LOS D in the PM peak hour but does not offer significant improvements to this approach in the AM peak hour. Further, addition of this may be limited by the existing bike lanes, sidewalks, and stone walls on the east side of Charlotte Street. Therefore, it is not recommended that this turn-lane be constructed by the proposed development.

Based on the Synchro 95th percentile queue length, approximately 200 feet of storage would be required to accommodate anticipated queues. However, due to the recommended turn lane at Access A (as discussed in **Section 7**), the westbound left-turn lane storage should be maximized to the proposed left-turn lane at Access A. This will create a three-lane section along Chestnut Street between Charlotte Street and Access A.

Based on the Synchro 95th percentile queue length, the northbound left-turn lane exceeds the existing storage under background and build-out conditions during the PM peak-hour. This left-turn lane extends into a TWLTL; queues that exceed the storage length could queue in the TWLTL. Further, the projected queue length is not expected to increase between background and build-out conditions. Therefore, this turn lane is not recommended to be extended by this development.

6.5 CHARLOTTE STREET AND I-240 WB RAMP

Table 6.5 summarizes the LOS, control delay, and 95th percentile queue lengths at the signalized intersection of Charlotte Street and I-240 WB Ramp.

Table 6.5 - Charlotte Street and I-240 WB Ramp

Condition	Measure	WB			NB		SB		Intersection
		WBL	WBLTR	WBR	NBL	NBT	SBT	SBR	LOS (Delay)
AM Peak Hour									
2020 Existing	LOS (Delay)	D (42.7)			B (16.5)		C (26.0)		C (29.2)
	Synchro 95th Q	248'	217'	334'	m219'	443'	266'	240'	
2025 Background	LOS (Delay)	D (44.8)			C (29.8)		C (33.3)		D (36.4)
	Synchro 95th Q	269'	236'	362'	m243'	m426'	291'	261'	
2025 Build-out	LOS (Delay)	D (45.4)			C (30.9)		D (36.1)		D (37.7)
	Synchro 95th Q	284'	249'	413'	m207'	m481'	338'	289'	
2025 Build-out IMP	LOS (Delay)	D (46.0)			C (30.7)		C (34.7)		D (37.4)
	Synchro 95th Q	463'	248'	260'	m224'	m534'	330'	282'	
PM Peak Hour									
2020 Existing	LOS (Delay)	E (57.5)			D (38.1)		E (69.5)		D (53.0)
	Synchro 95th Q	149'	102'	#586'	#650'	566'	#345'	#413'	
2025 Background	LOS (Delay)	E (74.1)			D (41.3)		E (65.3)		E (57.2)
	Synchro 95th Q	152'	154'	#665'	m#683'	m29'	#342'	#442'	
2025 Build-out	LOS (Delay)	F (82.4)			D (41.6)		F (80.1)		E (64.2)
	Synchro 95th Q	152'	154'	#695'	m#618'	m44'	#435'	#492'	
2025 Build-out IMP	LOS (Delay)	E (71.0)			C (23.9)		D (47.9)		D (43.3)
	Synchro 95th Q	260'	#414'	#414'	m#328'	m44'	365'	#431'	
Existing/Background Storage		250'		250'				50'	

Exceeds storage

95th percentile volume exceeds capacity, queue may be longer

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

As shown in **Table 6.5**, the overall intersection currently operates at LOS C during the AM peak hour and LOS D during the PM peak hour. Under background conditions, the overall intersection is expected to operate at LOS D during the AM peak hour and LOS E during the PM peak hour. With the addition of site traffic, the overall intersection is projected to remain at LOS D and LOS E in the AM and PM peak hours, respectively. In the PM peak hour, the westbound and southbound approaches are expected to drop from LOS E to LOS F with the addition of site traffic.

To mitigate site impacts, restriping the westbound through-left as a through-right was considered. With this improvement in place, the overall intersection and its approaches are expected to return to the background condition or better. However, the benefits of this restriping would be limited by the road diet in place along Charlotte Street. Although there is enough pavement width to accommodate two receiving lanes for the westbound right-turns at the intersection, this pavement was recently restriped to one through lane and a TWLTL a short distance north of the intersection. Transitioning two right-turn lanes into one through lane in close proximity to the current signal could limit the capacity of the facility to process traffic, which could create delays and queues along the corridor. Turn lane additions on other approaches would also be limited by available receiving lanes and the width of the existing I-240 bridge. Therefore, no developer improvements are recommended at this intersection for capacity purposes.

Based on the Synchro 95th percentile queue length, the southbound and westbound right-turn lanes exceed the existing storage under existing, background, and build-out conditions during

both peak-hours. However, extension of the southbound right-turn lane would be limited by the adjacent Starbucks driveway. The westbound right turn queues are anticipated to be accommodated on the ramp and are not expected to increase significantly with the addition of site traffic. Therefore, these turn lanes are not recommended to be extended by this development.

6.6 CHARLOTTE STREET AND I-240 EB RAMP/WOODFIN PLACE

Table 6.6 summarizes the LOS, control delay, and 95th percentile queue lengths at the signalized intersection of Charlotte Street and I-240 EB Ramp/Woodfin Place.

Table 6.6 - Charlotte Street and I-240 EB Ramp/Woodfin Place

Condition	Measure	EB		WB		NB		SB		Intersection
		EBLT	EBR	WBL	WBR	NBT	NBR	SBL	SBT	LOS (Delay)
AM Peak Hour										
2020 Existing	LOS (Delay)	D (40.5)		A (5.1)		E (62.6)		D (54.7)		D (49.8)
	Synchro 95th Q	152'	#928'	6'	3'	#231'	122'	#385'	285'	
2025 Background	LOS (Delay)	E (58.6)		A (5.3)		E (71.4)		D (53.6)		E (58.8)
	Synchro 95th Q	167'	#1000'	6'	3'	#255'	#110'	#434'	283'	
2025 Build-out	LOS (Delay)	E (57.6)		A (5.3)		F (124.5)		E (61.2)		E (72.4)
	Synchro 95th Q	186'	#1000'	6'	3'	#355'	#123'	#483'	325'	
2025 Build-out IMP	LOS (Delay)	E (76.4)		A (6.2)		E (77.5)		E (55.8)		E (68.6)
	Synchro 95th Q	203'	#1043'	7'	3'	#317'	102'	m#479'	346'	
PM Peak Hour										
2020 Existing	LOS (Delay)	E (57.5)		B (17.0)		C (28.3)		D (35.7)		D (36.2)
	Synchro 95th Q	205'	#499'	19'	37'	455'	413'	m#395'	m191'	
2025 Background	LOS (Delay)	E (59.9)		B (14.7)		D (37.5)		C (32.9)		D (40.7)
	Synchro 95th Q	262'	#542'	21'	36'	#540'	m#419'	m#441'	m245'	
2025 Build-out	LOS (Delay)	E (60.1)		B (14.8)		D (54.4)		C (33.5)		D (48.7)
	Synchro 95th Q	281'	#542'	21'	36'	m#574'	m#403'	m#421'	m255'	
2025 Build-out IMP	LOS (Delay)	E (62.6)		B (14.9)		D (41.7)		C (33.1)		D (43.2)
	Synchro 95th Q	285'	#553'	21'	36'	#583'	m#418'	#523'	247'	
Existing/Background Storage			225'	300'	300'		350'			

Exceeds storage

95th percentile volume exceeds capacity, queue may be longer

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

As shown in **Table 6.6**, the overall intersection currently operates at LOS D during both peak hours. It is expected to operate at LOS E during the AM peak hour and LOS D during the PM peak hour under background conditions. With the addition of site traffic, the overall intersection is projected to remain at LOS E and LOS D in the AM and PM peak hours, respectively. In the AM peak hour, the northbound and southbound approaches are expected to drop in LOS with the addition of site traffic.

Additional lanes on the northbound and southbound approaches would be limited by the existing bridge of I-240. Further, additional left-turn lanes on the eastbound approach could create merging/weaving issues on the bridge, which only has one northbound through lane. This traffic signal operates within a coordinated signal system along Charlotte Street with the I-240 WB Ramp and College Street. If signal timings are routinely updated along the corridor, the northbound and southbound approaches are expected to improve; those results are shown in the build-out improved row of the table above (including the restriping at the I-240 WB Ramp).

As the development does not impact overall intersection LOS and improvements would be limited by the adjacent roadway network, no improvements are recommended at this intersection for capacity purposes.

6.7 CHARLOTTE STREET AND COLLEGE STREET

Table 6.7 summarizes the LOS, control delay, and 95th percentile queue lengths at the signalized intersection of Charlotte Street and College Street.

Table 6.7 - Charlotte Street and College Street

Condition	Measure	EB			WB			NB			SB			Intersection
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	LOS (Delay)
AM Peak Hour														
2020 Existing	LOS (Delay)	D (39.9)			D (37.2)			D (36.4)			C (25.0)			C (30.4)
	Synchro 95th Q	30'	64'	50'	#173'	179'	139'	94'	135'	78'	m225'	228'	m0'	
2025 Background	LOS (Delay)	D (40.5)			D (37.5)			D (36.3)			C (23.9)			C (29.9)
	Synchro 95th Q	31'	65'	51'	#180'	182'	141'	96'	140'	80'	m219'	m232'	m0'	
2025 Build-out	LOS (Delay)	D (42.4)			D (37.7)			D (37.3)			C (23.7)			C (30.2)
	Synchro 95th Q	47'	65'	51'	#180'	182'	156'	96'	159'	82'	m235'	m238'	m0'	
PM Peak Hour														
2020 Existing	LOS (Delay)	D (43.3)			D (45.7)			D (47.4)			C (24.2)			D (40.5)
	Synchro 95th Q	105'	119'	93'	#230'	250'	317'	92'	#453'	245'	m#282'	m126'	m0'	
2025 Background	LOS (Delay)	D (43.8)			D (43.6)			D (46.6)			C (21.1)			D (38.7)
	Synchro 95th Q	115'	126'	101'	#251'	268'	321'	99'	#476'	258'	m253'	m112'	m0'	
2025 Build-out	LOS (Delay)	D (45.1)			D (47.0)			D (48.3)			C (20.1)			D (39.8)
	Synchro 95th Q	123'	126'	101'	#251'	268'	335'	99'	#493'	258'	m281'	m111'	m0'	
Existing/Background Storage		175'		175'	150'			150'			50'		75'	

Exceeds storage

95th percentile volume exceeds capacity, queue may be longer

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

As shown in **Table 6.7**, the overall intersection currently operates at LOS C during the AM peak hour and LOS D during the PM peak hour. Under background and build-out conditions, the overall intersection is expected to continue to operate at LOS C and LOS D during the AM and PM peak hours, respectively. As the site has a minimal impact on the intersection as a whole, no improvements are recommended at this intersection for capacity purposes.

6.8 CHESTNUT STREET AND MERRIMON AVENUE

Table 6.8 summarizes the LOS, control delay, and 95th percentile queue lengths at the signalized intersection of Chestnut Street and Merrimon Avenue.

Table 6.8 - Chestnut Street and Merrimon Avenue

Condition	Measure	EB		WB		NB	SB	Intersection
		EBL	EBTR	WBL	WBTR	NBLTR	SBTR	LOS (Delay)
AM Peak Hour								
2020 Existing	LOS (Delay)	D (53.7)		D (42.0)		A (8.8)	C (22.4)	C (20.6)
	Synchro 95th Q	-	200'	-	126'	197'	298'	
2025 Background	LOS (Delay)	D (55.0)		D (43.2)		A (9.3)	C (24.5)	C (21.9)
	Synchro 95th Q	-	205'	-	131'	205'	315'	
2025 Build-out	LOS (Delay)	E (57.3)		E (58.2)		A (9.9)	C (25.3)	C (23.9)
	Synchro 95th Q	-	#234'	-	#180'	212'	315'	
2025 Build-out IMP	LOS (Delay)	D (48.7)		D (39.7)		A (8.0)	C (23.1)	C (20.2)
	Synchro 95th Q	42'	183'	54'	102'	194'	308'	
PM Peak Hour								
2020 Existing	LOS (Delay)	E (72.4)		D (42.7)		C (26.1)	D (39.2)	D (38.0)
	Synchro 95th Q	-	#294'	-	223'	#321'	#419'	
2025 Background	LOS (Delay)	E (76.6)		D (49.9)		B (20.0)	C (32.5)	C (33.5)
	Synchro 95th Q	-	#332'	-	#290'	#281'	#423'	
2025 Build-out	LOS (Delay)	F (80.0)		E (74.3)		C (21.8)	C (33.0)	D (37.6)
	Synchro 95th Q	-	#342'	-	#358'	#294'	#423'	
2025 Build-out IMP	LOS (Delay)	E (57.6)		E (55.3)		B (10.8)	C (27.7)	C (26.8)
	Synchro 95th Q	#106'	#231'	#92'	#254'	211'	411'	

95th percentile volume exceeds capacity, queue may be longer

As shown in **Table 6.8**, the overall intersection currently operates at LOS C during the AM peak hour and LOS D during the PM peak hour. Under background conditions, the overall intersection is expected to operate at LOS C during both peak hours. With the addition of site traffic, the overall intersection is projected to operate at LOS C and LOS D in the AM and PM peak hours, respectively. The eastbound and westbound approaches are expected to drop one LOS, to LOS E or LOS F, in both peak hours with the addition of site traffic.

Eastbound and westbound left-turn lanes were considered as mitigation at this intersection. With these turn lanes in place, the overall intersection returns to LOS C in the PM peak hour, but the westbound approach is still expected to operate at LOS E in the PM peak hour. Due to the existing buildings in the northeast and southwest corners of the intersection as well as the topographic challenges at this intersection, construction of these turn-lanes may not be feasible.

Because the anticipated drop in LOS in the PM peak hour is due to an increase in delay of only 4.1 seconds and physical improvements to the intersection would be limited by existing buildings and topography, no improvements are recommended at this intersection for capacity purposes.

6.9 CHESTNUT STREET AND ASHEVILLE ARMS DRIVEWAY

Table 6.9 summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized, stop-controlled intersection of Chestnut Street and Asheville Arms Driveway.

Table 6.9 - Chestnut Street and Asheville Arms Driveway				
Condition	Measure	EB	WB	SB
		EBLT	WBTR	SBLR
AM Peak Hour				
2020 Existing	LOS (Delay)	A (0.8)	A (0.0)	A (8.9)
	Synchro 95th Q	0'	0'	2'
2025 Background	LOS (Delay)	A (0.8)	A (0.0)	A (8.9)
	Synchro 95th Q	0'	0'	2'
2025 Build-out	LOS (Delay)	A (1.2)	A (0.0)	A (8.9)
	Synchro 95th Q	0'	0'	2'
PM Peak Hour				
2020 Existing	LOS (Delay)	A (2.5)	A (0.0)	A (8.9)
	Synchro 95th Q	1'	0'	4'
2025 Background	LOS (Delay)	A (3.5)	A (0.0)	A (8.8)
	Synchro 95th Q	1'	0'	2'
2025 Build-out	LOS (Delay)	A (3.6)	A (0.0)	A (8.8)
	Synchro 95th Q	1'	0'	2'

As shown in **Table 6.9**, the stop-controlled, southbound approach operates with short delays under existing, background, and build-out conditions. Therefore, no mitigation is recommended at this intersection for capacity purposes.

6.10 FURMAN AVENUE AND ASHEVILLE ARMS DRIVEWAY

Table 6.10 summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized, stop-controlled intersection of Furman Avenue and Asheville Arms Driveway.

Table 6.10 - Furman Street and Asheville Arms Driveway				
Condition	Measure	EB	NB	SB
		EBLR	NBLT	SBTR
AM Peak Hour				
2020 Existing	LOS (Delay)	A (9.5)	A (0.0)	A (0.0)
	Synchro 95th Q	0'	0'	0'
2025 Background	LOS (Delay)	A (9.5)	A (0.0)	A (0.0)
	Synchro 95th Q	0'	0'	0'
2025 Build-out	LOS (Delay)	A (9.3)	A (0.0)	A (0.0)
	Synchro 95th Q	1'	0'	0'
PM Peak Hour				
2020 Existing	LOS (Delay)	A (8.5)	A (1.0)	A (0.0)
	Synchro 95th Q	0'	0'	0'
2025 Background	LOS (Delay)	A (8.5)	A (0.3)	A (0.0)
	Synchro 95th Q	0'	0'	0'
2025 Build-out	LOS (Delay)	A (8.6)	A (0.3)	A (0.0)
	Synchro 95th Q	0'	0'	0'

As shown in **Table 6.10**, the stop-controlled, eastbound approach operates with short delays under existing, background, and build-out conditions. Therefore, no mitigation is recommended at this intersection for capacity purposes.

6.11 CHESTNUT STREET AND ACCESS A

Table 6.11 summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized, stop-controlled intersection of Chestnut Street and Access A.

Table 6.11 - Chestnut Street and Access A				
Condition	Measure	EB	WB	SB
		EBLT	WBTR	SBLR
AM Peak Hour				
2025 Build-out	LOS (Delay)	A (6.7)	A (0.0)	A (9.4)
	Synchro 95th Q	12'	0'	13'
PM Peak Hour				
2025 Build-out	LOS (Delay)	A (6.1)	A (0.0)	A (9.4)
	Synchro 95th Q	7'	0'	15'

As shown in **Table 6.11**, the stop-controlled, southbound approach operates with short delays under build-out conditions. Therefore, no mitigation is recommended at this intersection for capacity purposes.

6.12 BAIRD STREET AND ACCESS B

Table 6.12 summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized, stop-controlled intersection of Baird Street and Access B.

Table 6.12 - Baird Street and Access B				
Condition	Measure	EB	WB	NB
		EBTR	WBLT	NBLR
AM Peak Hour				
2025 Build-out	LOS (Delay)	A (0.0)	A (0.0)	A (9.4)
	Synchro 95th Q	0'	0'	4'
PM Peak Hour				
2025 Build-out	LOS (Delay)	A (0.0)	A (0.0)	A (9.4)
	Synchro 95th Q	0'	0'	5'

As shown in **Table 6.12**, the stop-controlled, northbound approach operates with short delays under build-out conditions. Therefore, no mitigation is recommended at this intersection for capacity purposes

7.0 Auxiliary Turn Lane Warrants

Warrants for additional turn-lane improvements for unsignalized intersections beyond those necessary for capacity were determined based on a review of the figure titled 'Warrant for Left and Right-Turn Lanes' found on page 80 in the *NCDOT Policy On Street And Driveway Access to North Carolina Highways*. The results of the warrants for left- and right-turn lanes under 2025 background and build-out conditions are summarized by intersection below and included in the **Appendix**.

Charlotte Street and Baird Street

2025 Background Conditions

- Southbound left-turn lane along Charlotte Street with a minimum storage length of 75'

2025 Build out Conditions

- Southbound left-turn lane along Charlotte Street with a minimum storage length of 75'
- Northbound right-turn lane along Charlotte Street with a minimum storage length of 50'

A southbound TWLTL currently exists and the same storage length is warranted for this turn-lane in both background and build out conditions. Therefore, this turn-lane is not recommended to be constructed by the proposed development.

As mentioned in **Section 6.2**, construction of a northbound right-turn lane may be limited by the existing bike lanes, sidewalk, and brick wall. Also, the addition of a right-turn lane could pose a safety threat to bikers using the northbound lane. Therefore, this turn-lane is not recommended to be constructed by the proposed development.

Charlotte Street and Broad Street

2025 Background Conditions

- Northbound left-turn lane along Charlotte Street with a minimum storage length of 75'

2025 Build out Conditions

- Northbound left-turn lane along Charlotte Street with a minimum storage length of 75'

A northbound TWLTL currently exists and the same storage length is warranted for this turn-lane in both background and build out conditions. Therefore, this turn-lane is not recommended to be constructed by the proposed development.

Chestnut Street and Access A

2025 Build out Conditions

- Eastbound left-turn lane along Chestnut Street with a minimum storage length of 125'

Due to the recommended westbound left-turn lane at the Charlotte Street and Chestnut Street intersection, 125' of storage may not be feasible. It is recommended that this lane be extended to the proposed left-turn lane at the Charlotte/Chestnut Street intersection to maximize the provided storage. This will create a three-lane section along Chestnut Street between Charlotte Street and Access A.

Baird Street and Access B

2025 Build out Conditions

- Eastbound right-turn lane along Baird Street with a minimum storage length of 50'

Based on NCDOT guidelines, this turn lane is recommended to be 100' with applicable taper.

8.0 Crash Data Analysis

Crash data was obtained at all intersections and along each corridor within the study area for crashes that occurred between November 1, 2015, and October 31, 2020. Over this five-year period, 284 total crashes were reported within the study area. Crash data was reported for the Charlotte Street corridor, between Hillside Street and College Street, and for the Chestnut Street and Merrimon Avenue intersection. The breakdown of crashes by severity, frequency and crash type are shown in the tables below.

Table 8.1 – Crash Severity Summary

Crash Type	Number of Crashes
Fatal Crashes	0
Class A	0
Class B	12
Class C	45
Property Damage Only	227
Total	***284***

Table 8.1 above shows the total number of crashes by severity type from most to least severe. As shown, 80% of the crashes over the past five years at the study intersections had no injury reported. The crash types are defined as follows:

- Class A - crashes where serious injury is suspected and can include significant loss of blood or broken bones.
- Class B - crashes where minor injury is suspected, such as bruises or minor cuts.
- Class C - crashes wherein possible injuries occur, which are injuries reported by the person or indicated by his/her behavior, but no wounds or injuries are physically present, such as limping or complaint of neck pain.
- Property Damage Only (PDO) – crashes where no injury is reported.

Table 8.2 shows the crash rates at the study area intersections resulted in a weighted average crash rate of 104.7 crashes per 100 million entering vehicles (MEV) or 100 million vehicle miles (MVMT), with the highest rates occurring at the signalized intersections of Charlotte Street with the I-240 ramps as well as the signalized intersection of Chestnut Street and Merrimon Avenue.

Table 8.2 – Crash Frequency Summary

Location	Crashes/100 MEV or MVMT
Charlotte Street and Hillside Street	31.4
Charlotte Street and Baird Street	27.5
Charlotte Street and Broad Street	19.6
Charlotte Street and Chestnut Street	51.0
Charlotte Street and I-240 WB Ramp/Orchard Street	176.7
Charlotte Street and I-240 EB Ramp/Woodfin Place	208.1
Charlotte Street and College Street	117.8
Merrimon Street and Chestnut Street	159.1
Average	***104.7***

The most common crash type within the study area was rear-end collisions caused by slowing or stopping vehicles, making up 29% of total crashes. Rear-end collisions are often associated with higher levels of congestion at signalized intersections.

Table 8.3 – Crash Type Summary

Crash Type	Charlotte Street Corridor (College Street to Hillside Street)	Merrimon Avenue and Chestnut Street
Angle	**22**	**14**
Backing Up	**2**	0
Fixed Object	**2**	0
Head On	**1**	0
Left-Turn, Different	**28**	**4**
Left-Turn, Same Roadway	**42**	**10**
Other Collision with Vehicle	**2**	**1**
Other Non-Collision	**1**	0
Overturn/Rollover	**1**	0
Pedestrian	**1**	0
Ran off Road - Left	**1**	**1**
Ran off Road - Right	0	**2**
Rear End, Slow or Stop	**55**	**28**
Rear End, Turn	**2**	**1**
Right-Turn, Different	**7**	**4**
Right-Turn, Same Roadway	**3**	0
Sideswipe, Same Direction	**35**	**10**
Sideswipe, Opposite	**4**	0
Total	***209***	***75***

Crash data provided by NCDOT is included in the **Appendix.**

9.0 Recommendations

Recommendations for improvements to intersection lane geometry for intersections in the study area for this TIA are summarized in the following listing. Based on the capacity analyses contained herein, the following improvements are recommended to mitigate impact of the proposed development under the build-out conditions:

Charlotte Street and Chestnut Street

- Construct a westbound left-turn lane along Chestnut Street with storage maximized to the proposed left-turn lane at Access A (creating a three-lane section).

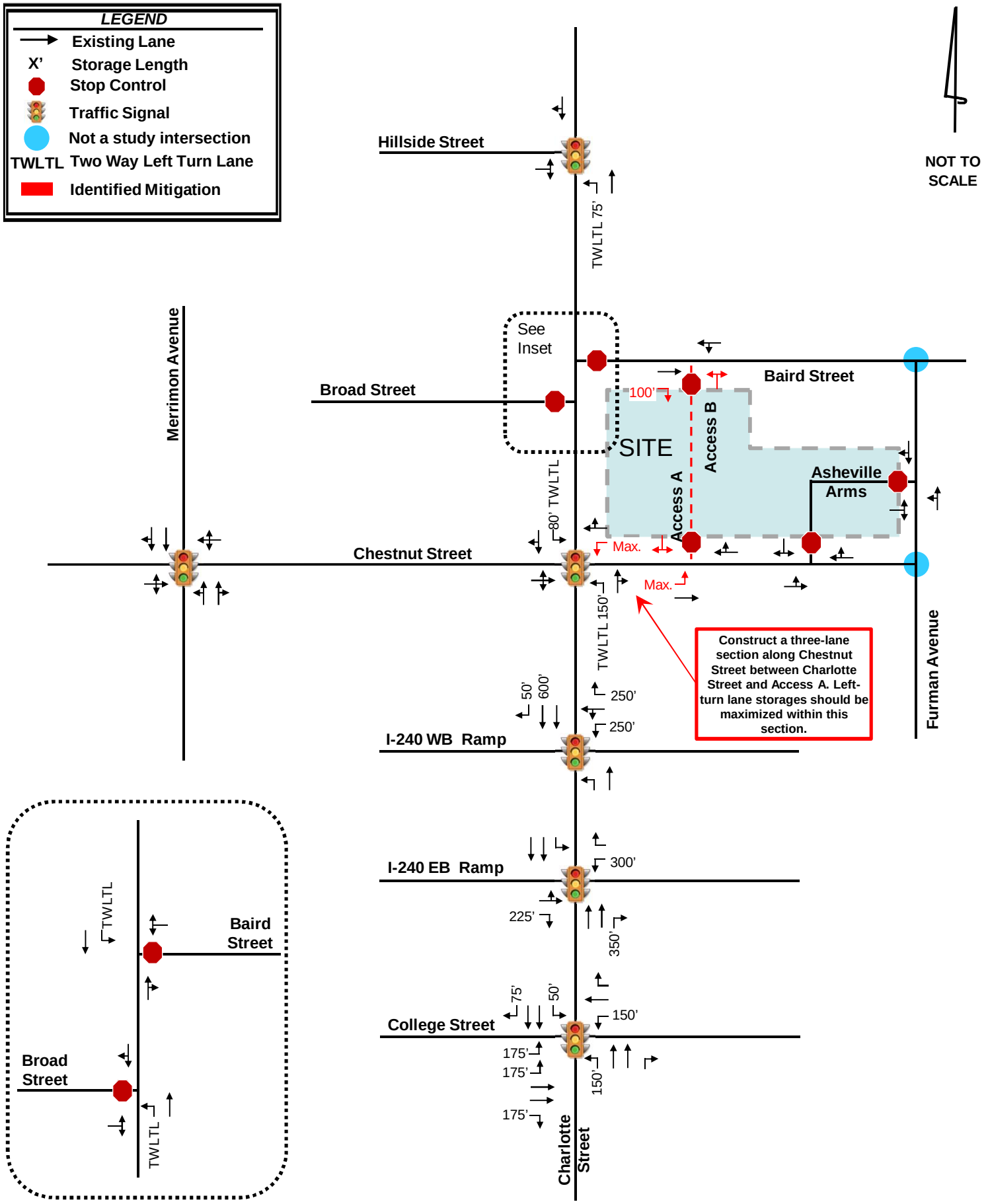
Chestnut Street and Access A

- Construct the site driveway with a single lane approach.
- Construct an eastbound left-turn lane along Chestnut Street with storage maximized to the proposed left turn lane at Charlotte Street (creating a three-lane section).

Baird Street and Access B

- Construct the site driveway with a single lane approach.
- Construct an eastbound right-turn lane along Baird Street with 100’ of storage and appropriate taper

Pedestrian facility requirements along Charlotte Street and Chestnut Street should be coordinated and confirmed with the City of Asheville through the site development process. The mitigation improvements identified within the study area are shown in **Figure 9.1**. The improvements shown on this figure are subject to approval by NCDOT and the City of Asheville. All additions and attachments to the State and City roadway system shall be properly permitted, designed and constructed in conformance to standards maintained by the agencies.



Kimley»Horn	Charlotte Chestnut Masterplan Traffic Impact Analysis	Identifed Roadway Mitigation	Figure 9.1

APPENDIX