

SOUTH FORK DEVELOPMENT

Traffic Impact Analysis

Armstrong Ford Road
Belmont, North Carolina

Prepared for:
City of Belmont



September 2020

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**DRAFT Traffic Impact Analysis for
South Fork Development
Armstrong Ford Road
Belmont, North Carolina**

Prepared for:

**City of Belmont
Belmont, North Carolina**



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1.0 Executive Summary

The purpose of this Traffic Impact Analysis (TIA) is to evaluate the impacts on the surrounding transportation infrastructure as a result of the proposed South Fork development. The primary objectives of the study are:

- To estimate trip generation and distribution for the proposed development.
- To perform intersection capacity analyses for each of the identified study intersections.
- To determine the potential transportation impacts of the proposed development.
- To identify improvements to mitigate the proposed development’s transportation impacts.

The proposed South Fork senior residential community and commercial town center is located south of Armstrong Ford Road along the east side of the South Fork River in Belmont, North Carolina (<https://goo.gl/maps/wAb2EYA7NY8VDy2m8>). The 462-acre site is currently undeveloped and zoned as Parallel District (G-R/TN-D). Based on the site plan provided by the applicant, the proposed development is currently envisioned to include the following land uses and intensities for the purposes of this TIA to be constructed in three phases:

- Phase 1
 - 400 age-restricted single-family homes
- Phase 2
 - 408 age-restricted single-family homes
- Phase 3
 - 130,000 square-foot (SF) of commercial town-center space, assumed to be comprised of the land uses and approximate square footages as listed below:
 - 50,000 SF grocery
 - 15,000 SF pharmacy
 - 10,000 SF of fast-food restaurant space
 - 30,000 SF of general retail space
 - 25,000 SF of medical office space

For the purposes of this TIA, Phase 1 of the development is assumed to be completed (built-out) in 2025 and Phases 2 and 3 are assumed to be completed in 2029.

A TIA Scoping Meeting was held with the City of Belmont, North Carolina Department of Transportation (NCDOT) and representatives of the applicant in Belmont on November 6, 2019, to obtain background information and to ascertain the scope and parameters to be included in this TIA. The City’s Memorandum of Understanding (MOU) was developed based on discussions from this meeting, along with follow-up coordination with the City of Belmont, NCDOT, the applicant and Gaston-Cleveland-Lincoln Metropolitan Planning Organization (GCLMPO), that documented all scoping parameters to be used for the TIA. The MOU was reviewed and agreed upon by the City of Belmont, NCDOT and the applicant and is included in the **Appendix**.

The southern portion of the planned Belmont-Mt. Holly Loop (interchangeably referred to as Belmont-Mt. Holly *Connector*) is a critical component that impacts this site and was discussed at the TIA Scoping Meeting as to how to appropriately incorporate into this TIA. GCLMPO has specifically developed a [preliminary functional design](#) for the southern portion of the Belmont-Mt. Holly Loop as it has been identified as one of the corridors most threatened by development. The intent of the boulevard is to alleviate traffic and reduce congestion along S Point Road (NC 273) by providing a new north/south alternative as the southern portion of the peninsula continues to develop. Based on this alignment, the recommended four-lane boulevard is currently planned along

the eastern side of the proposed South Fork development site with a connection to Armstrong Ford Road at the existing intersection with Eastwood Drive. Based on input from the applicant, the feasibility of a connection to Armstrong Ford Road at Eastwood Drive is potentially constrained by existing residential homes on the northwest and southeast quadrants and presence of major utilities including an overhead transmission easement. If feasible, this portion of the alignment within the proposed site is planned to be constructed as part of the proposed development to serve as both Access 1 and as a spine road within the development. However, dependent on the results of a future feasibility study, this connection to Armstrong Ford Road at Eastwood Drive may be determined infeasible by City, NCDOT and GCLMPO staff, resulting in the need to provide alternative access and modify the current MTP and CTP alignments for the Belmont-Mt. Holly Loop. To continue moving the proposed South Fork development project forward, the applicant proposed an alternative access strategy that would evaluate the impacts of the proposed site under two separate access scenarios, resulting in two sets of transportation mitigation improvements. The alternative access option moves to connect to Armstrong Ford Road at Cimarron Boulevard, creating the fourth leg of this existing unsignalized, tee-intersection. Therefore, two alignment alternatives for Access 1 were evaluated for the purposes of this TIA (and reflected in the site plan included in the **Appendix**):

- **Option A** – full-movement connection to Armstrong Ford Road at Eastwood Drive
- **Option B** – full-movement connection to Armstrong Ford Road at Cimarron Boulevard

Based on the provided site plan, the proposed development is currently planned to ultimately be accessed via three access points:

- Access 1 (Belmont-Mt. Holly Loop) - two potential access alternatives:
 - **Option A** – full-movement connection to Armstrong Ford Road at Eastwood Drive (creating the fourth leg)
 - **Option B** – full-movement connection to Armstrong Ford Road at Cimarron Boulevard (creating the fourth leg)
- Access 2 - extension of existing Nixon Road through the Amberley development (which provides access to the east via the intersection of S Point Road (NC 273)/R L Stowe Road)
- Access 3 (*Phase 3 only*) – a right-in/right-out connection to Armstrong Ford Road located approximately 600 feet east of Cimarron Boulevard; planned to serve the commercial portion of the proposed development.

Note that based on input from the applicant and documented in the approved MOU, no proposed access was assumed to connect to the future east/west connection shown in [Belmont's Comprehensive Land Use Plan](#) between the approved Belmont Middle School (along S Point Road) and the planned Belmont-Mt. Holly Loop.

The following AM and PM peak-hour scenarios were analyzed to determine the proposed development's transportation impacts on the surrounding network through each phase of development:

- 2020 Existing Conditions
- 2025 Background Conditions
- 2025 Build-out Phase 1 Conditions
- 2029 Background Conditions
- 2029 Build-out Phase 2 Conditions
- 2029 Build-out Phase 3 Conditions
- 2034 Build-out Conditions + 5 years

Note that both Options A and B for Access 1 were evaluated under each build-out scenario.

Based on the expected site trip generation and discussions of projected travel patterns for the proposed site trips in context with the surrounding area, this TIA evaluated operations under each of the AM and PM peak-hour scenarios above for the following study area intersections:

1. S Point Road (NC 273) and Belmont Middle School Driveway (*future conditions only*)
2. S Point Road (NC 273) and South Point High School Driveway/Red Raider Run
3. S Point Road (NC 273) and R L Stowe Road/Nixon Road
4. Keener Boulevard (NC 273) and R L Stowe Road/Fort William Avenue
5. Keener Boulevard/Park Street (NC 273) and Catawba Street (NC 7)
6. N Main Street (NC 7) and N Central Avenue
7. S Main Street and Central Avenue
8. S Main Street and Eagle Road
9. S Main Street and Julia Avenue
10. Eagle Road and Eastwood Drive
11. Eagle Road and Lakewood Road
12. Armstrong Ford Road and Eastwood Drive/**Access 1 (Option A)**
13. Armstrong Ford Road and Cimarron Boulevard/**Access 1 (Option B)**
14. S New Hope Road (NC 279) and Armstrong Ford Road/Twin Tops Road
15. Armstrong Ford Road and Access 3 (*Phase 3 only*)

Note the following modifications from the background data collected were applied to the capacity analyses to meet [NCDOT Congestion Management Capacity Analysis Guidelines](#):

- Right-turn-on-red (RTOR) operations were not allowed.
- Protected-only left-turn phasing was used for analysis of future operations where protected/permitted left-turn phasing exists or is planned (except as noted for the S Main Street/Eagle Road intersection).
- Lost time adjust was added to the yellow and all-red times provided in the existing signal plans to maintain a total lost time of 5 seconds for each movement.

Kimley-Horn was retained to determine the potential transportation impacts of this development (in accordance with the traffic study guidelines in the [NCDOT Policy on Street and Driveway Access to North Carolina Highways](#) and set forth by the [City of Belmont Land Development Code – Section 16.14 Traffic Impact Analysis](#)) and to identify transportation improvements that may be required to mitigate these impacts. This report presents trip generation, distribution, capacity analyses, crash analyses and identified transportation improvements required to mitigate anticipated traffic demands produced by the subject development.

Based on the capacity analyses performed at each of the identified study intersections, along with review of the auxiliary turn-lane warrants and crash analyses contained herein, the following phased improvements are identified to mitigate the impact of the proposed development on the adjacent street network:

PHASE 1 (2025)

12. Armstrong Ford Road and Eastwood Drive/ (Access 1)

Option A (Access 1 at Eastwood Drive)

- Southbound left turn lane along Eastwood Drive with 225 feet of storage
- Northbound left-turn lane and a shared through/right lane along Access 1
 - Provide a minimum of 175 feet of storage for the northbound left-turn lane
- Provide a 175-foot internal protected stem (IPS) along Access 1

Option B (Access 1 at Cimarron Boulevard)

- Eastbound left-turn lane along Armstrong Ford Road with 175 feet of storage
- Southbound left turn lane along Eastwood Drive with 150 feet of storage

13. Armstrong Ford Road and Cimarron Boulevard/ (Access 1)

Option A (Access 1 at Eastwood Drive)

- Stripe the southbound approach of Cimarron Boulevard to include a right-turn lane with a minimum of 100 feet of storage

Option B (Access 1 at Cimarron Boulevard)

- Stripe the southbound approach of Cimarron Boulevard to include a left-turn lane with a minimum of 125 feet of storage and a shared through/right lane
- Northbound left-turn lane and a shared through/right lane along Access 1
 - Provide a minimum of 100 feet of storage for the northbound left-turn lane
- Provide a 100-foot internal protected stem (IPS) along Access 1

PHASE 2 (2029)

7. S Main Street and Central Avenue

- Eastbound right-turn lane along S Main Street with 300 feet of storage
- Reconfigure/restripe the existing eastbound approach along S Main Street to allow the through lane to serve as the continuous lane and the left-turn lane to serve as a standard turn lane pocket with 300 feet of storage

9. S Main Street and Julia Avenue

- Northbound left-turn lane along Julia Avenue with storage maximized between S Main Street and the first residential driveway along the east side of Julia Avenue (located approximately 250 feet south of S Main Street)

12. Armstrong Ford Road and Eastwood Drive/ (Access 1)

Option A (Access 1 at Eastwood Drive)

- Installation of a traffic signal
- Eastbound left-turn lane along Armstrong Ford Road with 375 feet of storage

13. Armstrong Ford Road and Cimarron Boulevard/ (Access 1)

Option B (Access 1 at Cimarron Boulevard)

- Eastbound right-turn lane along Armstrong Ford Road with 100 feet of storage
- Westbound left-turn lane along Armstrong Ford Road with 100 feet of storage

PHASE 3 (2029)

3. S Point Road (NC 273) and R L Stowe Road/Nixon Road

- Eastbound right-turn lane along Nixon Road with 100 feet of storage

Given the four total driveways along Nixon road, this improvement should be coordinated with City and High School staff to determine if the easternmost South Point High School driveway could potentially be eliminated by rerouting the buses to one of the other three existing driveways along Nixon Road.

7. S Main Street and Central Avenue

- Extension of the eastbound left-turn lane along S Main St from 300 feet to 425 feet of storage

The full storage identified for Phase 3 should be considered for installation as part of the Phase 2 improvements to potentially avoid multiple phases of construction impacts.

8. S Main Street and Eagle Road

- Westbound right-turn lane along S Main Street with 150 feet of storage

10. Eagle Road and Eastwood Drive

- Reconfigure the existing northbound approach of Eastwood Drive to provide a northbound left-turn lane with 100 feet of storage

12. Armstrong Ford Road and Eastwood Drive/ (Access 1)

Option A (Access 1 at Eastwood Drive)

- Westbound left-turn lane along Armstrong Ford Road with 300 feet of storage
- Extension of the eastbound left-turn lane along Armstrong Ford Road from 375 feet to 500 feet of storage
- Extension of the northbound left-turn lane along Access 1 from 175 feet to 425 feet of storage
- Extension of the IPS along Access 1 from 175 feet to 425 feet

The full storages identified for Phase 3 should be considered for installation as part of the applicable Phase 1 or Phase 2 improvements to potentially avoid multiple phases of construction impacts.

Option B (Access 1 at Cimarron Boulevard)

- Installation of a traffic signal
- Extension of the eastbound left-turn lane along Armstrong Ford Road from 175 feet to 425 feet of storage

The full storage identified for Phase 3 should be considered for installation as part of the Phase 1 improvements to potentially avoid multiple phases of construction impacts.

13. Armstrong Ford Road and Cimarron Boulevard/ (Access 1)

Option B (Access 1 at Cimarron Boulevard)

- Installation of a traffic signal
- Extension of the westbound left-turn lane along Armstrong Ford Road from 100 feet to 400 feet of storage
- Extension of the northbound left-turn lane along Access 1 from 100 feet to 425 feet of storage
- Extension of the IPS along Access 1 from 100 feet to 425 feet

Consideration should be given to potentially converting the eastbound right-turn lane to a through/right lane, providing two eastbound through lanes along Armstrong Ford Road that would extend to Eastwood Drive with one dropping as a left-turn lane at Eastwood Drive. If required, this should be installed as part of Phase 3 to potentially reduce the long eastbound approach queues projected upon installation of the traffic signal identified for mitigation.

The full storages identified for Phase 3 should be considered for installation as part of the applicable Phase 1 or Phase 2 improvements to potentially avoid multiple phases of construction impacts.

15. Armstrong Ford Road and Access 3

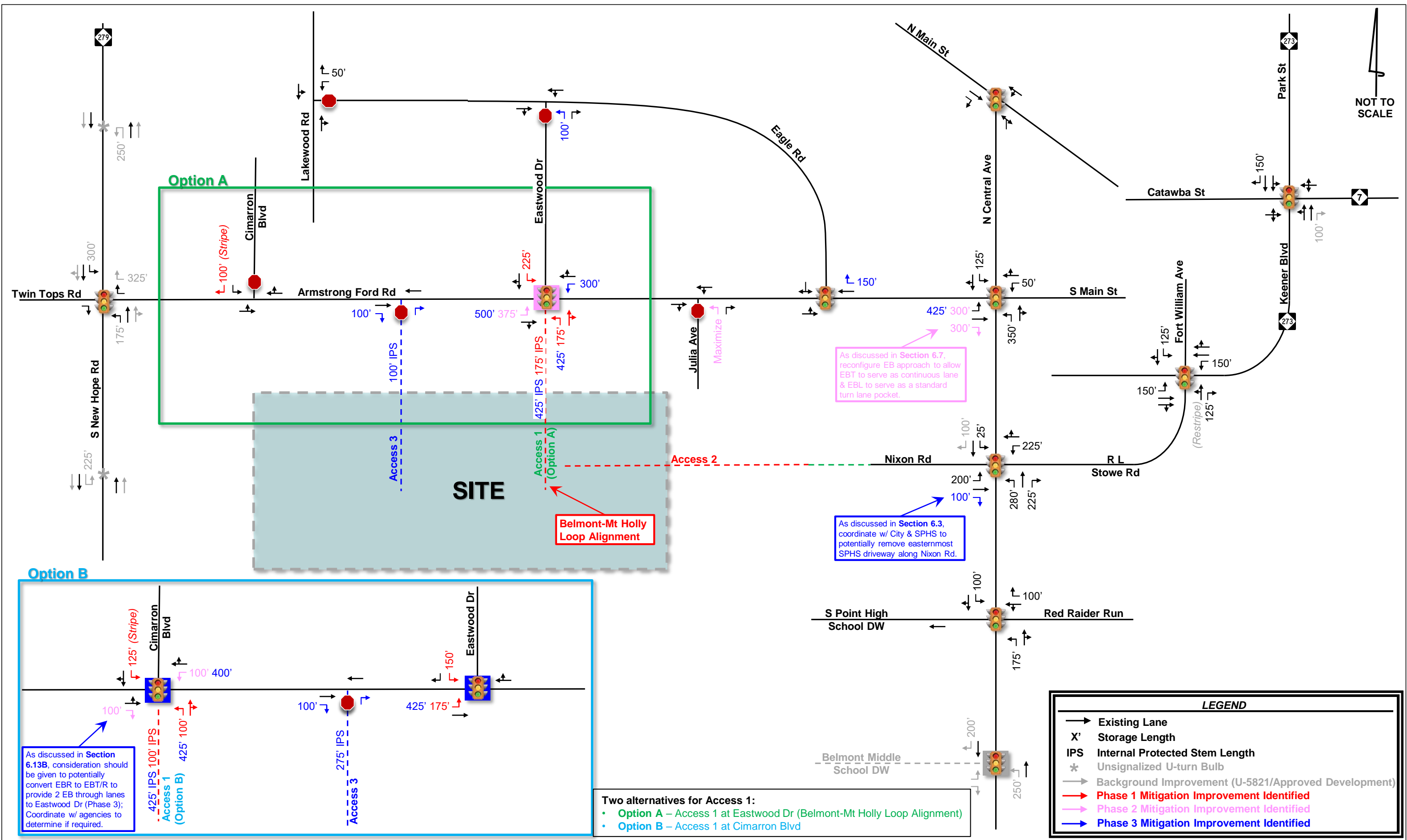
Option A (Access 1 at Eastwood Drive)

- Eastbound right-turn lane along Armstrong Ford Road with 100 feet of storage
- Single northbound right-out only egress lane and a single ingress lane along Access 3
- Provide a 100-foot internal protected stem (IPS) along Access 3

Option B (Access 1 at Cimarron Boulevard)

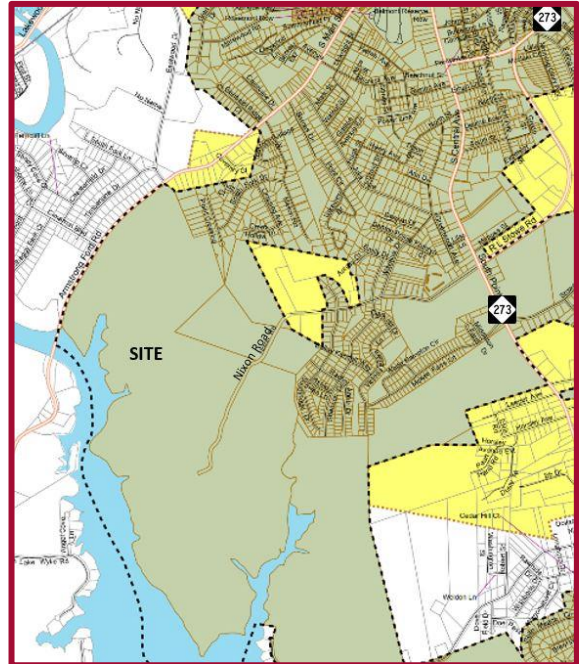
- Eastbound right-turn lane along Armstrong Ford Road with 100 feet of storage
- Single northbound right-out only egress lane and a single ingress lane along Access 3
- Provide a 275-foot internal protected stem (IPS) along Access 3

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 Belmont. 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.



2.0 Introduction

The proposed South Fork senior residential community and commercial town center is located south of Armstrong Ford Road along the east side of the South Fork River in Belmont, North Carolina (<https://goo.gl/maps/wAb2EYA7NY8VDy2m8>). The 462-acre site is currently undeveloped and zoned as Parallel District (G-R/TN-D). Based on the site plan provided by the applicant, the proposed development is currently envisioned to include the following land uses and intensities for the purposes of this TIA to be constructed in three phases:



- Phase 1
 - 400 age-restricted single-family homes
- Phase 2
 - 408 age-restricted single-family homes
- Phase 3
 - 130,000 SF of commercial town-center space, assumed to be comprised of the land uses and approximate square footages as listed below:
 - 50,000 SF grocery
 - 15,000 SF pharmacy
 - 10,000 SF of fast-food restaurant space
 - 30,000 SF of general retail space
 - 25,000 SF of medical office space

For the purposes of this TIA, Phase 1 of the development is assumed to be completed (built-out) in 2025 and Phases 2 and 3 are assumed to be completed in 2029.

A TIA Scoping Meeting was held with the City of Belmont, NCDOT and representatives of the applicant in Belmont on November 6, 2019, to obtain background information and to ascertain the scope and parameters to be included in this TIA. The City's MOU was developed based on discussions from this meeting, along with follow-up coordination with the City of Belmont, NCDOT, the applicant and GCLMPO, that documented all scoping parameters to be used for the TIA. The MOU was reviewed and agreed upon by the City of Belmont, NCDOT and the applicant and is included in the **Appendix**.

The southern portion of the planned Belmont-Mt. Holly Loop (interchangeably referred to as Belmont-Mt. Holly *Connector*) is a critical component that impacts this site and was discussed at the TIA Scoping Meeting as to how to appropriately incorporate into this TIA. As later described in **Section 4.3**, two alignment alternatives for Access 1 were evaluated for the purposes of this TIA (and reflected in the site plan included in the **Appendix**):

- **Option A** – full-movement connection to Armstrong Ford Road at Eastwood Drive
- **Option B** – full-movement connection to Armstrong Ford Road at Cimarron Boulevard

Based on the provided site plan, the proposed development is currently planned to ultimately be accessed via three access points:

- Access 1 (Belmont-Mt. Holly Loop) - two potential access alternatives:
 - **Option A** – full-movement connection to Armstrong Ford Road at Eastwood Drive (creating the fourth leg)
 - **Option B** – full-movement connection to Armstrong Ford Road at Cimarron Boulevard (creating the fourth leg)
- Access 2 - extension of existing Nixon Road through the Amberley development (which provides access to the east via the intersection of S Point Road (NC 273)/R L Stowe Road)
- Access 3 (*Phase 3 only*) – a right-in/right-out connection to Armstrong Ford Road located approximately 600 feet east of Cimarron Boulevard; planned to serve the commercial portion of the proposed development.

Note that based on input from the applicant and documented in the approved MOU, no proposed access was assumed to connect to the future east/west connection shown in *Belmont’s Comprehensive Land Use Plan* between the approved Belmont Middle School (along S Point Road) and the planned Belmont-Mt. Holly Loop.

Kimley-Horn was retained to determine the potential transportation impacts of this development (in accordance with the traffic study guidelines in the [NCDOT Policy on Street and Driveway Access to North Carolina Highways](#) and set forth by the [City of Belmont Land Development Code – Section 16.14 Traffic Impact Analysis](#)) and to identify transportation improvements that may be required to mitigate these impacts. This report presents trip generation, distribution, capacity analyses, crash analyses and identified transportation improvements required to mitigate anticipated traffic demands produced by the subject development.

3.0 Existing Traffic Conditions

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

3.1 STUDY AREA

Based on coordination with each agency and the applicant, the study area for this TIA includes the following existing intersections:

1. S Point Road (NC 273) and Belmont Middle School Driveway (*future conditions only – currently being constructed*)
2. S Point Road (NC 273) and South Point High School Driveway/Red Raider Run
3. S Point Road (NC 273) and R L Stowe Road/Nixon Road
4. Keener Boulevard (NC 273) and R L Stowe Road/Fort William Avenue
5. Keener Boulevard/Park Street (NC 273) and Catawba Street (NC 7)
6. N Main Street (NC 7) and N Central Avenue
7. S Main Street and Central Avenue
8. S Main Street and Eagle Road
9. S Main Street and Julia Avenue
10. Eagle Road and Eastwood Drive
11. Eagle Road and Lakewood Road
12. Armstrong Ford Road and Eastwood Drive
13. Armstrong Ford Road and Cimarron Boulevard
14. S New Hope Road (NC 279) and Armstrong Ford Road/Twin Tops Road

The study area was based on the [City of Belmont Land Development Code – Section 16.14 Traffic Impact Analysis](#), which states “The limits of the study area shall be based on the location, size and extent of the proposed project, and an understanding of existing and future land uses and traffic conditions surrounding the site. The limits of the study area for the TIA shall be reviewed and approved by the City and NCDOT staff at the mandatory scoping meeting. At a minimum, the study area shall include all streets and signalized intersections within a 1-mile radius of the proposed site and/or where site traffic estimated for build-out of the project will constitute 10% or more of any signalized intersection approach during the peak hour. Unsignalized intersections between the required signalized intersections will be added to the scope as directed by the City.” Given the expected site trip generation and based on discussions of projected travel patterns for the proposed site trips in context with the surrounding area, the study area listed above was agreed upon at the TIA Scoping Meeting and reviewed and approved by the City of Belmont, NCDOT, GCLMPO and the applicant as documented in the approved MOU included in the **Appendix**.

Figure 3.1 shows the study area intersections and the site location, **Figure 3.2** shows the proposed site plan for the development as provided by the applicant and **Figure 3.3** shows the existing roadway geometry at the study intersections. A full-sized site plan to scale is provided in the **Appendix**.

The primary roadways in the vicinity of the site are S Point Road (NC 273), Central Avenue, Keener Boulevard/Park Street (NC 273), R L Stowe Road, Nixon Road, and Armstrong Ford Road. The information below describes existing conditions for portions of these roadways within the vicinity of the site.

S Point Road (NC 273) is a two-lane, undivided state highway that serves as the primary north/south route along the peninsula formed between the Catawba River and South Fork River where portions of Belmont and Gaston County exist. This route serves both North Carolina and South Carolina commuters via a bridged connection to York County, South Carolina. S Point Road (NC 273) is classified as a minor arterial throughout the study area by NCDOT's functional classification system, and classified by GCLMPO as a major thoroughfare north of R L Stowe Road and a boulevard south of R L Stowe Road. Based on 2018 NCDOT annual average daily traffic (AADT) maps, S Point Road (NC 273) carries 17,000 vehicles per day (vpd) south of R L Stowe Road and 10,500 vpd north of R L Stowe Road in the vicinity of the study area. During the AM peak hour, the traffic flow is heavily distributed northbound towards I-85, Belmont, Charlotte and Gastonia, and the heavy southbound flow is experienced more during the evening peak hour. S Point Road (NC 273) has a posted speed limit of 45 mph south of Stowe Road and 35 mph north of Stowe Road.

North of its intersection with North Street, S Point Road (NC 273) transitions to become Central Avenue and the NC 273 designation shifts onto Keener Boulevard to the east. Central Avenue is a two-lane, undivided roadway with a posted speed limit of 35 mph throughout the study area. Central Avenue is classified as a minor arterial by NCDOT's functional classification system and as a major thoroughfare by GCLMPO. Based on 2018 NCDOT AADT maps, Central Avenue carries 11,000 vpd south of S Main Street, 8,800 vpd just north of S Main Street, and 10,000 vpd just south of N Main Street.

Keener Boulevard (NC 273) is a four-lane, undivided roadway that transitions to be named Park Street at its intersection with Catawba Street (NC 7). Park Street (NC 273) provides access to US 74/US 29 and I-85. Keener Boulevard/Park Street (NC 273) is classified as a minor arterial by NCDOT's functional classification system and as a boulevard by GCLMPO. Based on 2018 NCDOT AADT maps, Keener Boulevard (NC 273) carries 6,600 vpd between Central Avenue and R L Stowe Road and 19,000 vpd between R L Stowe Road and Catawba Street (NC 7). Park Street (NC 273) carries 17,000 vpd north of Catawba Street (NC 7). The significant increase in AADT along Keener Boulevard (NC 273) east of R L Stowe Road shows that most of the traffic traveling from the south along S Point Road (NC 273) toward US 74/29 and I-85 uses R L Stowe Road to access Park Street (NC 273), rather than the S Point Road (NC 273)/Keener Boulevard intersection. Keener Boulevard/Park Street (NC 273) has a posted speed limit of 35 mph throughout the study area.

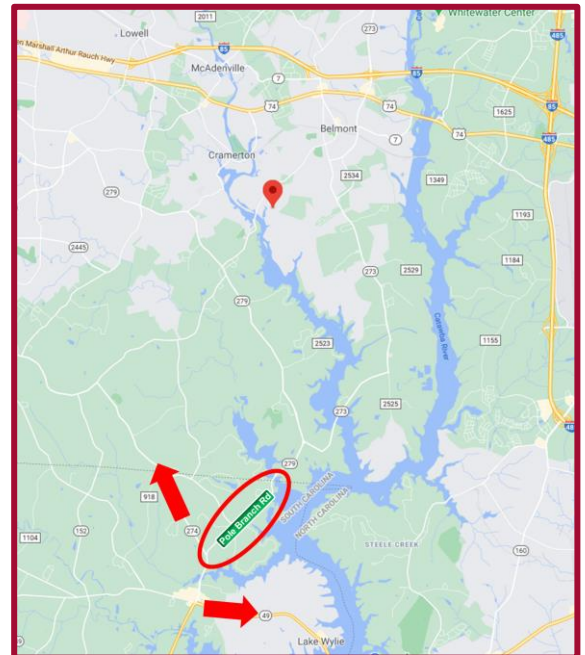
R L Stowe Road is a two-lane, undivided roadway that connects S Point Road (NC 273) to Keener Boulevard (NC 273). R L Stowe Road has a posted speed limit of 45 mph near its intersection with Keener Boulevard (NC 273) and a posted speed limit of 35 mph near its intersection with S Point Road (NC 273). Based on 2018 NCDOT AADT maps, R L Stowe Road carries 10,000 vpd east of S Point Road (NC 273). R L Stowe is classified as a local road by NCDOT's functional classification system and as a boulevard by GCLMPO.

Nixon Road is a two-lane, undivided roadway that primarily carries residential and school traffic to-and-from South Point High School. Nixon Road has a posted speed limit of 35 mph; however, there is a 25-mph school zone near its intersection with S Point Road (NC 273). Based on 2018 NCDOT AADT maps, Nixon Road carries 3,500 vpd west of S Point Road (NC 273). Nixon Road is classified as a local road by NCDOT's functional classification system and as a minor thoroughfare by GCLMPO.

Armstrong Ford Road is a two-lane, undivided roadway that connects S New Hope Road (NC 279) in Cramerton to Central Avenue in Belmont. Near its intersection with Julia Avenue, Armstrong Ford Road transitions to be named Main Street. Armstrong Ford Road/Main Street is classified as a major collector between S New Hope Road (NC 279) and Eagle Road and a minor arterial east of Eagle Road by NCDOT’s functional classification, and classified by GCLMPO as a major thoroughfare throughout the study area. Based on 2018 NCDOT AADT maps, Armstrong Ford Road/Main Street carries 8,700 vpd east of S New Hope Road (NC 279), 8,800 vpd in the vicinity of Cimarron Boulevard and Eastwood Drive, 9,300 vpd just west of Eagle Road, 11,500 vpd between Eagle Road and Central Avenue, and 5,000 vpd east of Central Avenue. Armstrong Ford Road has a posted speed limit of 35 mph near its intersection with S New Hope Road (NC 279) and transitions to 45 mph at the South Fork River before transitioning back to 35 mph between Cimarron Boulevard and Eastwood Drive. Main Street has a posted speed limit of 35 mph throughout the study area.

3.2 EXISTING INTERSECTION VOLUME DEVELOPMENT

Two separate factors impacted the traditional collection of existing turning movement counts. The first, which was discussed at the November 2019 TIA Scoping Meeting, was the temporary closing of Pole Branch Road, which is an important connection located in York County, SC that connects SC 274 in Lake Wylie, SC to Armstrong Road (NC 273) in Belmont, NC. At the North Carolina state line near its bridge over the Catawba River, Pole Branch Road transitions to become S New Hope Road (NC 279). Pole Branch Road was temporarily closed for an improvement project in November 2019, and at that time was expected to be closed through May 2020. Concern was raised with collecting new counts in Belmont during this closure, as traffic patterns had been significantly shifted, specifically for upstate South Carolina traffic, with the primary impact being traffic volumes significantly decreased along S Point Rd (NC 273). As shown in the image to the right, with the Pole Branch Road connection closed, some upstate South Carolina travelers were forced to shift their travel routes to instead either use SC/NC 274 or SC/NC 49 to travel north and east.



As shown in the image to the right, with the Pole Branch Road connection closed, some upstate South Carolina travelers were forced to shift their travel routes to instead either use SC/NC 274 or SC/NC 49 to travel north and east.

In addition to the temporary impacts from the Pole Branch Road closure, the second impact to typical traffic patterns was associated with the COVID-19 pandemic where school has not been in normal session since March 2020. At this time, it is unclear when traffic volumes will normalize. Traffic volumes have proven to be significantly reduced during the COVID-19 pandemic and is expected to remain lower than normal while school is not fully in session. Although this second factor was unknown at the time of the TIA Scoping Meeting in November, it is important to note that it did prevent new counts from being collected following the reopening of Pole Branch Road.

Fortunately, recent intersection counts from 2018 and 2019 had been previously performed at nine of the fourteen study intersections, including all study intersections along the S Point Road (NC

273) corridor, where the most significant impact from the Pole Branch Road closure was felt. These were obtained from the following sources:

- *Belmont Middle School TIA* (Kimley-Horn, September 2018)
- *Amberley TIA* (Kimley-Horn, May 2019)
- *Chronicle Mill TIA* (Kimley-Horn, October 2019)
- NCDOT counts collected in September 2018 and March 2019

The intersections where counts were collected and obtained from the above sources are listed below along with the date they were collected. For each of these, AM (6:30-8:30) and PM (4:30-7:00) intersection turning-movement, heavy-vehicle, pedestrian and bicycle counts were collected by National Data & Surveying Services (with the exception of intersection numbers 7 and 11 that were obtained from NCDOT; however, as noted below, both of these intersections were recounted in December 2019 with the same AM and PM count timeframes and the December 2019 counts were used for analysis purposes in this TIA):

1. S Point Rd (NC 273) and Belmont Middle School Driveway - 5/22/18 (AM), 1/10/19 (PM)
2. S Point Rd (NC 273) and South Point HS/Red Raider Run - 5/22/18 (AM), 1/10/19 (PM)
3. S Point Rd (NC 273) and R L Stowe Road/Nixon Road - 5/22/18 (AM), 1/10/19 (PM)
4. Keener Blvd (NC 273) and R L Stowe Road/Fort William Avenue – 5/14/19 (AM & PM)
5. Keener Blvd/Park St (NC 273) and Catawba Street (NC 7) – 5/14/19 (AM & PM)
6. N Main Street (NC 7) and N Central Avenue – 5/14/19 (AM & PM)
7. S Main Street and Central Avenue – 9/6/18 (AM & PM)
11. Eagle Road and Lakewood Road – 3/7/19 (AM & PM)
14. S New Hope Rd (NC 279) and Armstrong Ford Rd/Twin Tops Rd – 5/29/19 (AM & PM)

The five intersections in which counts had not been previously collected were either along, or in the vicinity of Armstrong Ford Road, where the impact of the Pole Branch Road closure was thought to be less severe than the impact to S Point Road (NC 273); however, the degree of impact was needed to be validated before moving forward under this assumption. Therefore, to determine the relative degree of impact (if any) to volumes in this area, three intersections listed above where previous counts were already provided (intersections 7, 11 and 14) were recollected and compared to the previous volumes. These were collected by National Data & Surveying Services on Wednesday, December 18, 2019 (when Belmont Abbey College and Gaston County Schools were in session) on the same day as collection of the five missing intersections. These eight total intersections include:

7. S Main Street and Central Avenue (*Recollected*)
8. S Main Street and Eagle Road
9. S Main Street and Julia Avenue
10. Eagle Road and Eastwood Drive
11. Eagle Road and Lakewood Road (*Recollected*)
12. Armstrong Ford Road and Eastwood Drive
13. Armstrong Ford Road and Cimarron Boulevard
14. S New Hope Road (NC 279) and Armstrong Ford Road/Twin Tops Road (*Recollected*)

Based on a comparison of the AM and PM peak-hour volumes at the three recollected intersections, the overall volume at all three intersections were either the same or slightly higher in December 2019 with Pole Branch Road closed than in the previous counts with Pole Branch Road open. These findings are summarized below:

7. S Main St and Central Ave – total volume was exactly the same between the two counts.

- 11. Eagle Rd and Lakewood Rd – December 2019 counts were 12% higher than March 2019 counts, likely attributed to the additional traffic traveling to/from McAdenville’s Christmas festivities in December.
- 14. S New Hope Rd (NC 279) and Armstrong Ford Rd/Twin Tops Rd – December 2019 counts were less than 2% higher than the May 2019 counts.

In summary, since the peak-hour volumes in the vicinity of Armstrong Ford Road were shown to be similar both with and without Pole Branch Road closed, the Pole Branch Road closure was not considered to have a significant impact on the traffic volumes at the five missing intersections and the three additional intersections collected in December 2019. Therefore, the December 2019 counts were determined as appropriate to be used for these eight intersections for the purposes of the South Fork TIA. This methodology and the findings were coordinated and approved by City and NCDOT staff, and a summary is included in the **Appendix**.

An annual growth rate of one percent (1%) was applied to the 2018/2019 counts to reflect base 2020 traffic volumes as shown in the approved MOU.

The AM and PM peak hours identified differed amongst some of the study intersections yet were found to be relatively consistent given the vast number of intersections. The AM peak hour was found to begin between 7:00 and 7:15 AM throughout the study area, with the exception of one intersection where the peak hour began at 7:30 AM. The PM peak hour was found to begin between 4:45 and 5:00 PM throughout the study area, with the exception of one intersection where the peak hour began at 5:30 PM. The specific peak hour of each individual intersection was used as the baseline data to represent the highest collected traffic volumes within the specified count timeframes. The peak hours for each intersection are shown in **Table 3.1**.

Table 3.1 – AM & PM Intersection Peak Hours



Intersection	AM Peak Hour	PM Peak Hour
2. S Point Rd (NC 273) and South Point HS/Red Raider Run	7:00 AM - 8:00 AM	5:00 PM - 6:00 PM
3. S Point Rd (NC 273) and R L Stowe Rd/Nixon Rd	7:00 AM - 8:00 AM	5:00 PM - 6:00 PM
4. Keener Blvd (NC 273) and R L Stowe Rd/Ft William Ave	7:15 AM - 8:15 AM	5:00 PM - 6:00 PM
5. Keener Blvd/Park St (NC 273) and Catawba St (NC 7)	7:00AM - 8:00 AM	4:45 PM - 5:45 PM
6. N Main St (NC 7) and N Central Ave	7:30 AM - 8:30 AM	5:00 PM - 6:00 PM
7. S Main St and Central Ave	7:00 AM - 8:00 AM	5:30 PM - 6:30 PM
8. S Main St and Eagle Rd	7:15 AM - 8:15 AM	5:00 PM - 6:00 PM
9. S Main St and Julia Ave	7:00 AM - 8:00 AM	5:00 PM - 6:00 PM
10. Eagle Rd and Eastwood Dr	7:00AM - 8:00 AM	4:45 PM - 5:45 PM
11. Eagle Rd and Lakewood Rd	7:15 AM - 8:15 AM	5:00 PM - 6:00 PM
12. Armstrong Ford Rd and Eastwood Dr	7:00AM - 8:00 AM	5:00 PM - 6:00 PM
13. Armstrong Ford Rd and Cimarron Blvd	7:00AM - 8:00 AM	5:00 PM - 6:00 PM
14. S New Hope Rd (NC 279) and Armstrong Ford Rd	7:00AM - 8:00 AM	5:00 PM - 6:00 PM

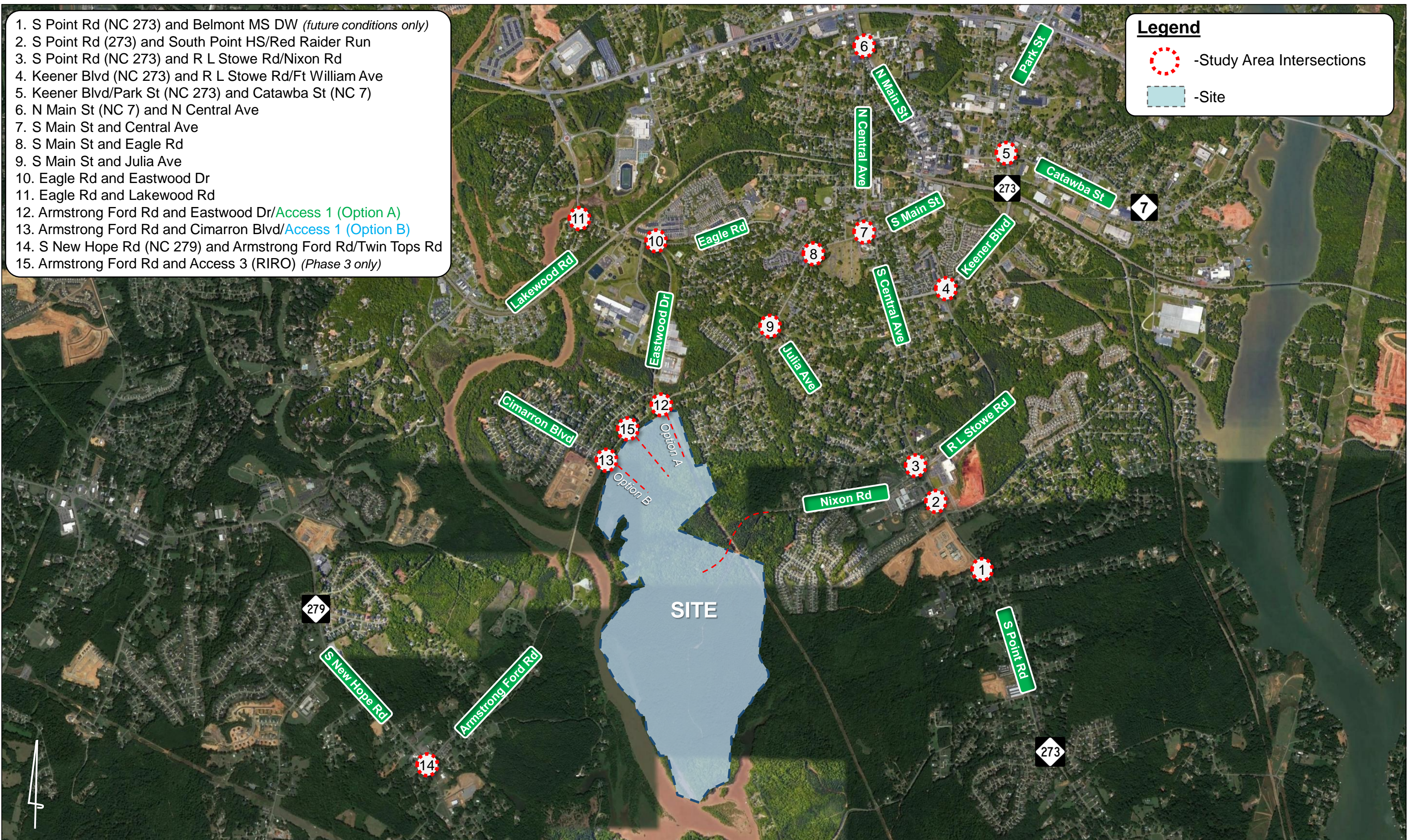
Volumes were balanced along S Point Road (NC 273) between South Point High School Driveway/Red Raider Run and R L Stowe Road/Nixon Road as there are no driveways present between these two intersections. No other volume balancing was performed between the remaining study area intersections due to the presence of public streets and other commercial and residential driveways. Peak-hour intersection turning-movement count data is provided in the **Appendix**.

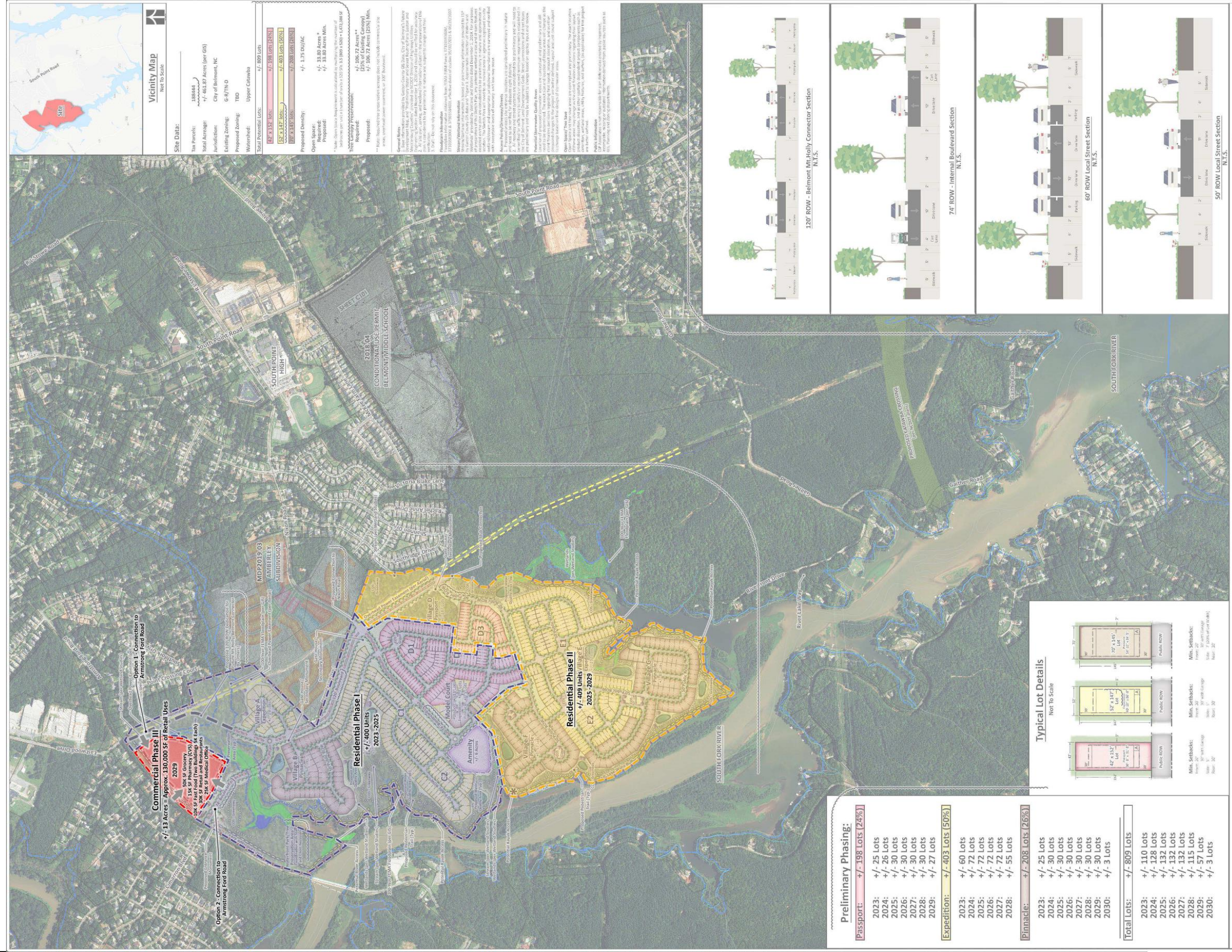
Figure 3.4 shows the 2020 existing AM and PM peak-hour traffic volumes.

1. S Point Rd (NC 273) and Belmont MS DW (future conditions only)
2. S Point Rd (273) and South Point HS/Red Raider Run
3. S Point Rd (NC 273) and R L Stowe Rd/Nixon Rd
4. Keener Blvd (NC 273) and R L Stowe Rd/Ft William Ave
5. Keener Blvd/Park St (NC 273) and Catawba St (NC 7)
6. N Main St (NC 7) and N Central Ave
7. S Main St and Central Ave
8. S Main St and Eagle Rd
9. S Main St and Julia Ave
10. Eagle Rd and Eastwood Dr
11. Eagle Rd and Lakewood Rd
12. Armstrong Ford Rd and Eastwood Dr/Access 1 (Option A)
13. Armstrong Ford Rd and Cimarron Blvd/Access 1 (Option B)
14. S New Hope Rd (NC 279) and Armstrong Ford Rd/Twin Tops Rd
15. Armstrong Ford Rd and Access 3 (RIRO) (Phase 3 only)

Legend

-  -Study Area Intersections
-  -Site



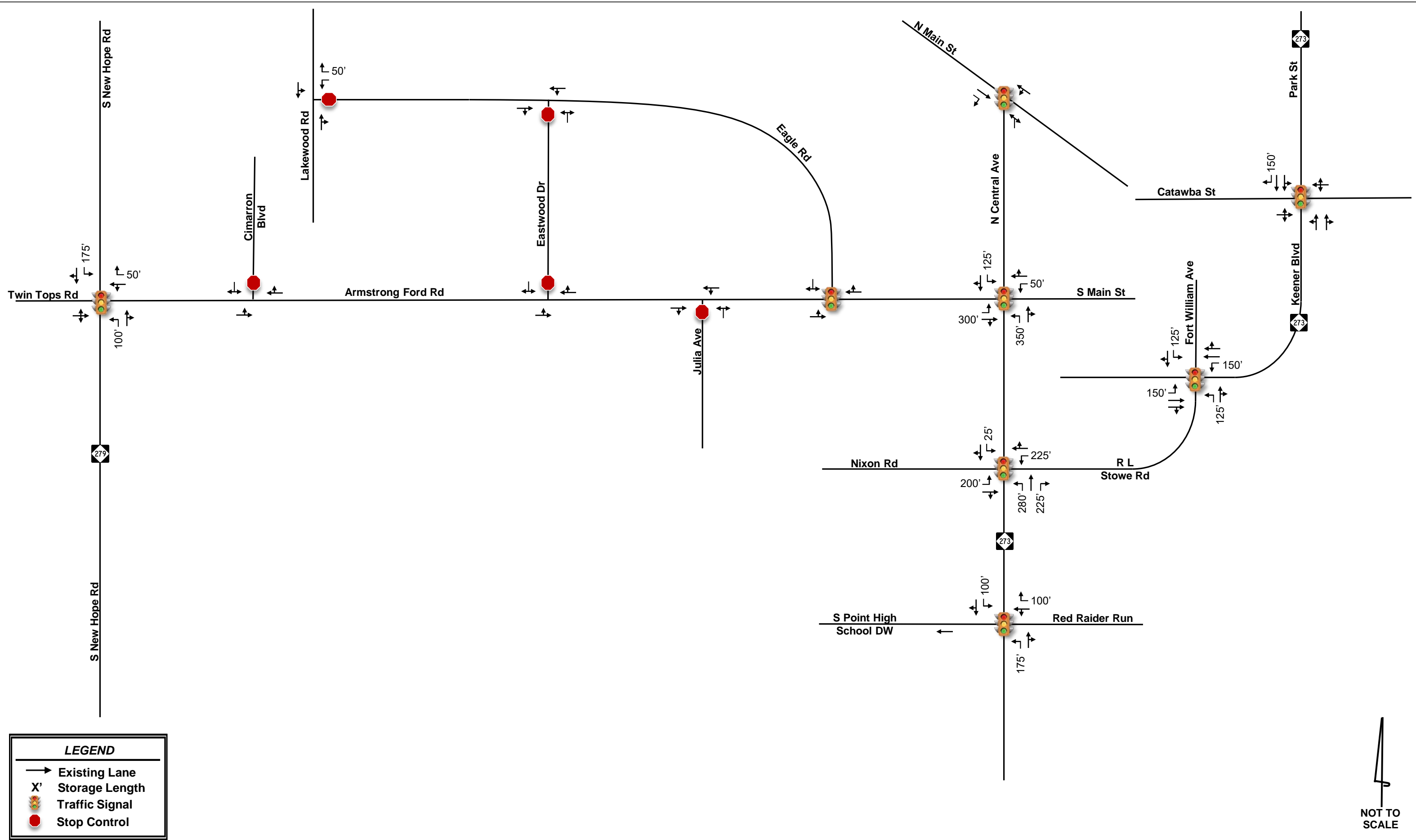


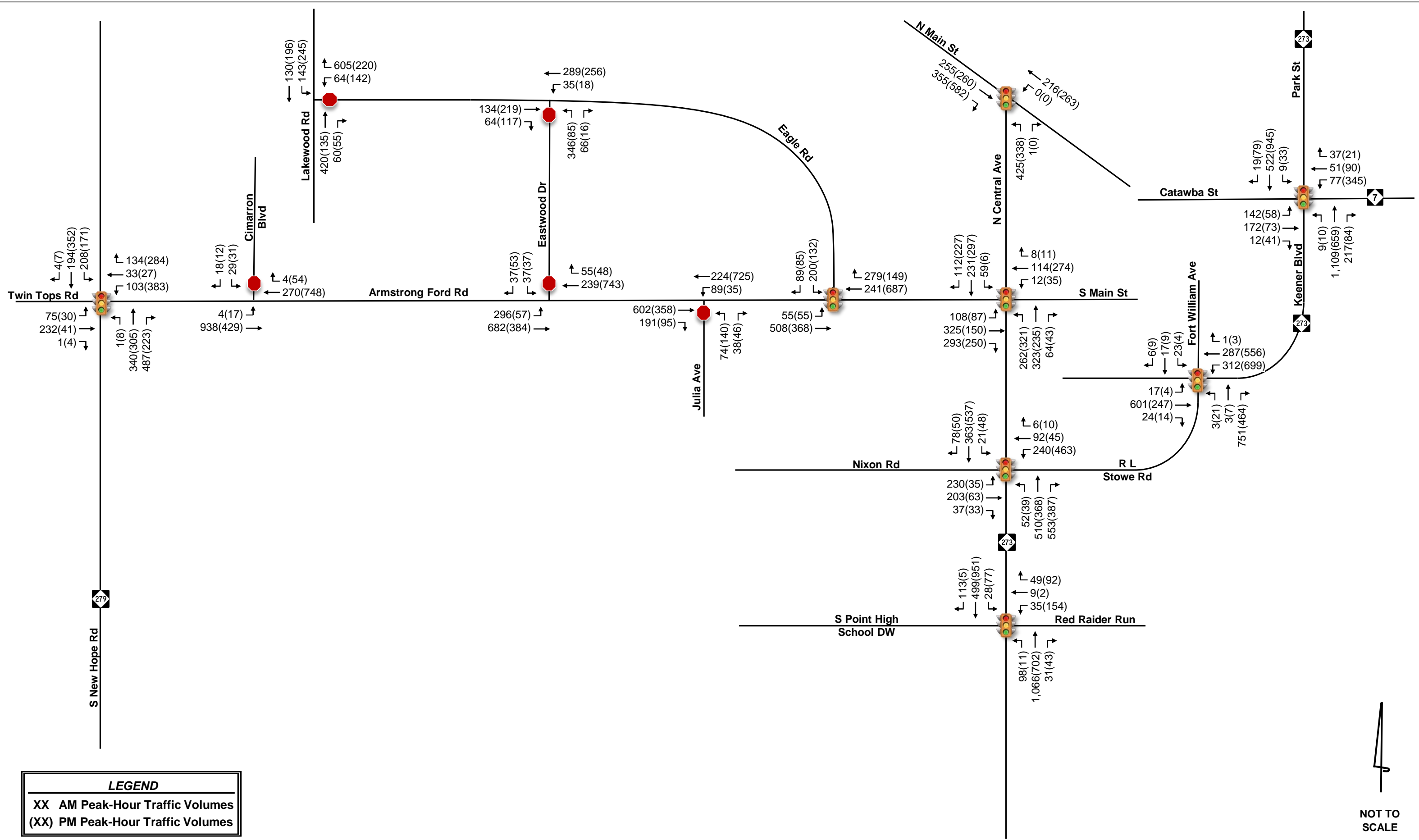
**South Fork Site
Sketch Plan**
SEP2020.03
ESP JOB PH226.100
April 22, 2020



ESP Associates, Inc.
Charlotte, NC 28241
803.802.2440
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11721 Carmel Commons Blvd, Suite 450
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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 (2018-2020) and the expected build-out years (2025 and 2029) absent the construction and opening of the proposed project. This includes both non-specific general growth based on historical increase in local traffic volumes (historical background growth), along with specific growth and/or change in traffic volumes caused by approved off-site developments that are not yet fully-constructed, and/or planned transportation projects specifically identified within the vicinity of the proposed development.

4.1 HISTORICAL BACKGROUND GROWTH TRAFFIC

Historical background growth is the increase in existing traffic volumes due to usage increases and non-specific growth throughout the area, and accounts for growth that is independent of specific off-site developments or planned transportation projects. Historical background growth traffic is calculated using an annual growth rate, which is applied to the existing traffic volumes up to the future horizon years. As shown in the approved MOU, an annual growth rate of one percent (1%) was applied to the 2020 existing peak-hour traffic volumes to calculate base 2025, 2029 and 2034 background traffic volumes. This growth rate was determined based on review of historical NCDOT AADT maps, specifically along Armstrong Ford Road between 2010 and 2018, in coordination with NCDOT, City of Belmont and GCLMPO, along with consideration of the additional specific traffic being added by the seven approved developments discussed below.

4.2 APPROVED DEVELOPMENTS

Based on input from the City of Belmont and NCDOT staff, seven approved developments that are expected to impact traffic volumes within the study area were included in the background traffic volumes for this TIA. The land uses, intensities, approximate build-out percentages at the time the counts were collected, and required transportation improvements at overlapping study intersections are outlined in **Table 4.1** on the following page.

Table 4.1 – Approved Developments

Development	Land Use/Intensity	% Build-out	TIA Included?	Required Improvements
Riverside (S New Hope Rd)	930 Single-Family units 140 Townhome units 100,000 SF General Office 80,000 SF Retail	0%	Yes	S New Hope Rd/Armstrong Ford Rd - WBR w/ 325' (to create dual WBRs)
Amberley (Nixon Rd)	188 Single-Family units	0%	Yes	- Extend Nixon Road to provide access to site S Point Rd/R L Stowe Rd/Nixon Rd - SBR w/ 100'
Belmont Middle School (S of McKee Farm Ln)	1,200-student middle school	0%	Yes	S Point Rd and Belmont MS D/W - Install traffic signal - NBL w/ 250' - SBR w/ 200' - Separate EBL & EBR
Rivermist (N of Bowen Rd)	86 Single-Family units	0%	No	No required IMPs at study intersections. (SBL on S Point Rd at site drive)
Chronicle Mill (Catawba St)	240 Multifamily units 10 Townhome units 8,650 SF Retail	0%	Yes	Keener Blvd/Catawba Street - NBR w/ 100' Keener Blvd/RL Stowe/Ft William Av - Restripe NB approach to NBL/T and NBR w/permitted-overlap phasing
McLean (Armstrong Rd)	810 Single-Family units 100 Multifamily units 125,000 SF Shopping Center	50%	Yes	No required IMPs at study intersections.
Belmont Town Center (N of Stowe Rd)	16 Single-Family units 92 Townhome units 27,800 SF General Office 21,600 SF Specialty Retail 53,000 SF Supermarket 4,330 SF Fast Food Restaurant 14 FP Gas Station	70% (of approved trip gen)	Yes	- Construct new connection between R L Stowe Rd and Stowe Rd. S Point Rd/R L Stowe Rd/Nixon Rd - Reduce NBL storage to 280' S Point Rd and South Point HS D/W - Install traffic signal - NBL w/ ~175' - SBL w/ ~100' - WBL/T and WBR

Note that the Belmont Town Center improvements (listed in both the MOU and **Table 4.1**) have already been constructed and therefore were not included as modifications between 2020 existing and 2025/2029 background conditions. These are listed in *italics* in **Table 4.1** and are reflected as existing laneage in this TIA.

Site volumes for approved developments were obtained from their respective TIAs, with the exception of Rivermist. A TIA was not performed for the Rivermist development; therefore, site trips for the Rivermist development were obtained from the *Amberley TIA* (Kimley-Horn, May 2019), where a trip generation analysis was performed to determine the number of AM and PM peak-hour trips, which were then assigned throughout the network based on the residential trip distribution.

Existing turning-movement splits were used to carry and assign the site volumes appropriately at study area intersections that were not included in the approved studies. Site traffic volume figures from the approved studies are included in the **Appendix**.

Note that the PM peak hour for the approved Belmont Middle School was analyzed as an afternoon peak between 2:30-4:30 PM and was determined to be between 2:55 to 3:55 PM. As shown in **Table 3.1**, the PM peak hour for this TIA was found to begin at 4:45 PM or later at each of the study

intersections. Since the PM peak hour analyzed in this TIA does not correspond or overlap with the PM peak hour evaluated for the Belmont Middle School, the middle school trips were factored by 48.6% to convert the afternoon PM site volumes from the *Belmont Middle School TIA* to evening PM site volumes (4:30-6:30PM). The factor was determined by comparing ITE’s average rate for PM Peak of Adjacent Street Traffic (0.17) to ITE’s average rate for PM Peak Hour of Generator (0.35) for ITE 530 (Middle School/Junior High School).

Also note that the approved Belmont Middle School is planned to replace the smaller existing Belmont Middle School currently located in the northeast quadrant of the N Central Avenue/Myrtle Street intersection. Therefore, to appropriately reflect the relocation, the existing Belmont Middle School trips were removed from the base background traffic consistent with the *Belmont Middle School TIA*. The approved development volumes shown in **Figures 4.1** and **4.2** incorporate the net addition/reduction expected at each study intersection of the relocated middle school. A further breakdown of the approved development volumes is included in the **Appendix**.

Required and planned as part of the Belmont Town Center, a new roadway connection will be constructed between Stowe Road and R L Stowe Road east of the existing Harris Teeter. This connection is expected to provide benefit to the S Point Road (NC 273) intersections between Stowe Road and R L Stowe Road by allowing the residential traffic east along Stowe Road to utilize this connection to access R L Stowe Road without accessing S Point Road (NC 273). Reassignment percentages of background traffic at the intersections of S Point Road (NC 273)/R L Stowe Road/Nixon Road and S Point Road (NC 273)/South Point High School Driveway/Red Raider Run were obtained from the *Amberley TIA* (Kimley-Horn, May 2019) and applied to the 2025 and 2029 background volumes.

Figures 4.1 and **4.2** show the projected 2025 background AM and PM peak-hour traffic volumes, respectively, that include the historical growth traffic and approved development trips. **Figure 4.3** shows the projected 2029 background AM and PM peak-hour traffic volumes that include the historical growth traffic and approved development trips. Note that the only difference between the 2025 and 2029 background volumes is the amount historical background growth is applied. The approved development volumes are identical between the two scenarios since the developments are assumed as specific trip generators regardless of the build-out year.

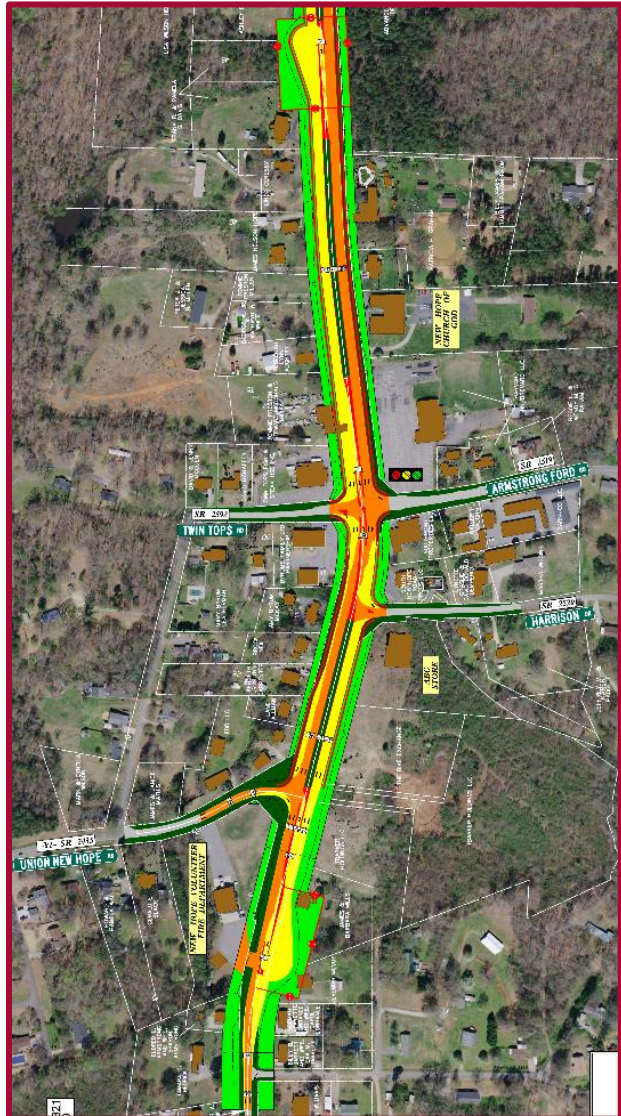
4.3 PLANNED TRANSPORTATION PROJECTS

Based on review of the adopted transportation plans for the area, five future transportation projects have been identified within the study area, one of which is funded through construction based on current planning documents, along with recommended pedestrian and bicycle segments in and around the South Fork site:

1. S New Hope Road (NC 279) Widening (**U-5821**) – Funded
2. Belmont-Mt. Holly Loop/Connector (**H190754**)
3. S Point Road (NC 273) Widening (**H184813**)
4. Keener Boulevard/Park Street (NC 273) and Catawba Street (NC 7) Intersection Improvements (**H184210**)
5. Armstrong Ford Road Realignment
6. Armstrong Ford Road Bike/Ped Facilities
7. Multiuse Path Projects

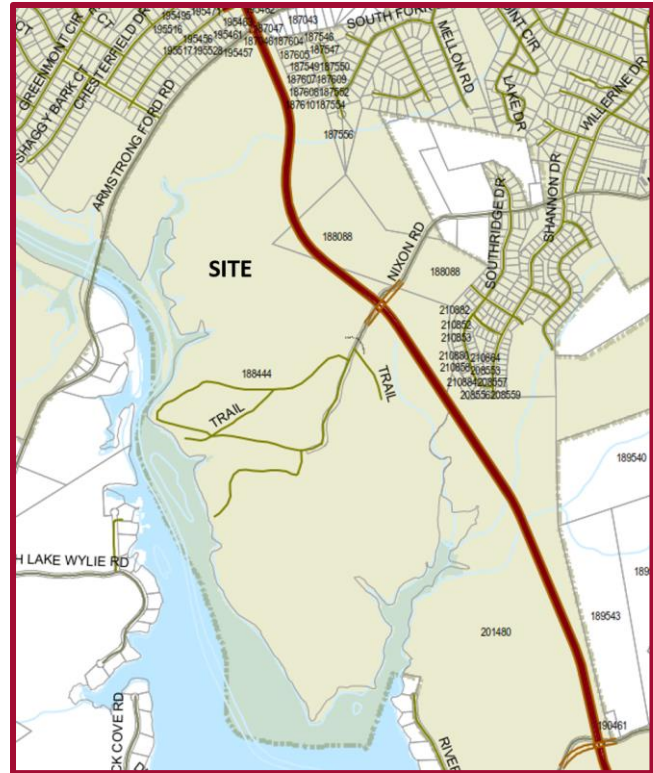
Note that only project number 1 above (U-5821) was included in the future-year analyses included in this TIA as it is funded for construction and assumed to be completed prior to Phase 1 of the South Fork development in 2025. The remaining identified projects above were not included since they are currently unfunded with the exception of project number 2 (Belmont-Mt. Holly Loop/Connector) where the proposed South Fork development is planned to construct the portion of this roadway within the proposed site.

NCDOT State Transportation Improvement Program (STIP) Project No. U-5821 is currently funded to widen S New Hope Road (NC 279) to a four-lane divided section between Titman Road and Union New Hope Road, overlapping with only the Armstrong Ford Road/Twin Tops Road intersection in this TIA study area. As shown on [NCDOT's project information page](#), which includes the August 2019 public hearing maps included in the **Appendix** and shown in the image to the right, this project intends to improve S New Hope Road (NC 279) through widening and significantly modifying intersection turn patterns at one of the study intersections, S New Hope Road (NC 279) and Armstrong Ford Road/Twin Tops Road, by converting the existing standard full-movement configuration to a reduced conflict intersection (RCI). This configuration allows the main-street left-turn movements from S New Hope Road (NC 279) to remain; however, minor-street left-turn and through movements from Armstrong Ford Road and Twin Tops Road will be redirected to unsignalized U-turn bulb-outs planned just north of Armstrong Ford Road and just south of Union New Hope Road. As currently planned, the main intersection will be signalized. At the time of scoping, this project was scheduled for construction in FY 2023-2025; however, based on the [current NCDOT STIP](#) as of September 2020, the project is now currently scheduled for construction in FY 2024-2027. Given the expected schedule at the time of scoping, this project was assumed to be in place and included in all future-year (2025/2029/2034) analyses.



The 2025, 2029 and 2034 background traffic volumes at the intersection of S New Hope Road (NC 279) Armstrong Ford Road/Twin Tops Road were redistributed to account for the planned RCI configuration. Furthermore, the two adjacent U-turn bulbs planned as part of the RCI were included in the Synchro analysis models to appropriately reflect the modified travel patterns.

As described in GCLMPO's [2045 Metropolitan Transportation Plan \(MTP\)](#) as well as [Belmont's Comprehensive Land Use Plan](#), the Belmont-Mt. Holly Loop (interchangeably referred to as Belmont-Mt. Holly Connector) has been identified as a new four-lane boulevard and multi-use path ultimately connecting S Point Road (NC 273) in Belmont to N Main Street (NC 273) in Mount Holly. GCLMPO has specifically developed a [preliminary functional design](#) (shown in the image to the right) for the southern portion of the Belmont-Mt. Holly Loop as it has been identified as one of the corridors most threatened by development. The intent of the boulevard is to alleviate traffic and reduce congestion along S Point Road (NC 273) by providing a new north/south alternative as the southern portion of the peninsula continues to develop. This project is not currently funded for construction; however, it is currently being scored for potential funding as part of NCDOT's strategic prioritization process (Prioritization 6.0 or P6.0), which is used to update the STIP for the years 2023-2032. NCDOT is expected to complete their scoring process in April 2021 and release the Draft 2023-2032 STIP in May 2022.

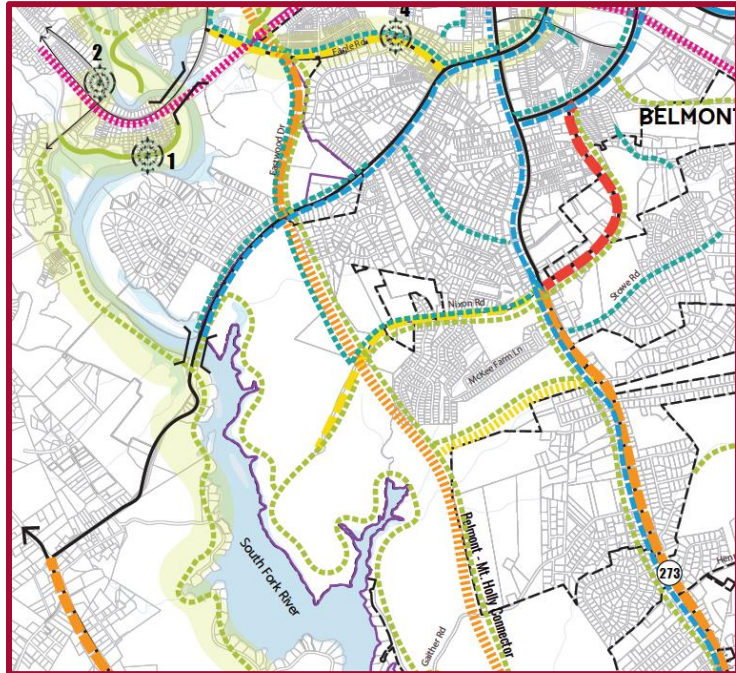


As previously discussed, the planned Belmont-Mt. Holly Loop is a critical component that impacts the proposed South Fork development and was discussed at the TIA Scoping Meeting as to how to appropriately incorporate into this TIA. Based on the current alignment, the recommended four-lane boulevard is currently planned along the eastern side of the proposed South Fork development site with a connection to Armstrong Ford Road at the existing intersection with Eastwood Drive. Based on input from the applicant, the feasibility of a connection to Armstrong Ford Road at Eastwood Drive is potentially constrained by existing residential homes on the northwest and southeast quadrants and presence of major utilities including an overhead transmission easement. If feasible, this portion of the alignment within the proposed site is planned to be constructed as part of the proposed development to serve as both Access 1 (**Option A**) and as a spine road within the development. However, dependent on the results of a future feasibility study, this connection to Armstrong Ford Road at Eastwood Drive may be determined infeasible by City, NCDOT and GCLMPO staff, resulting in the need to provide alternative access and modify the current MTP and CTP alignments for the Belmont-Mt. Holly Loop. To continue moving the proposed South Fork development project forward, the applicant proposed an alternative access strategy that would evaluate the impacts of the proposed site under two separate access scenarios, resulting in two sets of transportation mitigation improvements. The alternative access option (**Option B**) moves Access 1 to connect to Armstrong Ford Road at Cimarron Boulevard, creating the fourth leg of this existing unsignalized, tee-intersection. Therefore, two alignment alternatives for Access 1 were evaluated for the purposes of this TIA (and reflected in the site plan included in the **Appendix**):

- **Option A** – full-movement connection to Armstrong Ford Road at Eastwood Drive
- **Option B** – full-movement connection to Armstrong Ford Road at Cimarron Boulevard

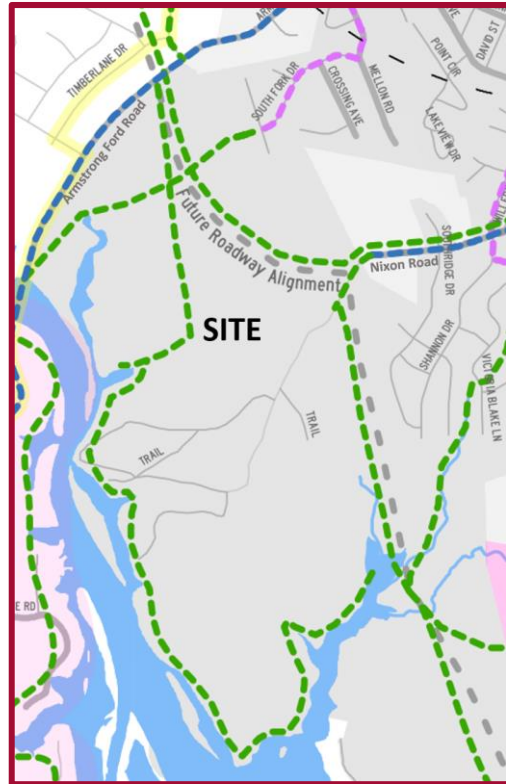
Note that since construction of the full Belmont-Mt. Holly Loop is not currently funded, existing traffic on S Point Road (NC 273) was not redistributed as part of this study to account for the Belmont-Mt. Holly Loop. Only the portion of the boulevard planned to be constructed as part of the South Fork development was included in the future year build-out analyses in this TIA.

Furthermore, based on input from the applicant and documented in the approved MOU, no proposed access was assumed to connect to the future east/west connection shown in [Belmont's Comprehensive Land Use Plan](#) between the approved Belmont Middle School (along S Point Road) and the planned Belmont-Mt. Holly Loop. However, it's important to note that the viability of the planned Belmont-Mt Holly Loop will be partly dependent on the number and type of connections made to it to allow access for drivers to utilize the alternative route. With the majority of the adjacent land along S Point Road (NC 273) already developed (mostly by single-family residential properties), there are limited options for future east/west connections between S Point Road (NC 273) and the planned Belmont-Mt Holly Loop. *Belmont's Comprehensive Land Use Plan* (shown to the right) identified the future middle-school site as a location for one of those vital east/west connections as represented by the yellow-dotted line. Given the limited options for an east/west connection south of Nixon Road, it is important that this connection is preserved and prioritized as the Belmont-Mt. Holly Loop is built out.



In addition to the projects discussed above, the City of Belmont and GCLMPO have identified the need for two additional projects within the study area that are not currently funded (H184210 and H184813). Both of these projects are currently being scored for potential funding as part of NCDOT's strategic prioritization process (P6.0). Based on GCLMPO's Draft P6.0 Project Submittal List, the Keener Boulevard/Park Street (NC 273)/Catawba Street (NC 7) intersection improvement project (H184210) includes the addition of left-turn lanes on each approach as well as a northbound right-turn lane along Keener Boulevard (NC 273). The S Point Road (NC 273) widening project (H184813) includes widening S Point Road (NC 273) from two to four lanes between Henry Chapel Road and R L Stowe Road/Nixon Road. Note that the GCLMPO (MTP) has also identified the need to widen S Point Road (NC 273) from Henry Chapel Road to Armstrong Road (NC 273). Since neither of these projects are currently funded, the identified improvements were not included in the future year analyses summarized in **Section 6**.

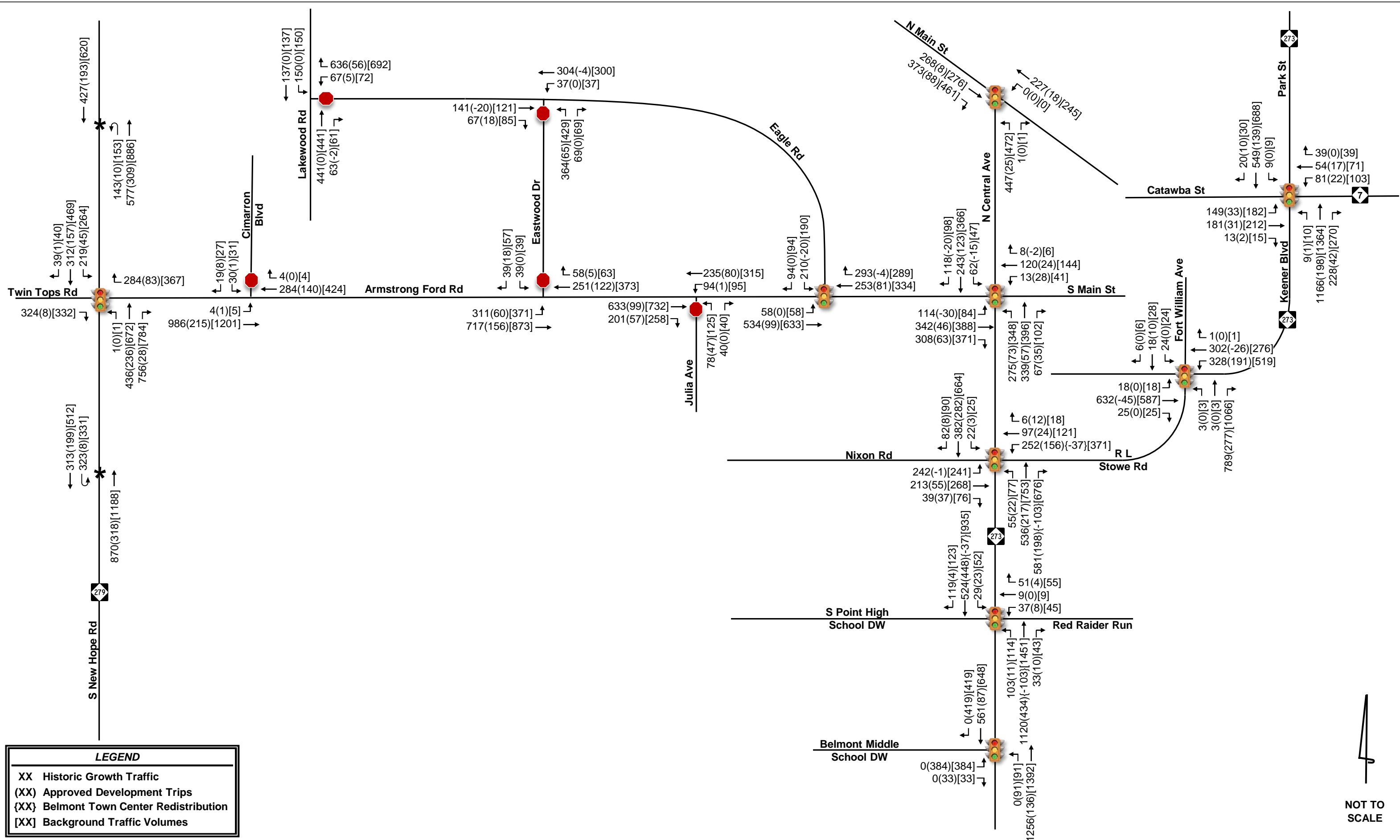
Multiple multiuse paths with conceptual alignments shown to traverse the proposed South Fork site have been identified in multiple planning documents. As shown in the image to the right from [Belmont's Comprehensive Land Use Plan](#), the green-dotted lines indicate recommended multiuse paths. The specific multi-use path alignment and cross-section should be coordinated with Carolina Thread Trail, GCLMPO and City of Belmont staff. It is important that the applicant coordinate with these agencies early in the site planning phase to determine the appropriate alignment and cross-section for any paths required. Additionally, City of Belmont and GCLMPO planning documents both recommend on-road bicycle facilities (bike lanes, protected bike lanes, or paved shoulder) as well as sidewalk for pedestrians along Armstrong Ford Road.

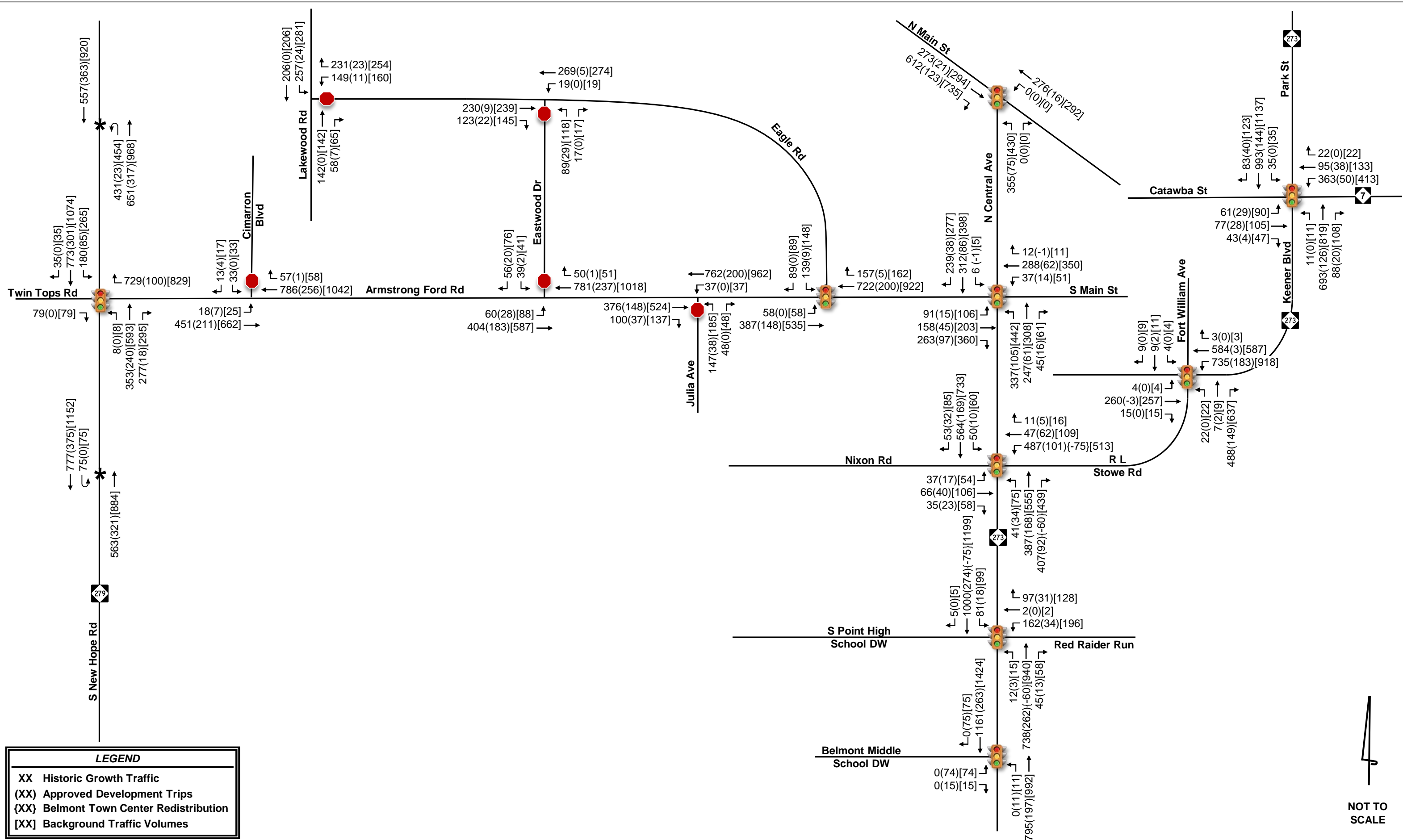


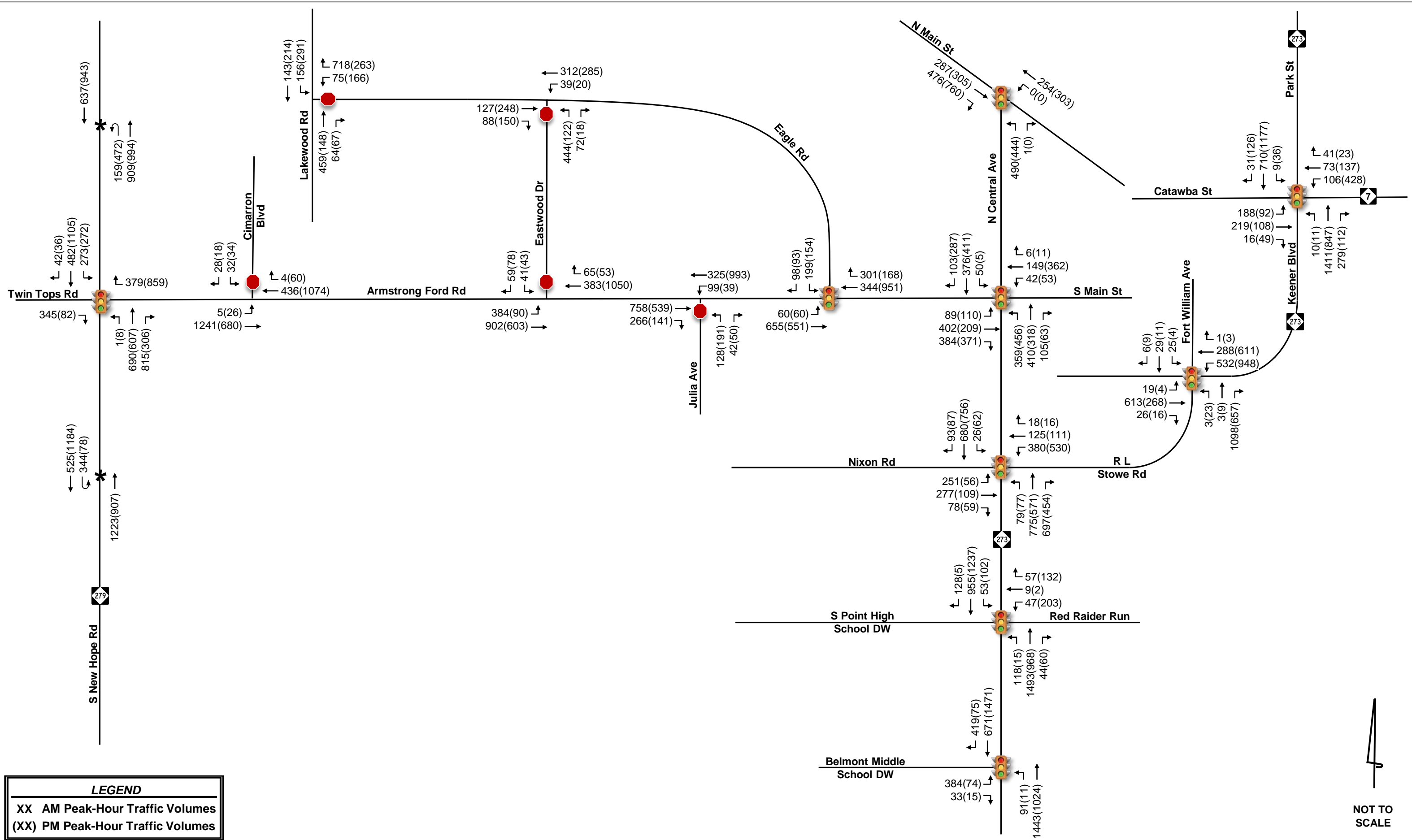
Below is additional information found in the adopted transportation planning documents relative to each of the identified future transportation projects:

- **S New Hope Road (NC 279) Widening (U-5821)**
 - Widen to four-lane, divided - Titman Rd to Union New Hope Rd
 - CON – 2024-2027, though expected to change due to NCDOT STIP reprogramming
 - Based on NCDOT concept plans, S New Hope Rd (NC 279) is planned to be converted to a signalized RCI with unsignalized U-turn bulbs south of Union New Hope Rd and north of Armstrong Ford Rd.
 - Laneage at S New Hope Rd (NC 279)/Armstrong Ford Rd (based on NCDOT concept):
 - NB (NC 279) – NBL w/175', NBT, & NBTR
 - SB (NC 279) – SBL w/300', SBT & SBTR
 - EB (Twin Tops Rd) – EBR
 - WB (Armstrong Ford Rd) – WBR
- **Belmont-Mt. Holly Loop/Connector (H190754) – Draft P6.0 Score: 31.7/100**
 - Recommended four-lane boulevard that ultimately connects S Point Rd (NC 273) in Belmont to N Main St (NC 273) in Mt. Holly.
 - **The alignment is currently shown through the proposed site. This TIA will evaluate two alignment alternatives through the site:**
 - **Option A** - FM connection to Armstrong Ford Rd at Eastwood Dr
 - **Option B** - FM connection to Armstrong Ford Rd at Cimarron Blvd
 - Multi-use path planned as part of Belmont-Mt Holly Loop per GCLMPO.
 - GCLMPO has developed a [preliminary functional design](#).
 - Submitted for funding as part of P6.0.
 - Identified in:
 - Belmont Comprehensive Land Use Plan (2018)
 - GCLMPO 2045 MTP
 - GCLMPO CTP

- **S Point Rd (NC 273) Widening (H184813)** – Draft P6.0 Score: 34.1/100
 - The section between Henry Chapel Rd and Nixon Rd was submitted as part of P6.0 for widening to a four-lane roadway.
 - Widen S Point Rd (NC 273) from two to three lanes from Armstrong Rd to Nixon Rd.
 - GCLMPO 2045 MTP
 - GCLMPO CTP
- **Keener Blvd/Park St (NC 273) and Catawba St (NC 7) Intersection Improvements (H184210)** – Draft P6.0 Score: 41/100
 - Construct left-turn lanes on each approach and a NBR along Keener Blvd (NC 273).
 - Submitted for funding as part of P6.0.
- **Armstrong Ford Road Realignment**
 - Realign Armstrong Ford Rd to connect to Union New Hope Rd.
 - Identified in:
 - GCLMPO 2045 MTP
 - GCLMPO CTP
- **Armstrong Ford Road Bike/Ped Facilities**
 - On-road bicycle facilities (bike lanes, protected bike lanes, or paved shoulder) as well as sidewalk for pedestrians along Armstrong Ford Rd
 - Identified in:
 - Belmont Comprehensive Land Use Plan (2018)
 - GCLMPO CTP
- **Multiuse Path Projects**
 - Recommended multiuse path along:
 - **Belmont-Mt. Holly Loop through proposed site**
 - **South Fork Catawba River to Armstrong Ford Rd through proposed site**
 - **South Fork Drive to South Fork Catawba River through proposed site**
 - Identified in:
 - Belmont Comprehensive Land Use Plan (2018)
 - Belmont Bicycle Master Plan (2012)
 - Belmont Pedestrian Master Plan (2009)
 - GCLMPO CTP
 - Carolina Thread Trail







5.0 Site Traffic Volume Development

Site traffic developed for this TIA is defined as the site-generated vehicular trips expected to be added to the study area by the construction of the proposed development, and the distribution and assignment of that traffic throughout the surrounding network.

5.1 SITE ACCESS

Based on the provided site plan, the proposed development is currently planned to ultimately be accessed via three access points:

- Access 1 (Belmont-Mt. Holly Loop) - two potential access alternatives:
 - **Option A** – full-movement connection to Armstrong Ford Road at Eastwood Drive (creating the fourth leg)
 - **Option B** – full-movement connection to Armstrong Ford Road at Cimarron Boulevard (creating the fourth leg)
- Access 2 - extension of existing Nixon Road through the Amberley development (which provides access to the east via the intersection of S Point Road (NC 273)/R L Stowe Road)
- Access 3 (*Phase 3 only*) – a right-in/right-out connection to Armstrong Ford Road located approximately 600 feet east of Cimarron Boulevard; planned to serve the commercial portion of the proposed development.

Note that based on input from the applicant and documented in the approved MOU (and further described in **Section 4.3**), no proposed access was assumed to connect to the future east/west connection shown in *Belmont's Comprehensive Land Use Plan* between the approved Belmont Middle School (along S Point Road) and the planned Belmont-Mt. Holly Loop.

5.2 TRAFFIC GENERATION

The traffic generation potential of the proposed development was determined using the trip generation rates published in *Trip Generation* (Institute of Transportation Engineers, Tenth Edition, 2017) for all land uses.

Internally captured trips are trips that begin and end within the project site and do not access the external roadway network. Examples of likely internal capture trips include residents who may visit the proposed grocery store on site. 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. This report provides extensive research into the internal capture rates for mixed-use developments. 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 percentages were calculated for the retail component of the proposed site based on the equations and data presented in the ITE *Trip Generation Handbook*, limited to a maximum of ten percent of the adjacent street traffic based on NCDOT and City of Belmont guidelines. Since the commercial portion of the development is planned to be located along Armstrong Ford Road, pass-by volumes were only assigned to the site driveways in the vicinity of Armstrong Ford Road (Accesses 1 and 3). No pass-by trips were assigned to the Nixon Road (Access 2) entrance. Pass-by calculations are included in the **Appendix**.

Based on the site plan provided by the applicant, the proposed development is currently envisioned to include the following land uses and intensities for the purposes of this TIA to be constructed in three phases:

- Phase 1
 - 400 age-restricted single-family homes
- Phase 2
 - 408 age-restricted single-family homes
- Phase 3
 - 130,000 SF of commercial town-center space, assumed to be comprised of the land uses and approximate square footages as listed below:
 - 50,000 SF grocery
 - 15,000 SF pharmacy
 - 10,000 SF of fast-food restaurant space
 - 30,000 SF of general retail space
 - 25,000 SF of medical office space

Table 5.1 summarizes the projected trip generation for the proposed development. During a typical weekday, the proposed development has the potential to generate 744 and 996 net new external trips during the AM and PM peak hours, respectively.

Table 5.1 - Trip Generation									
Land Use	Intensity	Daily	AM Peak Hour			PM Peak Hour			
			Total	In	Out	Total	In	Out	
Phase 1 - Residential									
Senior Adult Housing - Detached	400 DU	1,905	117	39	78	142	87	55	
Phases 1 & 2 - Residential									
Senior Adult Housing - Detached	808 DU	3,538	200	66	134	245	149	96	
Full Build-out - Residential & Commercial									
Medical Office Building	25,000 SF	870	70	55	15	87	24	63	
Shopping Center	30,000 SF	2,651	167	104	63	223	107	116	
Supermarket	50,000 SF	5,339	191	115	76	462	236	226	
Fast Food Restaurant with Drive-Thru Window	10,000 SF	4,710	402	205	197	327	170	157	
Pharmacy with Drive-Thru Window	15,000 SF	1,637	58	31	27	154	77	77	
Senior Adult Housing - Detached	808 DU	3,538	200	66	134	245	149	96	
Subtotal		18,745	1,088	576	512	1,498	763	735	
Internal Capture		6,828	200	100	100	318	159	159	
<i>ITE 820 Pass-By - 0% AM / 34% PM</i>			60	0	0	0	60	30	30
<i>ITE 850 Pass-By - 0% AM / 36% PM</i>			136	0	0	0	136	68	68
<i>ITE 934 Pass-By - 49% AM / 50% PM</i>			230	144	72	72	86	43	43
<i>ITE 881 Pass-By - 0% AM / 49% PM</i>			62	0	0	0	62	31	31
<i>ITE Pass-By</i>			488	144	72	72	344	172	172
<i>Adjacent Street Traffic</i>				1,728			1,821		
<i>10% Adjacent Street Traffic</i>			358	174	87	87	184	92	92
Pass-By			328	144	72	72	184	92	92
Net New External Trips			11,589	744	404	340	996	512	484

5.3 SITE TRAFFIC DISTRIBUTION AND ASSIGNMENT

The proposed development’s trips were assigned to the surrounding network based on existing peak-hour turning movements, surrounding land uses, locations of similar land uses and population densities in the area. The site traffic distribution was reviewed and approved as part of the MOU by the City of Belmont, NCDOT, GCLMPO and the applicant.

Given expected differences in travel characteristics, separate trip distributions were developed for the residential and commercial land uses. The site traffic distributions for the residential and commercial land use categories are shown in **Figures 5.1** and **5.2**, respectively.

5.4 2025 PHASE 1 BUILD-OUT TRAFFIC VOLUMES

The 2025 Phase 1 build-out traffic volumes include the assignment of the projected Phase 1 site traffic generation added to the 2025 background traffic volumes.

Nixon Road is planned to be extended from its current western terminus as part of the approved Amberley development. As shown on the site plan (**Figure 3.2**), the South Fork development plans to further extend Nixon Road, which currently only provides access to the east to S Point Road (NC 273), to connect to the future Belmont-Mt. Holly Loop (Access 1) as part of Phase 1 of the proposed South Fork development. The new connection between Nixon Road and Armstrong Ford Road will likely alter some of the existing traffic patterns, particularly the Amberley residents traveling to/from the west along Armstrong Ford Road. Given this, 2025 and 2029 background traffic at the S Point Road (NC 273)/Nixon Road intersection was redistributed under 2025 and 2029 build-out conditions to reflect the proposed extension of Nixon Road, sending some of this traffic through the South Fork development to the Access 1 connection at Armstrong Ford Road. Redistribution calculations are shown in the **Appendix**.

Figures 5.3 and **5.4** show the projected 2025 Phase 1 build-out traffic volumes including the Nixon Road redistribution for the AM and PM peak hours, respectively.

5.5 2029 BUILD-OUT TRAFFIC VOLUMES

The 2029 Phase 2 build-out traffic volumes include the assignment of the projected 2029 Phase 1 and Phase 2 site traffic generation along with the Nixon Road redistribution added to the 2029 background traffic volumes. **Figures 5.5** and **5.6** show the projected 2029 Phase 2 build-out traffic volumes including the Nixon Road redistribution for the AM and PM peak hours, respectively.

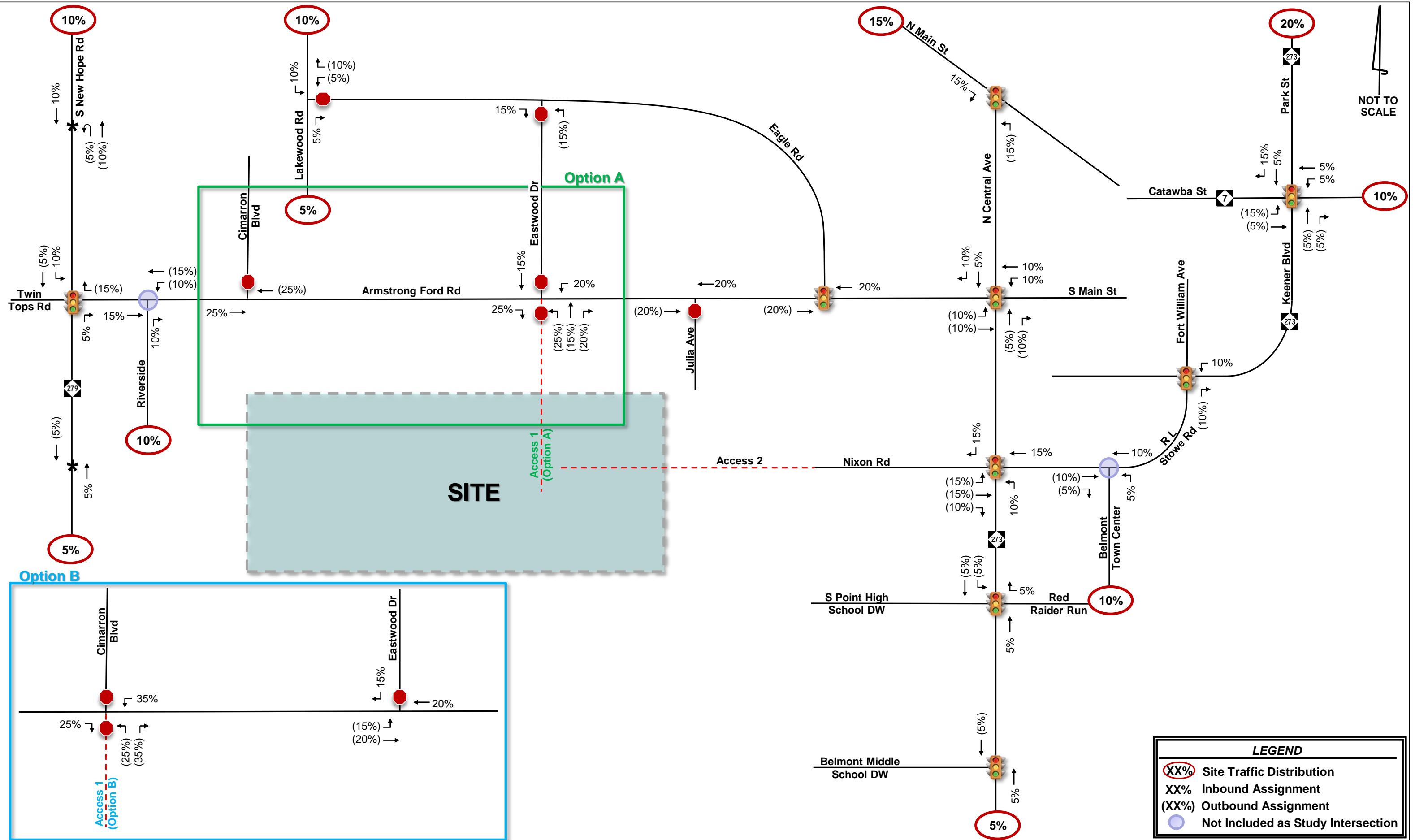
The 2029 Phase 3 build-out traffic volumes include the assignment of the projected full build-out (Phases 1, 2, and 3) site traffic generation along with the Nixon Road redistribution added to the 2029 background traffic volumes. **Figures 5.5** and **5.6** show the projected 2029 Phase 3 build-out traffic volumes including the Nixon Road redistribution for the AM and PM peak hours, respectively.

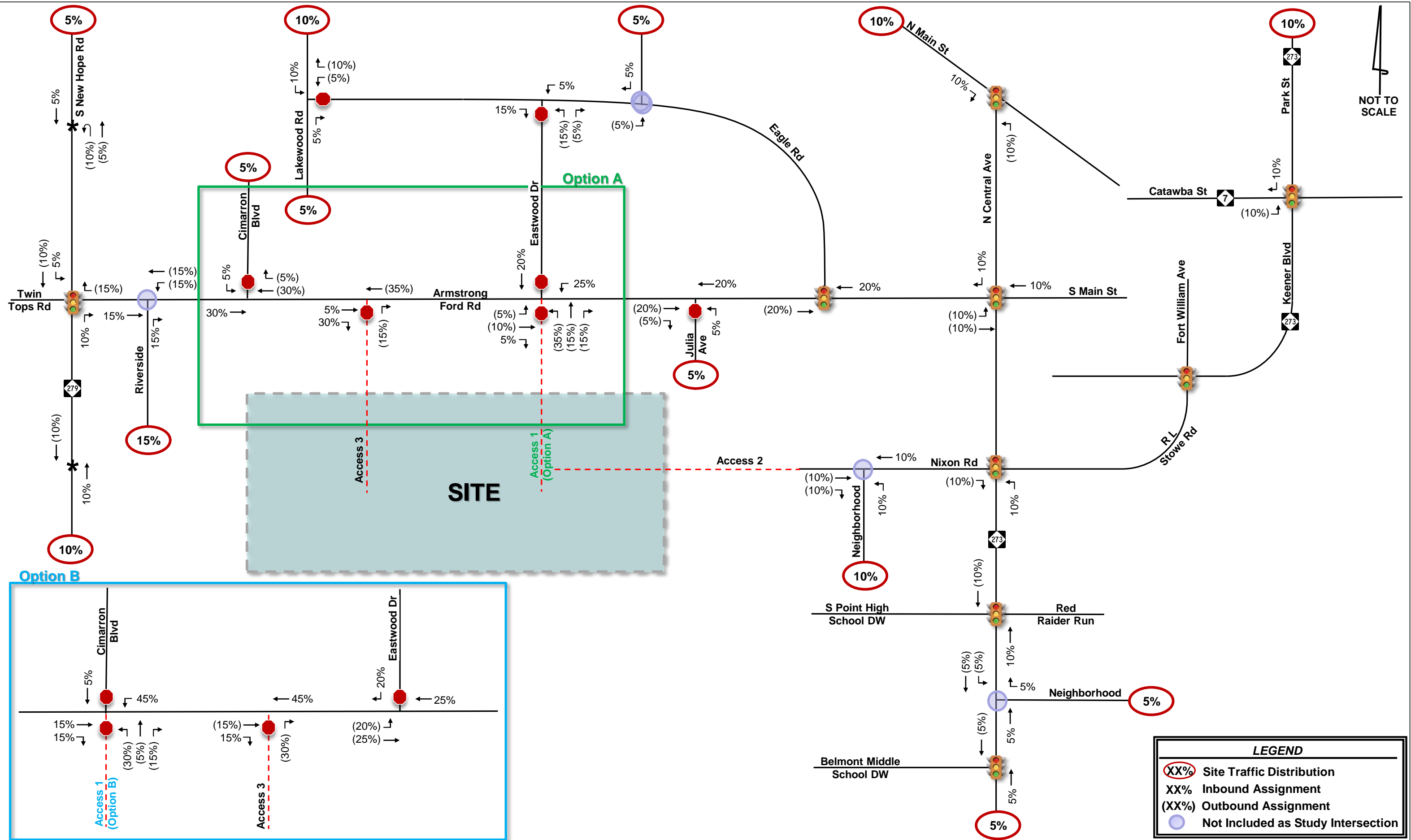
5.6 2034 BUILD-OUT +5 TRAFFIC VOLUMES

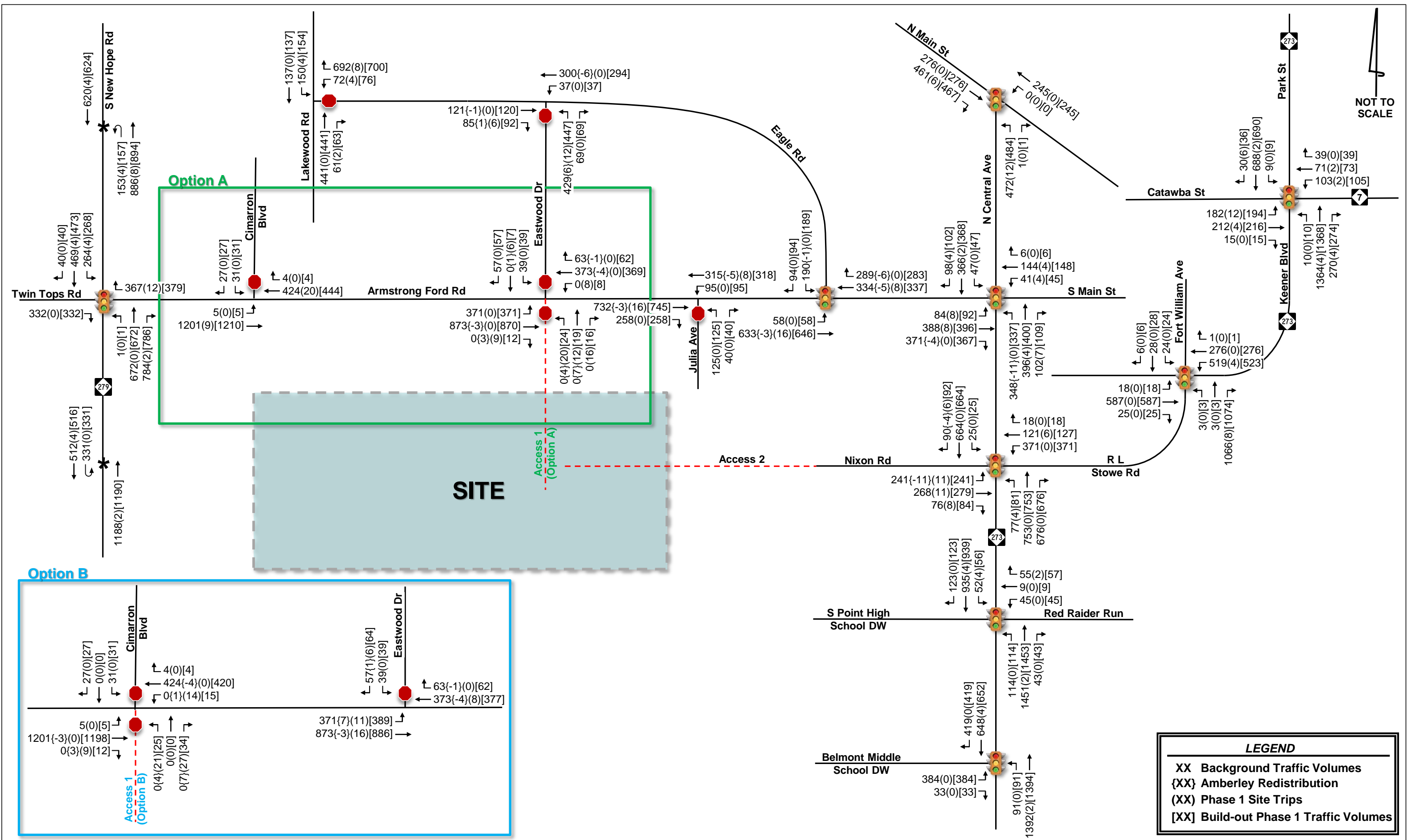
As required by the [City of Belmont Land Development Code – Section 16.14 Traffic Impact Analysis](#), an analysis scenario of five years after the build-out year was performed. The 2034 build-out +5 traffic volumes include assignment of the proposed full build-out site traffic generation along with the approved development traffic added to the 2034 base background traffic volumes. The

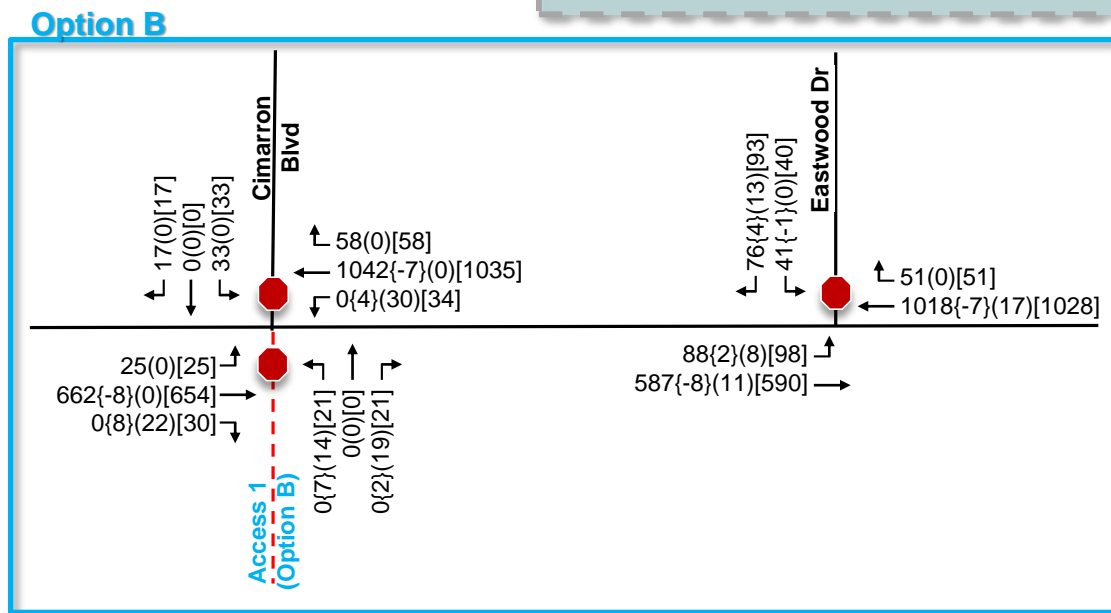
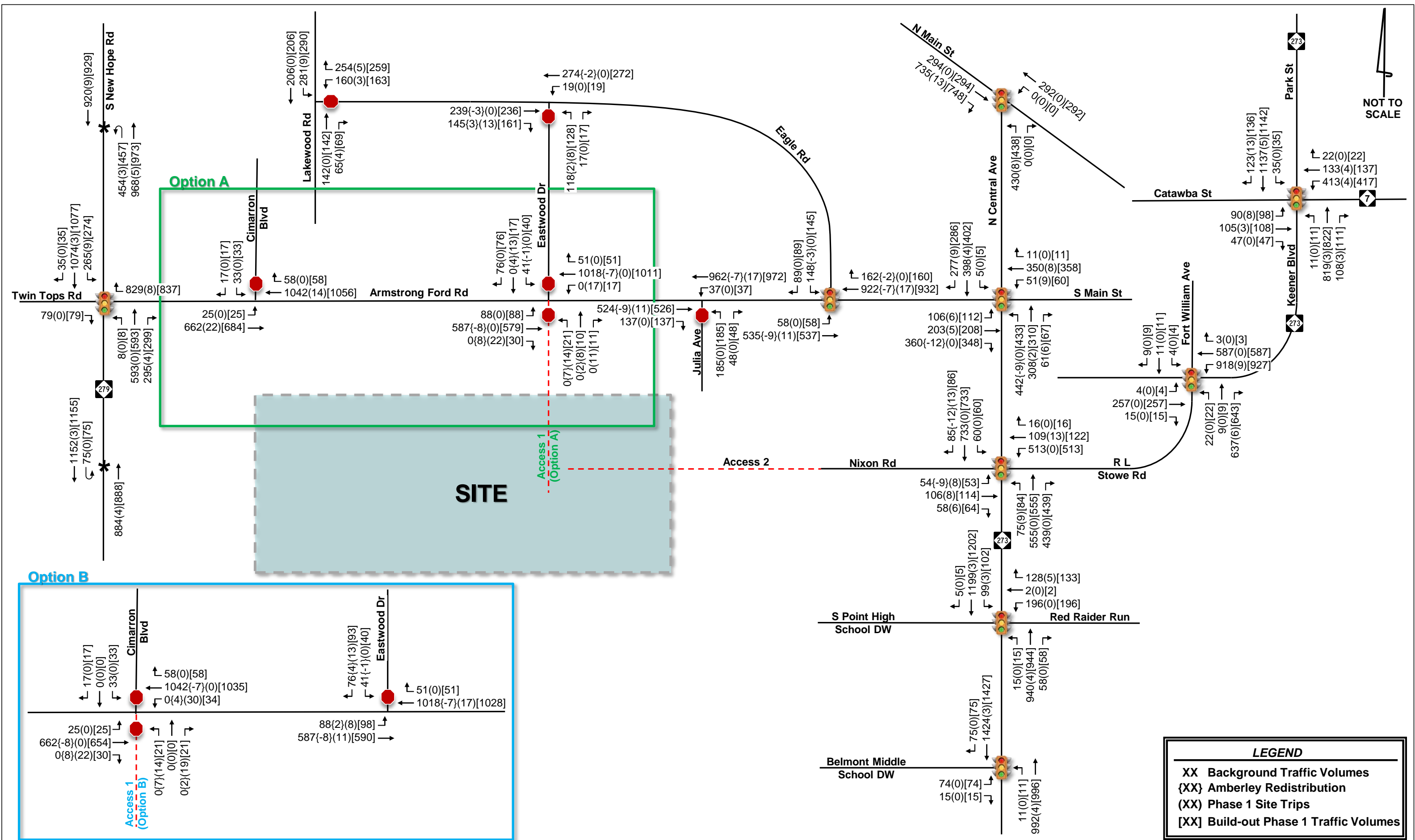
projected 2034 AM and PM peak-hour build-out +5 volumes for both access options are shown on **Figure 5.4**.

Intersection volume development worksheets for all intersections and driveways within the study network are provided in the **Appendix**.

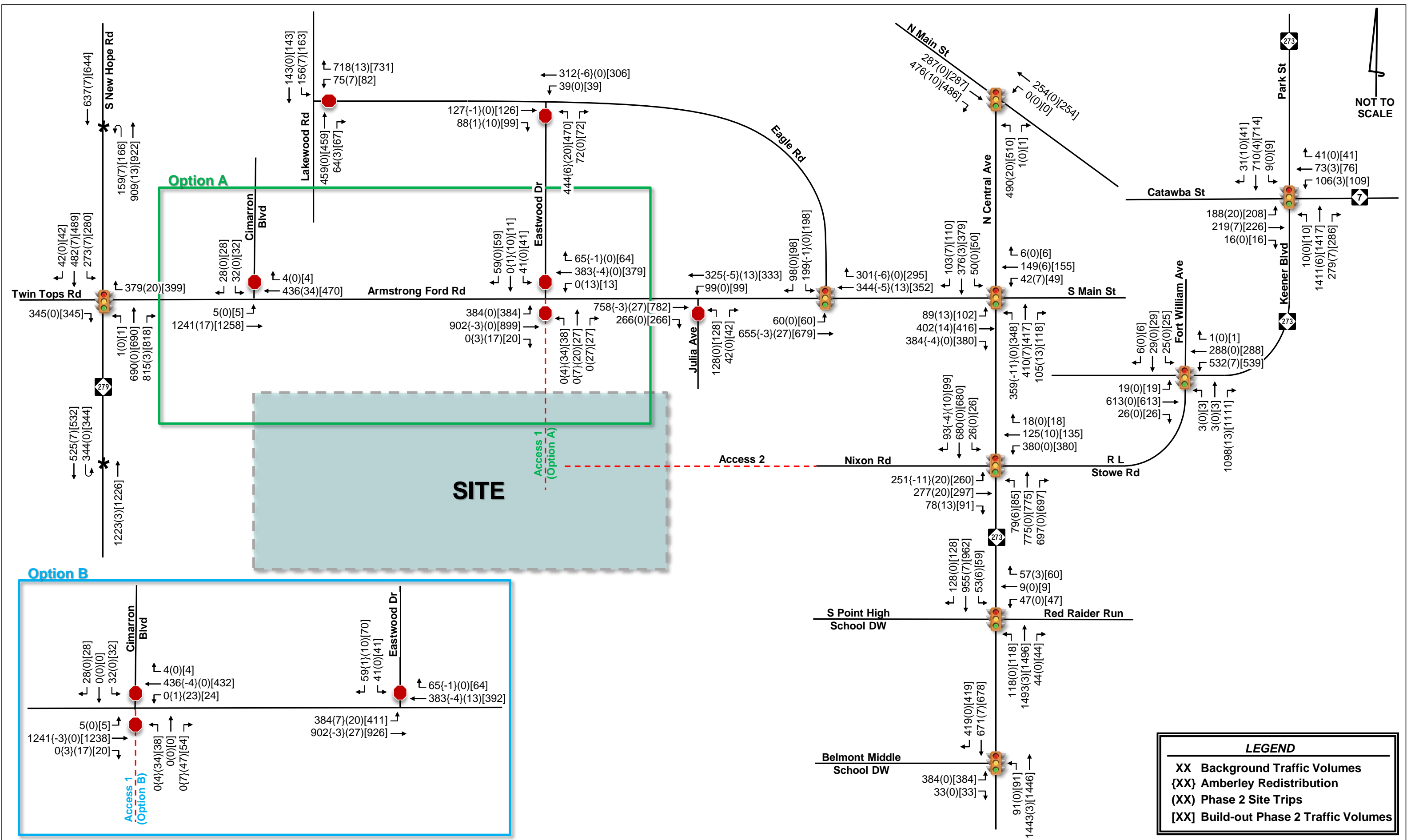


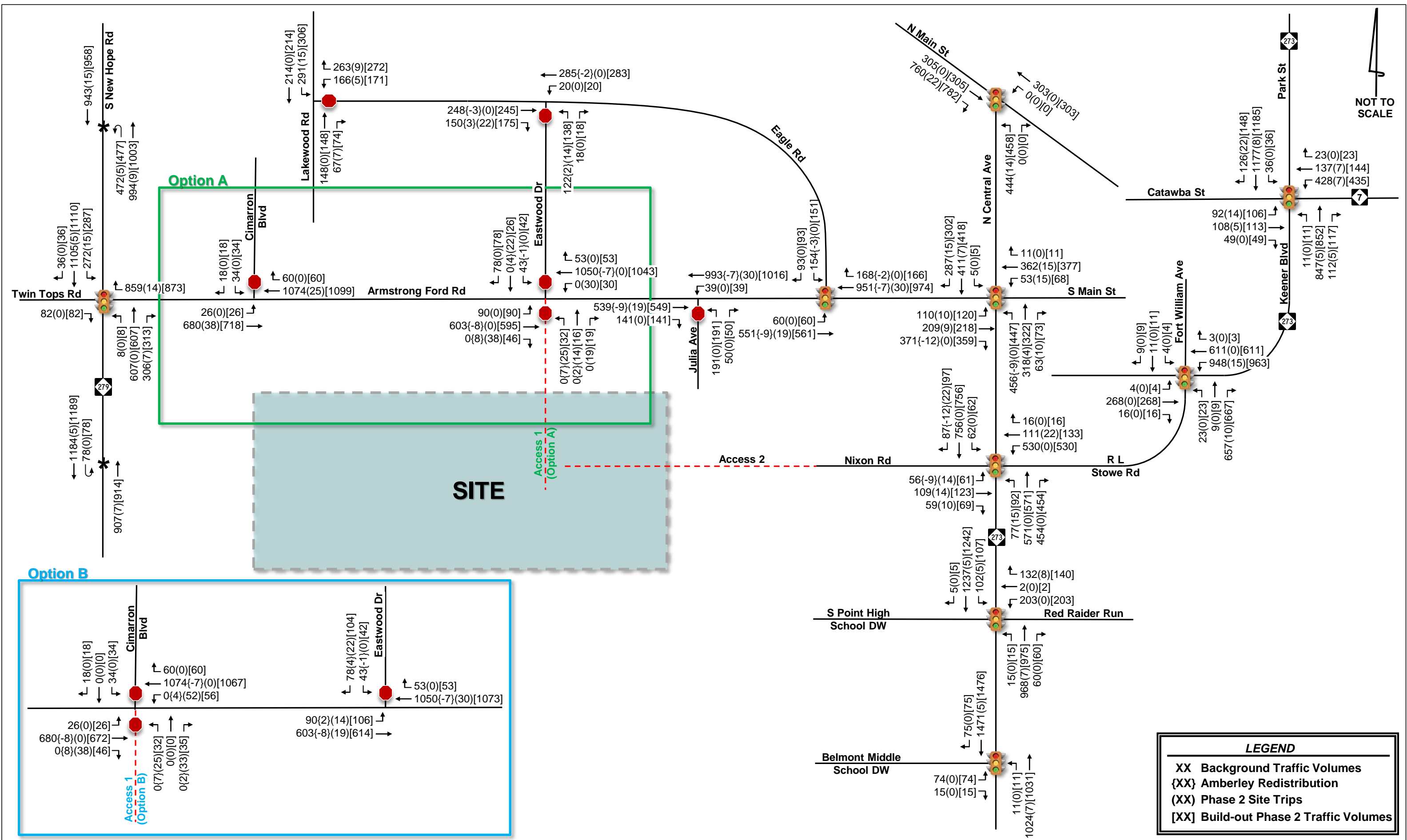


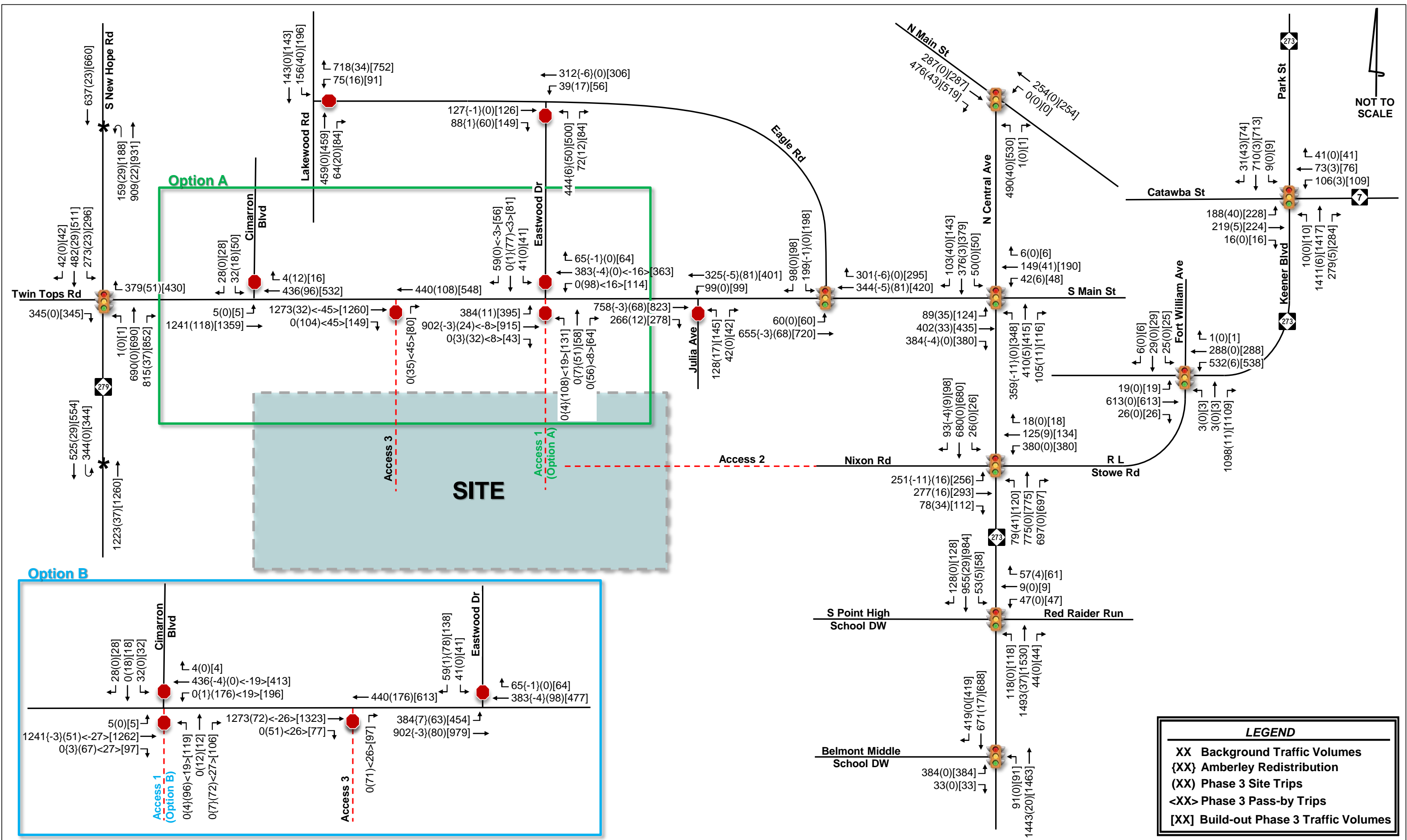


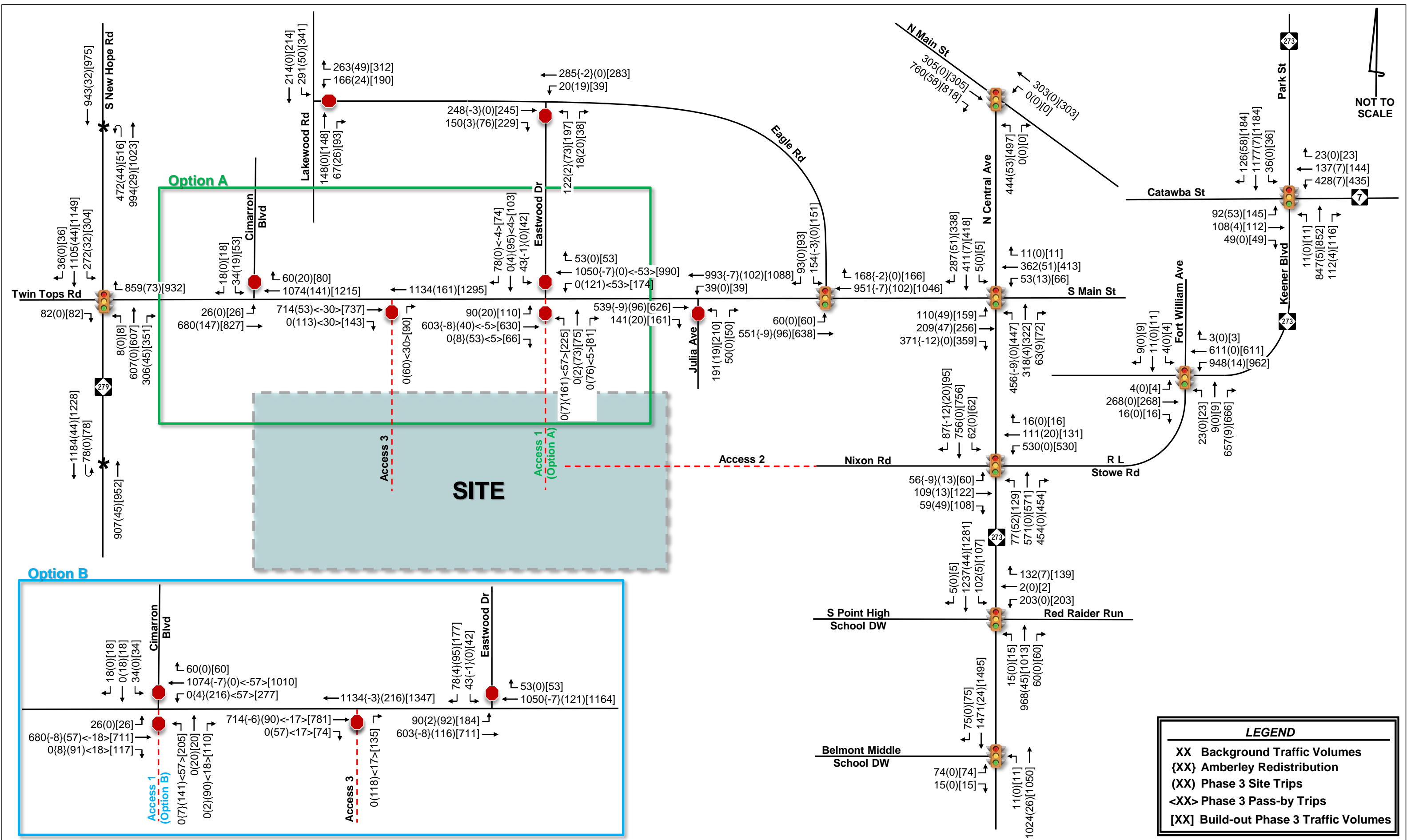


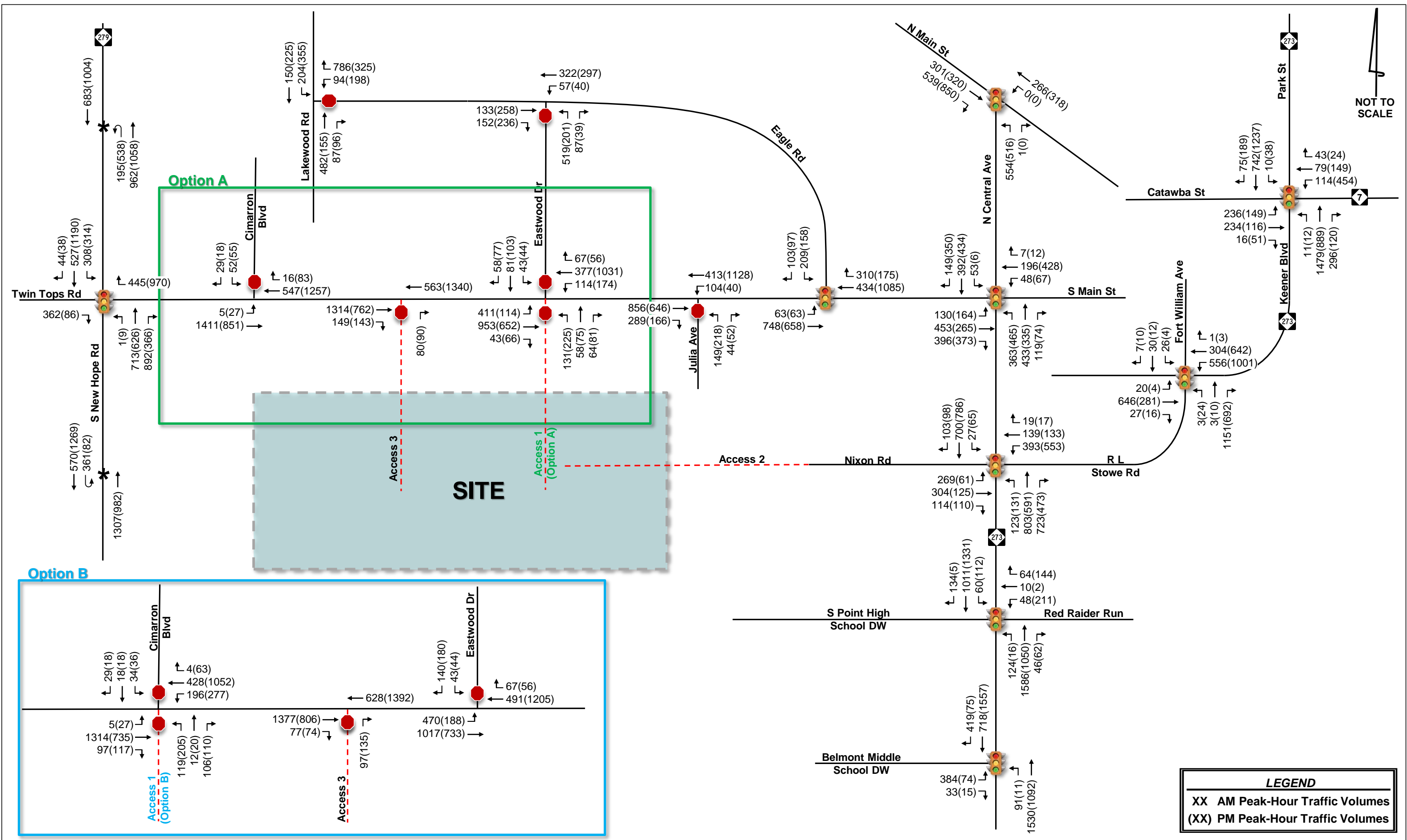
LEGEND	
XX	Background Traffic Volumes
{XX}	Amberley Redistribution
(XX)	Phase 1 Site Trips
[XX]	Build-out Phase 1 Traffic Volumes











6.0 Capacity Analysis

Based on the requirements set forth by the [City of Belmont Land Development Code – Section 16.14 Traffic Impact Analysis](#) and in accordance with the traffic study guidelines in the [NCDOT Policy on Street and Driveway Access to North Carolina Highways](#), capacity analyses were performed at the study area intersections for each of the following AM and PM peak-hour scenarios:

- 2020 Existing Conditions
- 2025 Background Conditions
- 2025 Build-out Phase 1 Conditions
- 2029 Background Conditions
- 2029 Build-out Phase 2 Conditions
- 2029 Build-out Phase 3 Conditions
- 2034 Build-out Conditions + 5 years

Note that access Options A and B were analyzed under each build-out scenario.

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. 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.

The *Highway Capacity Manual* (HCM) defines level-of-service (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 travelers’ 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 and is reported for 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.

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

NCDOT-provided signal geometric plans for each of the following signalized study area intersections were used in the development of the existing conditions Synchro network:

1. S Point Rd (NC 273) and Belmont Middle School D/W (*future conditions only*)
2. S Point Rd (NC 273) and South Point High School D/W/Red Raider Run (**NC 273 CLS**)
3. S Point Rd (NC 273) and R L Stowe Rd/Nixon Rd (**NC 273 CLS**)
4. Keener Boulevard (NC 273) and R L Stowe Rd/Fort William Avenue
5. Keener Boulevard/Park St (NC 273) and Catawba St (NC 7)
6. N Main St (NC 7) and N Central Avenue
7. S Main St and Central Avenue
8. S Main St and Eagle Rd
14. S New Hope Rd (NC 279) and Armstrong Ford Rd/Twin Tops Rd

Based on the provided signal plans, intersection numbers 2 and 3 above are part of the NC 273 Closed Loop Signal System (CLS). Therefore, the cycle lengths, splits, and offsets for these intersections were optimized as a system given the timing inputs in the existing conditions network and in accordance with [NCDOT Congestion Management Capacity Analysis Guidelines](#). The remaining study area intersections are currently uncoordinated. Therefore, the cycle lengths and splits were optimized for each of these intersections individually in the existing conditions network

given the timing inputs and in accordance with NCDOT *Congestion Management Capacity Analysis Guidelines*.

Per [NCDOT Congestion Management Capacity Analysis Guidelines](#), protected only left-turn phasing was used for analysis of future operations where protected/permitted left-turn phasing exists at the following intersections:

2. S Point Road (NC 273) and South Point High School Driveway/Red Raider Run
3. S Point Road (NC 273) and R L Stowe Road/Nixon Road
4. Keener Boulevard (NC 273) and R L Stowe Road/Fort William Avenue
7. S Main Street and Central Avenue

Additionally, improvements at multiple signalized study intersections are planned as part of the approved developments and NCDOT TIP Project No. U-5821 (as discussed in **Section 4.3**) are assumed to be in place under future conditions. At intersections where protected/permitted phasing was changed to protected phasing and/or laneage improvements are planned as part of an approved development or TIP project, splits were optimized under 2025 background conditions. Note that the cycle lengths and offsets were maintained when the splits were optimized under 2025 background conditions for the signals within the NC 273 Closed Loop Signal System. The cycle lengths at the uncoordinated signalized intersections were optimized with the laneage and/or phasing changes under 2025 background conditions in accordance with NCDOT *Congestion Management Capacity Analysis Guidelines*. Cycle lengths, splits, and offsets were maintained at all study intersections through 2025 background, 2025 build-out and 2029 background conditions.

Since Phase 1 site traffic was not included in 2029 background conditions, mitigation improvements identified as part of Phase 1 of the South Fork development were not included in the 2029 background capacity analyses. However, since the Phase 1 site trips are included in the 2029 Phase 2 volumes, mitigation improvements identified as part of Phase 1 of the South Fork development were included in the 2029 Phase 2 build-out capacity analyses. Similarly, since Phase 1 and Phase 2 site trips are included in the 2029 Phase 3 volumes, mitigation improvements identified as part of Phase 1 and Phase 2 of the South Fork development were included in the 2029 Phase 3 build-out capacity analyses.

Splits were optimized at signalized intersections where improvements were identified as mitigation for the South Fork development. Cycle lengths, splits, and offsets were maintained through the 2025 Phase 1 build-out improved and 2029 Phase 2 build-out scenarios. Similarly, cycle lengths, splits, and offsets were maintained through the 2029 Phase 2 build-out improved and 2029 Phase 3 build-out scenarios.

Signal geometric plans are included in the **Appendix**.

The following modifications from the background data collected were applied to the capacity analyses to meet [NCDOT Congestion Management Capacity Analysis Guidelines](#):

- RTOR operations were not allowed.
- Protected-only left-turn phasing was used for analysis of future operations where protected/permitted left-turn phasing exists or is planned (except as noted for the S Main Street/Eagle Road intersection).
- Lost time adjust was added to the yellow and all-red times provided in the existing signal plans to maintain a total lost time of 5 seconds for each movement.

Given the intersection configuration, the protected/permitted left-turn phasing for the eastbound approach of S Main Street and Eagle Road was maintained in the analysis. This approach currently includes a single combination left/through lane. If the analyses were performed to include protected-only phasing, the eastbound approach would not be allowed to run concurrently with the westbound approach. The intersection would operate similar to a split-phased intersection for the eastbound and westbound approaches. Given that this phase is unlikely to be modified to protected-only left-turn phasing under the current configuration, the protected/permitted phasing was maintained for this approach.

Field-observed peak-hour factors (PHFs) were used in the 2020 existing conditions analysis, whereas a 0.9 PHF was used in all future-year conditions in accordance with NCDOT *Congestion Management Capacity Analysis Guidelines*. Heavy-vehicle percentages collected with the counts were used and maintained for all scenarios, subject to a two-percent minimum.

Mitigation for traffic impacts caused by the proposed development were noted and identified based on City of Belmont and NCDOT mitigation requirements. When determining the proposed development’s traffic impact to the study area intersections, the 2025 Phase 1 build-out conditions were compared to the 2025 background conditions, while the 2029 Phase 2 and Phase 3 build-out conditions were each separately compared to the 2029 background conditions. Based on the [City of Belmont Land Development Code – Section 16.14 Traffic Impact Analysis](#), “the applicant shall be required to identify mitigation improvements to the roadway network if at least one of the following conditions exists when comparing future year background conditions to future year build-out conditions:

- a) the total average delay at an intersection or individual approach increases by 25% or greater, while maintaining the same LOS,
- b) the LOS degrades by at least one level,
- c) or the LOS is “D” or worse in background conditions and the proposed project shows a negative impact on the intersection or approach”

Capacity analysis reports generated by Synchro Version 10 software are included in the **Appendix** along with queuing and blocking reports generated by the SimTraffic microsimulation model.

6.1 S POINT ROAD (NC 273) AND BELMONT MIDDLE SCHOOL D/W

Table 6.1 summarizes the LOS, control delay and 95th percentile queue lengths at the future signalized intersection of S Point Road (NC 273) and Belmont Middle School Driveway. Note that at the time of this TIA, the Belmont Middle School is under construction and this driveway is not yet operational. Therefore, this intersection was not included in the existing conditions.

Table 6.1 - S Point Road (NC 273) and Belmont Middle School Driveway									
Condition	Measure	EB		NB		SB		Intersection	
		EBL	EBR	NBL	NBT	SBT	SBR	LOS (Delay)	
AM Peak Hour									
2025 Phase 1									
2025 Background	LOS (Delay)	F (144.3)		F (98.7)		B (16.5)		E (75.6)	
	Synchro 95th Q	#785'	58'	177'	#2272'	684'	135'		
2025 Build Ph 1	LOS (Delay)	F (144.3)		F (99.3)		B (16.6)		E (75.8)	
	Synchro 95th Q	#785'	58'	177'	#2274'	690'	135'		
2029 Phases 2 & 3									
2029 Background	LOS (Delay)	F (144.3)		F (115.1)		B (17.2)		F (84.0)	
	Synchro 95th Q	#785'	58'	177'	#2397'	727'	135'		
2029 Build Ph 2	LOS (Delay)	F (144.3)		F (116.2)		B (17.4)		F (84.6)	
	Synchro 95th Q	#785'	58'	177'	#2406'	739'	135'		
2029 Build Ph 3	LOS (Delay)	F (144.3)		F (121.9)		B (17.8)		F (87.5)	
	Synchro 95th Q	#785'	58'	177'	#2450'	756'	135'		
2034 Build +5									
2034 Build +5	LOS (Delay)	F (144.3)		F (144.1)		B (18.9)		F (99.3)	
	Synchro 95th Q	#785'	58'	177'	#2618'	819'	135'		
PM Peak Hour									
2025 Phase 1									
2025 Background	LOS (Delay)	F (160.9)		A (5.9)		D (41.2)		C (31.6)	
	Synchro 95th Q	#253'	54'	47'	354'	#2624'	12'		
2025 Build Ph 1	LOS (Delay)	F (160.9)		A (6.0)		D (41.9)		C (32.0)	
	Synchro 95th Q	#253'	54'	47'	358'	#2636'	12'		
2029 Phases 2 & 3									
2029 Background	LOS (Delay)	F (160.9)		A (6.2)		D (50.1)		D (36.8)	
	Synchro 95th Q	#253'	54'	47'	385'	#2777'	12'		
2029 Build Ph 2	LOS (Delay)	F (160.9)		A (6.3)		D (51.0)		D (37.3)	
	Synchro 95th Q	#253'	54'	47'	394'	#2792'	12'		
2029 Build Ph 3	LOS (Delay)	F (160.9)		A (6.5)		D (54.9)		D (39.5)	
	Synchro 95th Q	#253'	54'	47'	414'	#2855'	12'		
2034 Build +5									
2034 Build +5	LOS (Delay)	F (160.9)		A (7.1)		E (68.0)		D (47.2)	
	Synchro 95th Q	#253'	54'	47'	467'	#3056'	12'		
Existing/Background Storage									
				250'				200'	
# 95th percentile volume exceeds capacity, queue may be longer									

As part of the approved Belmont Middle School, a new driveway is planned to be constructed along S Point Road (NC 273) approximately 1,400 feet south of McKee Farm Lane/Stowe Road. Based on input at the TIA Scoping Meeting as reflected in the approved MOU and shown in the signal plan for this intersection included in the **Appendix**, the following laneage was assumed to be installed under future-year conditions:

- Traffic signal
- Northbound left-turn lane along S Point Road (NC 273) with 250 feet of storage
- Southbound right-turn lane along S Point Road (NC 273) with 200 feet of storage
- Separate eastbound left- and right lanes exiting the Belmont Middle School driveway

It should be noted that recommendations for this intersection identified in the approved *Belmont Middle School TIA* (Kimley-Horn, September 2018) also included (although are not planned to be installed and therefore not included in the analysis models):

- Additional northbound through lane along S Point Road (NC 273) that provides a minimum of 325' of storage and extends to R L Stowe Road
- Eastbound approach to include dual left-turn lanes
- Extension of the recommended southbound right turn-lane to serve as a drop lane and extend to the R L Stowe Road/Nixon Road intersection
- Realign Belwood Drive to the north to tie into S Point Road (NC 273) at the proposed Driveway #1 location and include a single shared left/through/right lane
- Southbound left-turn lane along S Point Road (NC 273)

2025 Phase 1

Table 6.1 shows that with these improvements in place, the signalized intersection as currently planned is expected to operate at LOS E during the AM peak hour and LOS C during the PM peak hour under 2025 background conditions. When the proposed Phase 1 site traffic is added to the 2025 background volumes, the overall intersection is expected to continue to operate at LOS E during the AM peak hour and LOS C during the PM peak hour with minimal increases in delay. Since Phase 1 of 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 as part of Phase 1 of the South Fork development.

2029 Phase 2

Under 2029 background conditions, the signalized intersection as currently planned is expected to operate at LOS F during the AM peak hour and LOS D during the PM peak hour. When the proposed Phase 1 and Phase 2 site traffic is added to the 2029 background volumes, the overall intersection is expected to continue to operate at LOS F during the AM peak hour and LOS D during the PM peak hour with minimal increases in delay. Since Phase 2 of 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 as part of Phase 2 of the South Fork development.

2029 Phase 3

When the proposed site traffic for full build-out is added to the 2029 background volumes, the overall intersection is expected to continue to operate at LOS F during the AM peak hour and LOS D during the PM peak hour with minimal increases in delay. **Since the proposed development is not expected to have a significant adverse impact on operations at this intersection, no mitigation improvements are recommended for the proposed South Fork development.**

6.2 S POINT RD (NC 273) AND SOUTH POINT HS/RED RAIDER RUN

Table 6.2 summarizes the LOS, control delay and 95th percentile queue lengths at the signalized intersection of S Point Road (NC 273) and South Point High School Driveway/Red Raider Run. Red Raider Run serves as a signalized driveway to approved (and still developing) Belmont Town Center. Note that the eastbound approach serves as an entrance only for South Point High School; therefore, there is no exiting volume, and thus no operations reported for the eastbound approach.

Table 6.2 - S Point Road (NC 273) and South Point High School Driveway/Red Raider Run										
Condition	Measure	WB		NB			SB			Intersection
		WBLT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	LOS (Delay)
AM Peak Hour										
2020 Existing	LOS (Delay)	D (52.7)		C (22.1)			A (6.2)			B (18.2)
	Synchro 95th Q	52'	70'	22'	#1164'	-	m7'	151'	-	
2025 Phase 1										
2025 Background	LOS (Delay)	D (51.7)		F (96.7)			B (18.9)			E (64.4)
	Synchro 95th Q	88'	74'	156'	#1939'	-	m40'	m350'	-	
2025 Build Ph 1	LOS (Delay)	D (51.4)		F (98.4)			B (19.4)			E (65.5)
	Synchro 95th Q	88'	77'	156'	#1947'	-	m43'	m353'	-	
2029 Phases 2 & 3										
2029 Background	LOS (Delay)	D (51.7)		F (110.7)			C (24.9)			E (74.9)
	Synchro 95th Q	91'	77'	161'	#2020'	-	m40'	m350'	-	
2029 Build Ph 2	LOS (Delay)	D (51.3)		F (114.2)			C (27.1)			E (77.5)
	Synchro 95th Q	91'	80'	161'	#2036'	-	m43'	m355'	-	
2029 Build Ph 3	LOS (Delay)	D (51.3)		F (124.1)			C (33.7)			F (85.8)
	Synchro 95th Q	91'	81'	161'	#2093'	-	m42'	m369'	-	
2029 Build Ph 3 IMP Opt 1 - NBR	LOS (Delay)	D (51.3)		F (105.8)			D (36.5)			E (76.5)
	Synchro 95th Q	91'	81'	164'	#2010'	26'	m49'	m#403'	-	
2029 Build Ph 3 IMP Opt 2 - SBR	LOS (Delay)	D (51.3)		F (124.1)			B (14.7)			E (78.3)
	Synchro 95th Q	91'	81'	161'	#2093'	-	m49'	m338'	m21'	
2034 Build +5										
2034 Build +5	LOS (Delay)	D (51.3)		F (165.2)			D (51.1)			F (116.1)
	Synchro 95th Q	92'	83'	169'	#2201'	-	m50'	m#930'	-	
PM Peak Hour										
2020 Existing	LOS (Delay)	E (62.2)		B (14.0)			B (16.3)			C (21.2)
	Synchro 95th Q	109'	116'	6'	524'	-	m5'	m0'	-	
2025 Phase 1										
2025 Background	LOS (Delay)	E (66.5)		C (34.0)			E (56.9)			D (49.3)
	Synchro 95th Q	#302'	159'	40'	#1147'	-	m79'	m457'	-	
2025 Build Ph 1	LOS (Delay)	E (66.2)		C (35.0)			E (56.8)			D (49.6)
	Synchro 95th Q	#302'	165'	40'	#1157'	-	m80'	m457'	-	
2029 Phases 2 & 3										
2029 Background	LOS (Delay)	E (67.9)		D (41.1)			E (57.7)			D (52.6)
	Synchro 95th Q	#319'	164'	40'	#1210'	-	m78'	m456'	-	
2029 Build Ph 2	LOS (Delay)	E (67.4)		D (44.3)			E (57.8)			D (53.9)
	Synchro 95th Q	#319'	174'	40'	#1224'	-	m82'	m458'	-	
2029 Build Ph 3	LOS (Delay)	E (67.4)		E (55.5)			E (60.1)			E (59.2)
	Synchro 95th Q	#319'	171'	40'	#1298'	-	m80'	m483'	-	
2029 Build Ph 3 IMP Opt 1 - NBR	LOS (Delay)	E (67.4)		D (35.1)			E (59.7)			D (51.2)
	Synchro 95th Q	#319'	171'	40'	#1169'	37'	m88'	m#514'	-	
2029 Build Ph 3 IMP Opt 2 - SBR	LOS (Delay)	E (67.4)		D (54.1)			E (59.2)			E (58.3)
	Synchro 95th Q	#319'	171'	40'	#1298'	-	m88'	m507'	m1'	
2034 Build +5										
2034 Build +5	LOS (Delay)	E (68.4)		E (72.3)			E (61.9)			E (66.7)
	Synchro 95th Q	#335'	177'	41'	#1373'	-	m89'	m#516'	-	
Existing/Background Storage			100'	175'			100'			
# 95th percentile volume exceeds capacity, queue may be longer										
m Volume for 95th percentile queue is metered by upstream signal										

Table 6.2 shows the signalized intersection currently operates acceptably at LOS B and LOS C during the AM and PM peak hours, respectively. As further discussed in **Section 6.3**, two separate heavy travel streams are combined into a single lane both northbound and southbound along S Point Road (NC 273) until they split at R L Stowe Road to the north. As traffic increases from the approved developments and other non-specific growth throughout the area (including non-specific growth from upstate South Carolina), the congestion at this intersection will continue to worsen under its current configuration. This is evidenced in **Table 6.2** where the northbound approach is expected to operate at LOS F during the AM peak hour, while the southbound approach is expected to operate at LOS E during the PM peak hour under both 2025 and 2029 background conditions. This table also shows the overall intersection is expected to operate at LOS E and LOS D under 2025 and 2029 background conditions during the AM and PM peak hours, respectively.

2025 Phase 1

When the proposed Phase 1 site traffic is added to the 2025 background volumes, the overall intersection is expected to continue to operate at LOS E and LOS D during the AM and PM peak hours, respectively, with minimal increases in delay. Since Phase 1 of 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 as part of Phase 1 of the South Fork development.

2029 Phase 2

When the proposed Phase 1 and Phase 2 site traffic is added to the 2029 background volumes, the overall intersection is expected to continue to operate at LOS E and LOS D during the AM and PM peak hours, respectively, with minimal increases in delay. Since Phase 2 of 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 as part of Phase 2 of the South Fork development.

2029 Phase 3

When the proposed site traffic for full build-out is added to the 2029 background volumes, the overall intersection is expected to drop from LOS E to LOS F during the AM peak hour and from LOS D to LOS E during the PM peak hour. Given the LOS degradation, identification of mitigation improvements is required. Based on review of the volume to capacity (v/c) ratios, the heavy mainline volume along S Point Road (NC 273) causes the northbound approach during the AM peak hour and the southbound approach during the PM peak hour to be over capacity (v/c ratio over 1.0) under 2029 background conditions, showing that these approaches are already constrained prior to the added traffic from the proposed South Fork development. The amount of volume, the LOS/delay, and the v/c ratios for these approaches support the need for additional through lanes along S Point Road (NC 273) to significantly improve operations at this intersection and along this corridor. However, given the relative impact caused by the proposed site, additional through lanes should not be considered as mitigation for the proposed South Fork development. Instead, the following two potential mitigation options were considered and evaluated at this intersection to potentially mitigate the operational impact and accommodate the added Phase 3 site traffic, while minimizing disruption to the background traffic:

- Option 1 – Northbound right-turn lane
- Option 2 – Southbound right-turn lane

Option 1 – Northbound Right-Turn Lane

Left-turn lanes are already provided along S Point Road (NC 273) at this intersection; therefore, Option 1 evaluated installation of a northbound right-turn lane to reduce the northbound approach delay. With this improvement in place, the overall intersection is expected to return to LOS E and LOS D during the AM and PM peak hours, respectively, while reducing the northbound approach delay. However, note that the southbound approach increases in delay to drops from LOS C to LOS D during the AM peak hour under this improvement option. Since the northbound and southbound approaches are tied to the same phases, the reduced green time required for the northbound approach also reduces the green time available for the southbound approach and thus increases the delay. Also note that the northbound right-turn lane would be expected to serve 44 AM and 60 PM trips as shown in **Figures 5.7 and 5.8**.

As shown in the aerial to the right, there is approximately eight feet between the sidewalk along the east side of S Point Road (NC 273) and the retaining wall for the recently-constructed Harris Teeter Fuel Center as part of the Belmont Town Center development. Construction of a northbound right-turn lane would require significant property impacts (including impacts to the limited parking for the Fuel Center) as well as relocation and/or removal of the newly installed sidewalk, street trees, curb and gutter, metal strain pole (for the traffic signal) and underground/overhead utilities along the eastern edge of S Point Road (NC 273) at this location. Given the constraints along the east side of S Point Road (NC 273), the construction of a northbound right-turn lane may require S Point Road (NC 273) to instead shift to the left, resulting in additional widening both upstream and downstream of the intersection, and thus additional property and utility impacts on either side of the intersection.



Option 2 – Southbound Right-Turn Lane

Given the constraints discussed above along the east side of S Point Road (NC 273), improvement to the southbound approach was considered as an alternative mitigation option. Since a left-turn lane is already provided, Option 2 evaluated installation of a southbound right-turn lane. With this improvement in place, the overall intersection is expected to return to LOS E during the AM peak hour, yet only minimal benefit is provided during the PM peak hour. Additionally, the northbound approach during the AM peak hour remains constrained.

Review of Phase 3 Mitigation Options

As discussed in **Section 4.3**, this intersection has been identified for improvements by the City of Belmont and GCLMPO through a roadway widening project along S Point Road (NC 273) (H184813). This project is currently being scored for potential funding as part of NCDOT’s strategic prioritization process (P6.0), which is used to update the STIP for the years 2023-2032. NCDOT is expected to complete their scoring process in April 2021 and release the Draft 2023-2032 STIP in May 2022. Based on GCLMPO’s Draft P6.0 Project Submittal List, project H184813 includes

widening S Point Road (NC 273) from two to four lanes between Henry Chapel Road and R L Stowe Road/Nixon Road. Since this project is not currently funded, the identified improvements were not included in the future year analyses at this intersection summarized in **Table 6.2** above. However, the identified existing issues at this intersection should still be considered when mitigation improvements are finalized.

No improvements are recommended as mitigation for the proposed South Fork development at this intersection based on review of the potential mitigation options discussed above and summarized below:

- The northbound and southbound approaches are already constrained and over capacity prior to the added traffic from the proposed South Fork development, where the volumes and operations for these approaches support the need for additional through lanes along S Point Road (NC 273) to significantly improve operations at this intersection and along this corridor.
- The extent of impacts associated with construction of improvements to the northbound approach.
- The limited projected benefit expected to be provided through installation of a southbound right-turn lane.
- Based on review of **Figures 5.7** and **5.8**, the proposed site is projected to add less than 3% and 4% of the total intersection traffic during the AM and PM peak hours, respectively.
- Need for improvements at this intersection have already been identified by the City of Belmont and GCLMPO (S Point Road (NC 273) Widening - **H184813**).

Based on review of the Synchro 95th percentile queues, the westbound right-turn queue is expected to extend beyond the Harris Teeter Fuel Center driveway under both background and build-out conditions during the PM peak hour. Since the storage is exceeded under both background and build-out conditions and the proposed site is not expected to significantly extend the projected queue lengths, extension of the westbound right-turn lane is not recommended as mitigation for the proposed South Fork development.

6.3 S POINT ROAD (NC 273) AND R L STOWE RD/NIXON RD

Table 6.3 summarizes the LOS, control delay and 95th percentile queue lengths at the signalized intersection of S Point Road (NC 273) and R L Stowe Road/Nixon Road.

Table 6.3 - S Point Road (NC 273) and R L Stowe Road/Nixon Road													
Condition	Measure	EB			WB		NB			SB			Intersection LOS (Delay)
		EBL	EBT	EBR	WBL	WBTR	NBL	NBT	NBR	SBL	SBT	SBR	
AM Peak Hour													
2020 Existing	LOS (Delay)	E (77.0)			E (64.8)		B (12.5)			D (45.3)			D (39.7)
	Synchro 95th Q	#309'	#351'	-	#345'	112'	m24'	m287'	m107'	23'	426'	-	
2025 Phase 1													
2025 Background	LOS (Delay)	F (116.0)			F (112.4)		D (44.6)			F (94.0)			E (78.6)
	Synchro 95th Q	#344'	#546'	-	#576'	166'	m58'	m357'	m171'	#60'	#891'	59'	
2025 Build Ph 1	LOS (Delay)	F (130.8)			F (111.6)		D (44.8)			F (93.9)			F (81.4)
	Synchro 95th Q	#344'	#585'	-	#576'	174'	m60'	m352'	m171'	#60'	#891'	60'	
2029 Phases 2 & 3													
2029 Background	LOS (Delay)	F (125.8)			F (119.4)		D (44.6)			F (102.3)			F (83.2)
	Synchro 95th Q	#363'	#570'	-	#592'	172'	m58'	m353'	m171'	#63'	#922'	60'	
2029 Build Ph 2	LOS (Delay)	F (153.7)			F (118.1)		D (44.8)			F (102.0)			F (88.8)
	Synchro 95th Q	#383'	#633'	-	#592'	182'	m61'	m345'	m173'	#63'	#922'	64'	
2029 Build Ph 3	LOS (Delay)	F (170.9)			F (118.5)		D (49.5)			F (102.4)			F (93.9)
	Synchro 95th Q	#373'	#669'	-	#592'	181'	m86'	m332'	m169'	#63'	#922'	63'	
2029 Build Ph 3 IMP EBR	LOS (Delay)	F (92.9)			F (106.9)		D (49.0)			F (93.5)			E (75.6)
	Synchro 95th Q	#397'	#462'	77'	#581'	179'	m86'	m315'	m168'	#63'	#910'	65'	
2034 Build +5													
2034 Build +5	LOS (Delay)	F (102.7)			F (117.0)		D (49.6)			F (103.4)			F (81.4)
	Synchro 95th Q	#426'	#484'	79'	#609'	185'	m82'	m285'	m163'	#65'	#945'	67'	
PM Peak Hour													
2020 Existing	LOS (Delay)	E (65.2)			E (58.6)		B (15.1)			E (67.3)			D (46.2)
	Synchro 95th Q	55'	142'	-	#665'	77'	m21'	211'	89'	53'	#793'	-	
2025 Phase 1													
2025 Background	LOS (Delay)	E (70.4)			F (105.7)		C (24.1)			F (126.4)			E (78.3)
	Synchro 95th Q	88'	#230'	-	#809'	152'	m81'	m396'	m152'	82'	#1086'	64'	
2025 Build Ph 1	LOS (Delay)	E (72.4)			F (111.3)		C (25.6)			F (126.5)			F (80.3)
	Synchro 95th Q	87'	#269'	-	#809'	167'	m93'	m397'	m149'	82'	#1086'	66'	
2029 Phases 2 & 3													
2029 Background	LOS (Delay)	E (70.7)			F (119.4)		C (25.1)			F (139.9)			F (86.1)
	Synchro 95th Q	91'	#246'	-	#844'	155'	m82'	m394'	m151'	88'	#1133'	66'	
2029 Build Ph 2	LOS (Delay)	E (75.4)			F (127.7)		C (27.9)			F (138.5)			F (89.0)
	Synchro 95th Q	97'	#302'	-	#844'	179'	m#103'	m390'	m148'	88'	#1133'	72'	
2029 Build Ph 3	LOS (Delay)	F (92.9)			F (142.2)		D (42.9)			F (138.7)			F (98.7)
	Synchro 95th Q	96'	#392'	-	#844'	178'	m#174'	m364'	m141'	88'	#1133'	72'	
2029 Build Ph 3 IMP EBR	LOS (Delay)	D (51.4)			F (100.4)		D (35.8)			F (138.7)			F (82.7)
	Synchro 95th Q	96'	174'	79'	#856'	180'	m#162'	m352'	m141'	85'	#1133'	72'	
2034 Build +5													
2034 Build +5	LOS (Delay)	D (51.5)			F (115.8)		D (37.5)			F (155.7)			F (92.0)
	Synchro 95th Q	97'	178'	79'	#903'	182'	m#158'	m353'	m143'	95'	#1192'	73'	
Existing/Background Storage		200'			225'		280'		225'		25'		100'

95th percentile volume exceeds capacity, queue may be longer

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

Table 6.3 shows the signalized intersection currently operates at LOS D during both peak hours. As noted in **Section 4.2**, the following improvement is required to be installed at this intersection as part of the approved Amberley development and was assumed to be in place under future-year conditions:

- Southbound right-turn lane along S Point Road (NC 273) with 100 feet of storage

The operations and LOS for this intersection play a vital role in the overall mobility along Belmont's peninsula because of its location. This intersection is located where a major portion of northbound traffic disperses away from S Point Road (NC 273), either east towards Charlotte (turn onto R L Stowe Road) or north/west towards downtown Belmont or Gastonia (continue north along S Point Road). This location is also where two heavy traffic streams combine onto S Point Road (NC 273) heading southbound. This combination creates an issue because these two heavy movements (the southbound through and westbound left) conflict with one another. The heavy southbound volume demands green time from the signal, which reduces the amount available for the westbound approach, and vice versa. As traffic increases from the approved developments and other non-specific growth throughout the area (including non-specific growth from upstate South Carolina), the congestion at this intersection will continue to worsen under its current configuration. This is evidenced in **Table 6.3** by the sharp increase in overall intersection delay between existing and background conditions, even with the addition of the southbound right-turn lane as part of Amberley. As shown, the intersection is expected to operate at LOS E (and within two seconds of LOS F) during both peak hours under 2025 background conditions, and expected to operate at LOS F during both peak hours under 2029 background conditions.

Based on input from the applicant, Nixon Road is planned to be extended as part of Phase 1 of the proposed South Fork development through the approved Amberley development.

2025 Phase 1

When Nixon Road is extended and the proposed Phase 1 site traffic is added to the 2025 background volumes, the overall intersection is expected to operate at LOS F during both peak hours. Review of the operational impacts in **Table 6.3** shows that the impacts caused by the site are considered relatively minor at this intersection based on the considerations below:

- The LOS degradation during both peak hours is a result of the background delay hovering just below the LOS E/F demarcation at 80 seconds, where the site traffic pushes the delay just beyond (1.4/0.3 seconds) this demarcation, with an increase in delay of less than three seconds per vehicle in each peak hour.
- Based on review of **Figures 5.3** and **5.4**, Phase 1 is projected to add less than 2% of the total intersection traffic during each of the AM and PM peak hours.

Note that as described in **Section 5.4**, the new connection between Nixon Road and Armstrong Ford Road planned as part of the South Fork development will provide Amberley residents an additional outlet, particularly those traveling to/from the west along Armstrong Ford Road. Although site traffic will be added by the South Fork development, some of the existing traffic will also be removed from this intersection given the alternative access that the new connection will provide.

Since Phase 1 of 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 as part of Phase 1 of the South Fork development.

2029 Phase 2

When the proposed Phase 1 and Phase 2 site traffic is added to the 2029 background volumes (along with the Nixon Road extension), the overall intersection is expected to continue to operate at LOS F during both peak hours. **Table 6.3** shows that build-out of Phase 2 is expected to slightly increase the overall delay at this intersection during both peak hours while **Figures 5.5** and **5.6** show that Phase 2 is projected to add less than 3% of the total intersection traffic during each of the AM and PM peak hours. Since Phase 2 of 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 as part of Phase 2 of the South Fork development.

2029 Phase 3

When the proposed site traffic for full build-out is added to the 2029 background conditions (along with the Nixon Road extension), the overall intersection is expected to increase in delay while continuing to operate at LOS F during both peak hours. Given the increase in delay for the overall intersection and approaches that are already operating at LOS F along with the LOS degradation for the eastbound and northbound approaches during the PM peak hour, identification of potential mitigation improvements is required. **The following improvement was identified to mitigate the operational impact and accommodate the addition of Phase 3 (full build-out) site traffic:**

- **Eastbound right-turn lane along Nixon Road with 100 feet of storage**

Table 6.3 shows that with this improvement in place, the overall intersection is expected to operate with less delay than background conditions during both peak hours, with a significant reduction in delay particularly for the eastbound approach of Nixon Road where the proposed site would most impact. Note that the storage length is based on Synchro 95th percentile queues.

As shown in the aerial to the right, the easternmost South Point High School driveway along Nixon Road (four total driveways along Nixon Road) is located approximately 100-125 feet west of S Point Road (NC 273). Therefore, the construction of an eastbound right-turn lane with 100 feet of storage would extend to this driveway without enough distance to provide an appropriate taper prior to the driveway. Ideally, the right-turn lane would taper back to the existing curbline prior to the driveway to avoid the situation where vehicles turn out of the driveway and are in the right-turn lane, potentially needing to shift one or two lanes in a short distance before the signal. Based



on the site visit, this easternmost driveway is currently signed for one-way exiting traffic for buses only; therefore, this driveway is expected to be limited in its use. **Given the four total driveways along Nixon road, this improvement should be coordinated with City and High School staff to determine if the easternmost South Point High School driveway could potentially be eliminated by rerouting the buses to one of the other three existing driveways along Nixon Road.**

Based on review of the Synchro 95th percentile queues, the southbound and westbound left-turn queues are projected to exceed the existing left-turn lane storage under both background and build-out conditions during both peak hours, and the existing eastbound left-turn storage is projected to be exceeded under both background and build-out conditions during the AM peak hour. Since the storage is exceeded under both background and build-out conditions and the proposed site is not expected to significantly extend the projected queue lengths, extension of these turn lanes is not recommended as mitigation for the proposed South Fork development.

6.4 KEENER BLVD (NC 273) AND R L STOWE RD/FORT WILLIAM AVE

Table 6.4 summarizes the LOS, control delay and 95th percentile queue lengths at the signalized intersection of Keener Boulevard (NC 273) and R L Stowe Road/Fort William Avenue.

Table 6.4 - Keener Boulevard (NC 273) and R L Stowe Road/Fort William Avenue										
Condition	Measure	EB		WB		NB		SB		Intersection LOS (Delay)
		EBL	EBTR	WBL	WBTR	NBLT	NBR	SBL	SBTR	
AM Peak Hour										
2020 Existing	LOS (Delay)	F (118.5)		F (101.4)		F (115.5)		F (120.2)		F (112.1)
	Synchro 95th Q	37'	#700'	#712'	217'	8'	#1254'	72'	69'	
2025 Phase 1										
2025 Background	LOS (Delay)	F (89.7)		B (13.2)		F (106.2)		F (103.2)		E (73.1)
	Synchro 95th Q	10'	#650'	568'	48'	29'	#2243'	78'	100'	
2025 Build Ph 1	LOS (Delay)	F (89.7)		B (13.3)		F (109.5)		F (103.2)		E (74.5)
	Synchro 95th Q	10'	#650'	574'	48'	29'	#2269'	78'	100'	
2029 Phases 2 & 3										
2029 Background	LOS (Delay)	F (95.3)		B (13.4)		F (120.2)		F (103.5)		F (80.4)
	Synchro 95th Q	11'	#697'	588'	50'	29'	#2346'	80'	102'	
2029 Build Ph 2	LOS (Delay)	F (95.3)		B (13.5)		F (125.6)		F (103.5)		F (82.8)
	Synchro 95th Q	11'	#697'	601'	50'	29'	#2389'	80'	102'	
2029 Build Ph 3	LOS (Delay)	F (95.3)		B (13.5)		F (124.8)		F (103.5)		F (82.4)
	Synchro 95th Q	11'	#697'	598'	50'	29'	#2384'	80'	102'	
2034 Build +5										
2034 Build +5	LOS (Delay)	F (105.6)		B (13.8)		F (144.1)		F (103.7)		F (93.1)
	Synchro 95th Q	11'	#758'	630'	54'	29'	#2525'	82'	106'	
PM Peak Hour										
2020 Existing	LOS (Delay)	F (111.9)		D (48.4)		E (79.6)		F (91.0)		E (65.8)
	Synchro 95th Q	7'	#259'	#1128'	274'	40'	#806'	17'	53'	
2025 Phase 1										
2025 Background	LOS (Delay)	F (83.4)		B (17.1)		B (14.7)		F (82.2)		C (24.5)
	Synchro 95th Q	4'	#254'	1189'	111'	79'	326'	19'	57'	
2025 Build Ph 1	LOS (Delay)	F (83.4)		B (17.5)		B (14.8)		F (82.2)		C (24.7)
	Synchro 95th Q	4'	#254'	1221'	111'	79'	335'	19'	57'	
2029 Phases 2 & 3										
2029 Background	LOS (Delay)	F (84.7)		B (18.4)		B (15.4)		F (82.4)		C (25.6)
	Synchro 95th Q	4'	#272'	#1390'	117'	82'	351'	19'	57'	
2029 Build Ph 2	LOS (Delay)	F (84.7)		B (19.1)		B (15.6)		F (82.4)		C (26.1)
	Synchro 95th Q	4'	#272'	#1432'	117'	82'	365'	19'	57'	
2029 Build Ph 3	LOS (Delay)	F (84.7)		B (19.1)		B (15.6)		F (82.4)		C (26.0)
	Synchro 95th Q	4'	#272'	#1430'	117'	82'	363'	19'	57'	
2034 Build +5										
2034 Build +5	LOS (Delay)	F (87.7)		C (21.2)		B (16.5)		F (82.9)		C (27.9)
	Synchro 95th Q	4'	#292'	#1539'	126'	86'	403'	19'	62'	
Existing/Background Storage		150'		150'		125'		125'		

95th percentile volume exceeds capacity, queue may be longer

Note that per [NCDOT Congestion Management Capacity Analysis Guidelines](#), the capacity analysis results shown in **Table 6.4** reflect the following modifications applied to the capacity analyses that differ from the background data collected:

- RTOR operations were not allowed.
- Protected-only left-turn phasing was used for analysis of future operations where protected/permitted left-turn phasing exists for the westbound approach.

These modifications have a significant impact particularly at this intersection given both the high northbound right-turn volume and high westbound left-turn volume. With RTOR allowed along with protected/permitted left-turn phasing on the westbound approach, the overall intersection is

expected to operate at LOS C or better during both peak hours under all future-year conditions. However, per City and NCDOT requirements, mitigation is determined by comparing background and build conditions with analyses that reflect these guidelines, as reflected in **Table 6.4**.

Table 6.4 shows the signalized intersection currently operates at LOS F and LOS E during the AM and PM peak hours, respectively. As noted in **Section 4.2**, the following improvement is required to be installed at this intersection as part of the approved Chronicle Mill development and was assumed to be in place under future-year conditions:

- Restripe the northbound approach of R L Stowe Road to provide a shared left/through lane and an exclusive right-turn lane with permitted-overlap phasing

2025 Phase 1

With this improvement in place, the signalized intersection is expected to operate at LOS E and LOS C during the AM and PM peak hours, respectively, under 2025 background conditions. When the proposed Phase 1 site traffic is added to the 2025 background volumes, the overall intersection is expected to continue to operate at LOS E during the AM peak hour and LOS C during the PM peak hour. Since Phase 1 of 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 as part of Phase 1 of the South Fork development.

2029 Phase 2

Under 2029 background conditions, the signalized intersection is expected to operate at LOS F and LOS C during the AM and PM peak hours, respectively. When the proposed Phase 1 and Phase 2 site traffic is added to the 2029 background volumes, the overall intersection is expected to continue to operate at LOS F during the AM peak hour and LOS C during the PM peak hour with minimal increases in delay. Since Phase 2 of 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 as part of Phase 2 of the South Fork development.

2029 Phase 3

When the proposed site traffic for full build-out is added to the 2029 background conditions, the overall intersection is expected to continue to operate at LOS F during the AM peak hour and LOS C during the PM peak hour with minimal increases in delay. **Since the proposed development is not expected to have a significant adverse impact on operations at this intersection, no mitigation improvements are recommended for the proposed South Fork development.**

Based on review of the Synchro 95th percentile queues, the westbound left- and northbound right-turn queues are projected to exceed the existing storages under existing, background and build-out conditions during both peak hours. As discussed above, the extensive queues shown in **Table 6.4** reflect modifications required per [NCDOT Congestion Management Capacity Analysis Guidelines](#) that do not reflect the true operations at this intersection, particularly for these two heavy movements - the westbound left and the northbound right-turn movements. Still, since the storage is exceeded under both background and build-out conditions and the proposed site is not expected to significantly extend the projected queue lengths, extension of these turn lanes is not recommended as mitigation for the proposed South Fork development.

6.5 KEENER BLVD/PARK ST (NC 273) AND CATAWBA ST (NC 7)

Table 6.5 summarizes the LOS, control delay and 95th percentile queue lengths at the signalized intersection of Keener Boulevard/Park Street (NC 273) and Catawba Street (NC 7).

Table 6.5 - Keener Boulevard/Park Street (NC 273) and Catawba Street (NC 7)									
Condition	Measure	EB	WB		NB		SB		Intersection
		EBLTR	WBL	WBTR	NBLT	NBR	SBLT	SBR	LOS (Delay)
AM Peak Hour									
2020 Existing	LOS (Delay)	D (47.9)	C (25.1)		C (23.5)		B (11.4)		C (24.5)
	Synchro 95th Q	#223'	-	101'	#401'	-	108'	12'	
2025 Phase 1									
2025 Background	LOS (Delay)	E (58.7)	C (25.7)		C (22.0)		B (11.3)		C (24.7)
	Synchro 95th Q	#327'	-	#145'	#403'	111'	132'	17'	
2025 Build Ph 1	LOS (Delay)	E (71.2)	C (26.3)		C (22.2)		B (11.3)		C (26.7)
	Synchro 95th Q	#345'	-	#160'	#404'	113'	133'	20'	
2029 Phases 2 & 3									
2029 Background	LOS (Delay)	E (68.9)	C (27.1)		C (25.2)		B (11.7)		C (28.0)
	Synchro 95th Q	#341'	-	#164'	#425'	115'	140'	17'	
2029 Build Ph 2	LOS (Delay)	F (92.6)	C (28.0)		C (25.6)		B (11.7)		C (31.9)
	Synchro 95th Q	#372'	-	#171'	#427'	119'	141'	22'	
2029 Build Ph 3	LOS (Delay)	F (113.5)	C (27.3)		C (25.6)		B (11.6)		D (35.1)
	Synchro 95th Q	#392'	-	#169'	#427'	118'	141'	34'	
2029 Build Ph 3 IMP WBL	LOS (Delay)	F (108.3)	F (82.3)		D (44.4)		C (25.9)		D (51.8)
	Synchro 95th Q	#711'	#235'	109'	#852'	188'	318'	68'	
2034 Build +5									
2034 Build +5	LOS (Delay)	F (134.5)	C (29.4)		C (32.2)		B (12.3)		D (42.0)
	Synchro 95th Q	#411'	-	#181'	#457'	123'	153'	34'	
PM Peak Hour									
2020 Existing	LOS (Delay)	B (13.8)	D (42.5)		B (18.3)		C (23.1)		C (24.5)
	Synchro 95th Q	97'	-	#287'	182'	-	#281'	43'	
2025 Phase 1									
2025 Background	LOS (Delay)	B (15.6)	F (130.0)		C (23.2)		E (65.0)		E (60.3)
	Synchro 95th Q	129'	-	#494'	#246'	62'	#430'	69'	
2025 Build Ph 1	LOS (Delay)	B (16.1)	F (142.1)		C (23.5)		E (66.7)		E (63.4)
	Synchro 95th Q	136'	-	#503'	#249'	63'	#433'	75'	
2029 Phases 2 & 3									
2029 Background	LOS (Delay)	B (15.8)	F (151.9)		C (26.3)		F (85.8)		E (74.3)
	Synchro 95th Q	133'	-	#517'	#287'	63'	#456'	70'	
2029 Build Ph 2	LOS (Delay)	B (16.8)	F (174.7)		C (27.1)		F (88.5)		E (79.9)
	Synchro 95th Q	147'	-	#535'	#291'	66'	#461'	81'	
2029 Build Ph 3	LOS (Delay)	B (19.8)	F (190.6)		C (27.1)		F (86.4)		F (81.6)
	Synchro 95th Q	180'	-	#541'	#291'	66'	#461'	100'	
2029 Build Ph 3 IMP WBL	LOS (Delay)	F (170.6)	F (113.5)		C (28.2)		E (71.6)		E (75.5)
	Synchro 95th Q	#476'	#618'	121'	379'	45'	#699'	146'	
2034 Build +5									
2034 Build +5	LOS (Delay)	C (20.5)	F (222.2)		D (37.2)		F (118.8)		F (104.3)
	Synchro 95th Q	189'	-	#570'	#323'	68'	#496'	102'	
Existing/Background Storage						100'		150'	

95th percentile volume exceeds capacity, queue may be longer

Table 6.5 shows the signalized intersection currently operates at LOS C during both peak hours. As noted in **Section 4.2**, the following improvement was identified for mitigation at this intersection

as part of the Chronicle Mill development and was assumed to be in place under future-year conditions:

- Northbound right-turn lane along Keener Boulevard (NC 273) with 100 feet of storage

The increase in delay during the PM peak hour between existing and background conditions is due to the added traffic from the several approved developments and other non-specific growth throughout the area (including non-specific growth from upstate South Carolina) to an intersection that is already over capacity on two of the approaches (southbound and westbound) under background conditions prior to traffic being added by the proposed South Fork development. The northbound right-turn lane provides the most benefit during the AM peak hour when the northbound and eastbound flow are heavier. With this improvement in place, **Table 6.5** shows that the intersection is expected to operate at LOS C and LOS E during the AM and PM peak hours, respectively, under 2025 and 2029 background conditions.

2025 Phase 1

When the proposed Phase 1 site traffic is added to the 2025 background volumes, the overall intersection is expected to continue to operate at LOS C and LOS E during the AM and PM peak hours, respectively, with minimal increases in delay. Since Phase 1 of 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 as part of Phase 1 of the South Fork development.

2029 Phase 2

When the proposed Phase 1 and Phase 2 site traffic is added to the 2029 background volumes, the overall intersection is expected to continue to operate at LOS C and LOS E during the AM and PM peak hours, respectively. Note the drop in LOS for the eastbound approach during the AM peak hour. **Table 6.5** shows that build-out of Phase 2 is expected to slightly increase the overall delay at this intersection while **Figure 5.5** shows that Phase 2 is projected to add less than 2% of the total intersection traffic during the AM peak hour. Furthermore, this approach is shown to operate over capacity with a v/c ratio of 1.01 under background conditions prior to build-out of the proposed site. Since Phase 2 of 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 as part of Phase 2 of the South Fork development.

2029 Phase 3

When the proposed site traffic for full build-out is added to the 2029 background volumes, the overall intersection is expected to drop from LOS C to LOS D during the AM peak hour and from LOS E to LOS F during the PM peak hour. Given the LOS degradation, identification of potential mitigation improvements is required. The following improvement options were considered and evaluated to potentially mitigate the operational impact and accommodate the added Phase 3 site traffic, while minimizing disruption to the background traffic:

- Westbound left-turn lane along Catawba Street (NC 7)
- Eastbound left-turn lane along Catawba Street (NC 7)

Based on review of **Table 6.5** where the PM peak is the controlling peak and **Figure 5.8** which shows a heavy westbound left-turn volume (although South Fork only adds 7 of the 428 left turns), a westbound left-turn lane was evaluated. With this improvement in place, the overall intersection is expected to operate at LOS D (yet with an increase in delay) during the AM peak hour and return to LOS E during the PM peak hour. Although the overall intersection returns to LOS E, the side

streets are shown to operate at LOS F during both peak hours. Based on review of [NCDOT Congestion Management Capacity Analysis Guidelines](#), two of the four criteria are met for use of protected left-turn phasing for the westbound left-turn movement. Therefore, the westbound left-turn movement was assumed to operate with protected phasing when provided its own lane. The addition of a protected westbound left-turn phase demands its own green time from the signal, which reduces the amount available for the opposing eastbound approach, causing a significant increase in delay for the eastbound approach. The addition of a protected westbound left-turn phase also requires a longer cycle length, which is the main cause for the increased delay shown for the AM peak hour. Aside from the limited projected operational benefit expected with the addition of the westbound left-turn lane, widening the westbound approach would also require the eastbound approach to be widened to appropriately accommodate the through movements. The impacts that would be required for this widening is further discussed below.

Given the considerations discussed above related to the westbound left-turn improvement, capacity improvements were also considered along the eastbound approach of Catawba Street (NC 7). Note that adding a left-turn lane to either side-street approach would require widening of both approaches to appropriately accommodate the through movements. Widening the eastbound approach of this intersection would likely cause significant property and utility impacts. Multiple utility poles are currently located either within the sidewalk or slightly behind the back of sidewalk along both sides of Catawba Street (NC 7). The placement of these poles is likely due to the proximity of the existing residential homes along the eastbound approach of Catawba Street (NC 7), with severe slopes already requiring steps and handrails, which are currently in place in the front yards of these homes, as shown in the image to the right. If the eastbound approach were further widened to install a left-turn lane (or if the eastbound approach required widening to accommodate a potential widening of the westbound approach for a turn lane), these front-yard slopes would become even more severe, with concern for the proximity of the residential structures to the travel lanes. Additionally, given the character of Catawba Street (NC 7) towards the downtown core to the west of this intersection, adding capacity to the eastbound approach could potentially encourage more travelers to utilize Catawba Street (NC 7), which could result in a higher volume of traffic through the pedestrian-heavy downtown area.



As discussed in **Section 4.3**, this intersection has been identified for improvements by the City of Belmont and GCLMPO through the Keener Boulevard/Park Street (NC 273)/Catawba Street (NC 7) intersection improvement project (H184210). This project is currently being scored for potential funding as part of NCDOT’s strategic prioritization process (P6.0), which is used to update the STIP for the years 2023-2032. NCDOT is expected to complete their scoring process in April 2021 and release the Draft 2023-2032 STIP in May 2022. Based on GCLMPO’s Draft P6.0 Project Submittal List, project H184210 includes the addition of left-turn lanes on each approach as well as a northbound right-turn lane along Keener Boulevard (NC 273). Since this project is not currently

funded, the identified improvements were not included in the future year analyses at this intersection summarized in **Table 6.5** above. However, the identified existing issues at this intersection should still be considered when mitigation improvements are finalized.

No improvements are recommended as mitigation for the proposed South Fork development at this intersection based on review of the potential mitigation options discussed above and summarized below:

- Based on review of **Figures 5.7** and **5.8**, the proposed site is projected to add less than 4% of the total intersection traffic during each of the AM and PM peak hours.
- The limited projected benefit expected to be provided with the addition of a westbound left-turn lane.
- The extent of impacts associated with widening the eastbound and/or westbound approaches to improve the existing deficiencies of this intersection.
- The capacity issues at this intersection is shown prior to the build-out conditions of the proposed site.
- Need for improvements at this intersection have already been identified by the City of Belmont and GCLMPO (NC 273/NC 7 Intersection Improvements - **H184210**).

Based on review of the Synchro 95th percentile queues, the northbound right-turn queue is shown to exceed the right-turn lane storage under background and build-out conditions during the AM peak hour. However, as previously discussed, the results reflect modifications required per NCDOT including no RTOR allowed. Since the storage is expected to be exceeded under both background and build-out conditions and the proposed site is not expected to have a significant impact on the queue length, the northbound right-turn lane is not recommended to be extended as part of the proposed South Fork development.

6.6 N MAIN STREET (NC 7) AND N CENTRAL AVENUE

Table 6.6 summarizes the LOS, control delay and 95th percentile queue lengths at the signalized, tee-intersection of N Main Street (NC 7) and N Central Avenue. Given the skewed angle, N Main Street (NC 7) is considered the eastbound/westbound approaches with N Central Avenue the northbound approach.

Table 6.6 - N Main Street (NC 7) and N Central Avenue						
Condition	Measure	EB		WB	NB	Intersection
		EBT	EBR	WBLT	NBLR	LOS (Delay)
AM Peak Hour						
2020 Existing	LOS (Delay)	A (5.5)		B (13.8)	C (22.2)	B (12.6)
	Synchro 95th Q	143'	0'	128'	241'	
2025 Phase 1						
2025 Background	LOS (Delay)	A (6.2)		B (15.2)	C (23.0)	B (13.2)
	Synchro 95th Q	178'	0'	158'	274'	
2025 Build Ph 1	LOS (Delay)	A (6.3)		B (15.7)	C (23.1)	B (13.4)
	Synchro 95th Q	182'	0'	162'	286'	
2029 Phases 2 & 3						
2029 Background	LOS (Delay)	A (6.5)		B (16.1)	C (23.4)	B (13.6)
	Synchro 95th Q	194'	0'	171'	296'	
2029 Build Ph 2	LOS (Delay)	A (6.8)		B (17.0)	C (23.7)	B (14.1)
	Synchro 95th Q	201'	0'	177'	318'	
2029 Build Ph 3	LOS (Delay)	A (6.9)		B (17.8)	C (24.1)	B (14.4)
	Synchro 95th Q	209'	0'	185'	337'	
2034 Build +5						
2034 Build +5	LOS (Delay)	A (7.2)		B (18.4)	C (25.3)	B (15.1)
	Synchro 95th Q	219'	0'	194'	371'	
PM Peak Hour						
2020 Existing	LOS (Delay)	A (3.8)		B (10.9)	C (20.7)	A (9.2)
	Synchro 95th Q	119'	0'	120'	183'	
2025 Phase 1						
2025 Background	LOS (Delay)	A (5.0)		B (14.8)	C (22.5)	B (10.9)
	Synchro 95th Q	179'	0'	179'	255'	
2025 Build Ph 1	LOS (Delay)	A (5.1)		B (15.1)	C (22.4)	B (11.0)
	Synchro 95th Q	182'	0'	182'	261'	
2029 Phases 2 & 3						
2029 Background	LOS (Delay)	A (5.3)		B (15.6)	C (22.6)	B (11.2)
	Synchro 95th Q	193'	0'	194'	270'	
2029 Build Ph 2	LOS (Delay)	A (5.4)		B (16.1)	C (22.8)	B (11.5)
	Synchro 95th Q	198'	0'	199'	281'	
2029 Build Ph 3	LOS (Delay)	A (5.7)		B (17.4)	C (23.4)	B (12.1)
	Synchro 95th Q	204'	0'	204'	313'	
2034 Build +5						
2034 Build +5	LOS (Delay)	A (6.0)		B (18.0)	C (24.6)	B (12.7)
	Synchro 95th Q	214'	0'	214'	340'	

Table 6.6 shows the overall intersection is expected to operate at LOS B during both the AM and PM peak hours under both 2025 and 2029 background conditions.

2025 Phase 1

When the proposed Phase 1 site traffic is added to the 2025 background volumes, the overall intersection is expected to continue to operate at LOS B during both peak hours. Since Phase 1 of 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 as part of Phase 1 of the South Fork development.

2029 Phase 2

When the proposed Phase 1 and Phase 2 site traffic is added to the 2029 background volumes, the overall intersection is expected to continue to operate at LOS B during both peak hours. Since Phase 2 of 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 as part of Phase 2 of the South Fork development.

2029 Phase 3

When the proposed site traffic for full build-out is added to the 2029 background volumes, the overall intersection is expected to continue to operate at LOS B during both peak hours. **Since the proposed development is not expected to have a significant adverse impact on operations at this intersection, no mitigation improvements are recommended for the proposed South Fork development.**

6.7 S MAIN STREET AND CENTRAL AVENUE

Table 6.7 summarizes the LOS, control delay and 95th percentile queue lengths at the signalized intersection of S Main Street and Central Avenue.

Table 6.7 - S Main Street and Central Avenue											
Condition	Measure	EB			WB		NB		SB		Intersection LOS (Delay)
		EBL	EBT	EBR	WBL	WBTR	NBL	NBTR	SBL	SBTR	
AM Peak Hour											
2020 Existing	LOS (Delay)	F (171.4)			C (25.5)		B (19.4)		F (111.0)		F (97.2)
	Synchro 95th Q	94'	#774'	-	18'	104'	#130'	192'	#81'	247'	
2025 Phase 1											
2025 Background	LOS (Delay)	F (92.2)			D (42.4)		E (75.0)		F (128.5)		F (89.9)
	Synchro 95th Q	85'	#1055'	-	#116'	136'	#581'	462'	#129'	#724'	
2025 Build Ph 1	LOS (Delay)	F (93.2)			D (47.0)		E (68.9)		F (132.6)		F (89.3)
	Synchro 95th Q	93'	#1063'	-	#125'	139'	#556'	476'	#129'	#735'	
2029 Phases 2 & 3											
2029 Background	LOS (Delay)	F (105.2)			D (43.1)		F (80.2)		F (141.2)		F (99.1)
	Synchro 95th Q	91'	#1111'	-	#116'	140'	#605'	485'	#140'	#754'	
2029 Build Ph 2	LOS (Delay)	F (108.1)			D (51.9)		E (74.1)		F (149.9)		F (100.5)
	Synchro 95th Q	103'	#1128'	-	#136'	146'	#581'	512'	#140'	#776'	
2029 Build Ph 2 IMP EBR	LOS (Delay)	D (40.3)			D (53.4)		D (41.0)		E (56.6)		D (45.1)
	Synchro 95th Q	128'	481'	278'	#117'	178'	#545'	386'	#139'	#631'	
2029 Build Ph 3	LOS (Delay)	D (41.6)			D (54.3)		D (42.7)		E (64.5)		D (48.1)
	Synchro 95th Q	160'	509'	278'	#121'	214'	#545'	382'	#139'	#701'	
2034 Build +5											
2034 Build +5	LOS (Delay)	D (42.9)			E (56.9)		D (49.3)		E (71.3)		D (52.5)
	Synchro 95th Q	167'	#566'	293'	#126'	222'	#577'	404'	#147'	#743'	
PM Peak Hour											
2020 Existing	LOS (Delay)	D (45.4)			C (29.7)		D (40.3)		D (54.0)		D (43.5)
	Synchro 95th Q	81'	#407'	-	40'	230'	#321'	141'	10'	#471'	
2025 Phase 1											
2025 Background	LOS (Delay)	F (128.6)			E (67.3)		F (94.1)		F (145.3)		F (112.3)
	Synchro 95th Q	#212'	#916'	-	#154'	442'	#765'	243'	16'	#1074'	
2025 Build Ph 1	LOS (Delay)	F (125.4)			E (78.4)		F (88.0)		F (154.5)		F (113.8)
	Synchro 95th Q	#232'	#898'	-	#180'	454'	#746'	249'	16'	#1104'	
2029 Phases 2 & 3											
2029 Background	LOS (Delay)	F (141.4)			E (69.6)		F (102.1)		F (161.4)		F (122.8)
	Synchro 95th Q	#230'	#950'	-	#160'	460'	#799'	253'	16'	#1125'	
2029 Build Ph 2	LOS (Delay)	F (145.3)			F (90.9)		F (95.1)		F (176.7)		F (129.0)
	Synchro 95th Q	#268'	#943'	-	#203'	482'	#778'	265'	16'	#1172'	
2029 Build Ph 2 IMP EBR	LOS (Delay)	D (50.1)			D (52.0)		F (94.9)		F (166.5)		F (95.3)
	Synchro 95th Q	#276'	258'	280'	100'	488'	#778'	259'	16'	#1160'	
2029 Build Ph 3	LOS (Delay)	F (128.0)			E (56.8)		F (94.9)		F (193.5)		F (123.5)
	Synchro 95th Q	#404'	304'	280'	99'	#574'	#778'	259'	16'	#1242'	
2034 Build +5											
2034 Build +5	LOS (Delay)	F (164.3)			E (59.7)		F (105.0)		F (213.3)		F (142.0)
	Synchro 95th Q	#368'	314'	294'	101'	#609'	#818'	270'	18'	#1301'	
Existing/Background Storage											
					50'	350'		125'			

95th percentile volume exceeds capacity, queue may be longer

Table 6.7 shows the overall intersection is expected to operate over capacity at LOS F during both the AM and PM peak hours under both 2025 and 2029 background conditions.

The decrease in overall intersection and eastbound approach delay during the AM peak hour reflects the change in the peak-hour factors (PHFs). Field-observed PHFs were used for existing conditions, while a PHF of 0.9 was used for all future year conditions to meet [NCDOT Congestion Management Capacity Analysis Guidelines](#). The existing PHF for multiple movements, including

the eastbound left- and right-turn movements during the AM peak hour, are less than 0.76. An increase in PHF to 0.9 causes the traffic volume to be more evenly distributed throughout the 60-minute peak-hour in the model, which results in a reduction in the average approach delay. Conversely, during the PM peak hour, the weighted average PHF for the overall intersection is 0.95. A decrease in PHF from greater than 0.9 down to 0.9 can result in an increased average delay. However, the significant increase in overall intersection delay during the PM peak hour can primarily be attributed to the addition of traffic associated with approved off-site developments that are not yet fully-constructed. As shown in **Figure 4.2**, 537 off-site development trips are expected to be added to this intersection between 2020 and 2025, increasing the total entering volume at the intersection by approximately 20%.

Review of the 2025 and 2029 background analyses shows that this intersection is already over capacity on all four approaches (v/c ratio greater than 1.0) under background conditions during the PM peak hour prior to traffic being added by the proposed South Fork development.

2025 Phase 1

When the proposed Phase 1 site traffic is added to the 2025 background volumes, the overall intersection is expected to continue to operate at LOS F during both peak hours with the overall delay remaining similar to background conditions. Note that based on the signal plans provided by NCDOT, this intersection operates as an isolated, actuated traffic signal and is not part of a coordinated signal system. Therefore, the green time given to each phase adjusts each cycle to reflect the demand for that phase, which can result in minor increases or decreases amongst each approach. Since Phase 1 of 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 as part of Phase 1 of the South Fork development.

2029 Phase 2

When the proposed Phase 1 and Phase 2 site traffic is added to the 2029 background volumes, the overall intersection is expected to increase in delay while continuing to operate at LOS F during both peak hours, with the increase primarily seen for the PM peak hour where the westbound approach is expected to drop from LOS E to LOS F. Given the increase in delay for the overall intersection that is already operating at LOS F along with the LOS degradation for the westbound approach during the PM peak hour, identification of potential mitigation improvements is required.

The following improvement was identified to mitigate the operational impact and accommodate the addition of Phase 2 site traffic:

- **Eastbound right-turn lane along S Main Street with 300 feet of storage**
- **Reconfigure/restripe the existing eastbound approach to allow the through lane to serve as the continuous lane and the left-turn lane to serve as a standard turn lane pocket with 300 feet of storage**

When currently traveling eastbound along S Main Street, the single lane transitions into a left-turn lane at this intersection. The through and right-turning traffic is forced to shift over a lane, which does not meet typical driver expectations. Furthermore, the left-turn volume is the lowest of the approach volumes as compared to the through and right-turn volumes. Therefore, this approach should be reconfigured or restriped to meet driver expectations where the through lane serves as the continuous lane.

Table 6.7 shows that with this improvement in place, the overall intersection is expected to operate with less delay than background conditions during both peak hours, a significant reduction in delay

particularly during the AM peak hour where the intersection is improved to LOS D. Note that the storage length is based on Synchro 95th percentile queues.

2029 Phase 3

When the proposed site traffic for full build-out is added to the 2029 background conditions (along with Phase 2 improvements identified above), the overall intersection is expected to continue to operate at LOS D during the AM peak hour and LOS F during the PM peak hour. **Table 6.7** shows the overall intersection is expected to operate with significantly less delay as compared to 2029 background conditions during the AM peak hour and expected to operate with similar delay as compared to 2029 background conditions during the PM peak hour. **Since the capacity improvements identified in Phase 2 is shown to mitigate the operational impact and accommodate the addition of Phase 3 (full build-out) site traffic, no additional mitigation improvements are recommended for capacity purposes as part of Phase 3 of the South Fork development.**

Based on review of the Synchro 95th percentile queues, the westbound and northbound left-turn queues are expected to exceed the existing left-turn storage under both background and build-out conditions during both peak hours, and the southbound left-turn queue is expected to exceed the existing left-turn storage under both background and build-out conditions during the AM peak hour. Since the storage is exceeded under both background and build-out conditions and the proposed site is not expected to significantly extend the projected queue lengths, extension of these turn lanes is not recommended as mitigation for the proposed South Fork development.

As shown in **Table 6.7**, the eastbound left-turn queue along S Main Street is expected to increase with the addition of Phase 3 site traffic during the PM peak hour under full build-out conditions to exceed the Phase 2 recommended storage of 300 feet. **Therefore, extension of the eastbound left-turn lane along S Main Street from 300 feet to 425 feet of storage is identified to mitigate the traffic impact of Phase 3 of the proposed South Fork development. This should be considered for installation as part of the Phase 2 improvements to potentially avoid multiple phases of construction impacts.**

6.8 S MAIN STREET AND EAGLE ROAD

Table 6.8 summarizes the LOS, control delay and 95th percentile queue lengths at the signalized, tee-intersection of S Main Street and Eagle Road.

Table 6.8 - S Main Street and Eagle Road							
Condition	Measure	EB	WB		SB		Intersection
		EBLT	WBT	WBR	SBL	SBR	LOS (Delay)
AM Peak Hour							
2020 Existing	LOS (Delay)	C (30.2)	D (54.5)		E (72.6)		D (48.3)
	Synchro 95th Q	237'	#496'	-	#305'	-	
2025 Phase 1							
2025 Background	LOS (Delay)	C (29.8)	E (63.4)		E (55.7)		D (47.5)
	Synchro 95th Q	#486'	#635'	-	#298'	-	
2025 Build Ph 1	LOS (Delay)	C (31.3)	E (61.6)		E (55.6)		D (47.3)
	Synchro 95th Q	#509'	#630'	-	#295'	-	
2029 Phases 2 & 3							
2029 Background	LOS (Delay)	E (56.5)	E (74.3)		E (58.4)		E (63.7)
	Synchro 95th Q	#603'	#666'	-	#318'	-	
2029 Build Ph 2	LOS (Delay)	E (69.6)	E (75.2)		E (58.2)		E (69.8)
	Synchro 95th Q	#694'	#669'	-	#317'	-	
2029 Build Ph 3	LOS (Delay)	F (153.5)	F (110.8)		E (58.2)		F (120.7)
	Synchro 95th Q	#864'	#764'	-	#317'	-	
2029 Build Ph 3 IMP Opt 1 - WBR	LOS (Delay)	B (17.4)	C (24.3)		E (58.2)		C (26.9)
	Synchro 95th Q	426'	#389'	132'	#317'	-	
2029 Build Ph 3 IMP Opt 2 - SBR	LOS (Delay)	C (26.4)	D (51.4)		E (62.2)		D (42.3)
	Synchro 95th Q	#417'	#683'	-	#262'	73'	
2034 Build +5							
2034 Build +5	LOS (Delay)	C (22.9)	C (26.3)		E (60.8)		C (30.6)
	Synchro 95th Q	#555'	#409'	140'	#340'	-	
PM Peak Hour							
2020 Existing	LOS (Delay)	A (9.4)	C (27.9)		E (69.7)		C (29.0)
	Synchro 95th Q	130'	#672'	-	#248'	-	
2025 Phase 1							
2025 Background	LOS (Delay)	F (166.8)	F (113.8)		E (68.9)		F (124.7)
	Synchro 95th Q	#502'	#1078'	-	#283'	-	
2025 Build Ph 1	LOS (Delay)	F (167.8)	F (117.5)		E (67.8)		F (127.0)
	Synchro 95th Q	#504'	#1089'	-	#278'	-	
2029 Phases 2 & 3							
2029 Background	LOS (Delay)	F (205.0)	F (131.8)		E (72.8)		F (147.1)
	Synchro 95th Q	#552'	#1127'	-	#297'	-	
2029 Build Ph 2	LOS (Delay)	F (211.8)	F (140.6)		E (71.8)		F (154.3)
	Synchro 95th Q	#570'	#1153'	-	#294'	-	
2029 Build Ph 3	LOS (Delay)	F (289.5)	F (172.8)		E (71.8)		F (199.2)
	Synchro 95th Q	#855'	#1251'	-	#294'	-	
2029 Build Ph 3 IMP Opt 1 - WBR	LOS (Delay)	F (118.5)	F (115.1)		F (124.2)		F (117.2)
	Synchro 95th Q	#532'	#1062'	50'	#328'	-	
2029 Build Ph 3 IMP Opt 2 - SBR	LOS (Delay)	F (120.3)	F (184.9)		D (50.6)		F (148.8)
	Synchro 95th Q	#502'	#1263'	-	#197'	80'	
2034 Build +5							
2034 Build +5	LOS (Delay)	F (147.1)	F (131.7)		F (140.9)		F (137.8)
	Synchro 95th Q	#596'	#1116'	53'	#346'	-	

95th percentile volume exceeds capacity, queue may be longer

Note that based on [NCDOT Congestion Management Capacity Analysis Guidelines](#), protected/permitted left-turn phasing is typically required to be modeled using protected-only phasing for future-year analysis. However, given the intersection configuration, the

protected/permitted left-turn phasing for the eastbound approach of S Main Street was maintained in the analysis. This approach currently includes a single combination left/through lane. If the analyses were performed to include protected-only phasing, the eastbound approach would not be allowed to run concurrently with the westbound approach. The intersection would operate similar to a split-phased intersection for the eastbound and westbound approaches. Given that this phase is unlikely to be modified to protected-only left-turn phasing under the current configuration, the protected/permitted phasing was maintained for this approach.

Table 6.8 shows the overall intersection is expected to operate at LOS D during the AM peak hour and over capacity at LOS F during the PM peak hour under 2025 background conditions. Beyond 2025, the overall intersection is expected to drop from LOS D to LOS E during the AM peak hour and significantly increase delay during the PM peak hour under 2029 background conditions.

The significant increase in overall intersection delay during the PM peak hour between 2020 existing and 2025 background conditions can be attributed to the addition of traffic associated with approved off-site developments that are not yet fully constructed. As shown in **Figure 4.2**, 362 off-site development trips are expected to be added to this intersection between 2020 and 2025, increasing the total entering volume at the intersection by approximately 20%.

The significant increase in overall intersection delay during both peak hours between 2025 and 2029 background conditions reveals how constrained this intersection is under background conditions prior to traffic being added by the proposed South Fork development. The only increase in traffic between these two scenarios is an annual increase using a growth rate of one percent, which results in a relatively minor increase in traffic volume, yet significant increase in delay.

Review of the 2029 background analyses shows that this intersection is already over capacity on both the eastbound and westbound approaches of S Main Street (v/c ratio greater than 1.0) under background conditions during both peak hours prior to traffic being added by the proposed South Fork development.

2025 Phase 1

When the proposed Phase 1 site traffic is added to the 2025 background volumes, the overall intersection is expected to continue to operate at LOS D and LOS F during the AM and PM peak hours, respectively, with minimal increases in delay. Since Phase 1 of 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 as part of Phase 1 of the South Fork development.

2029 Phase 2

When the proposed Phase 1 and Phase 2 site traffic is added to the 2029 background volumes, the overall intersection is expected to continue to operate at LOS E and LOS F during the AM and PM peak hour, respectively, with relatively minimal increases in delay. As discussed in **Section 5.4**, the South Fork development plans to extend Nixon Road, which currently only provides access to the east to S Point Road (NC 273), to connect to the future Belmont-Mt. Holly Loop (Access 1). The new connection between Nixon Road and Armstrong Ford Road will likely alter some of the existing traffic patterns, particularly the Amberley residents traveling to/from the west along Armstrong Ford Road. This new connection will remove some of this traffic that is currently forced to use S Point Road (NC 273) and S Main Street, including removing some traffic from this intersection at S Main Street/Eagle Road. The removal of this traffic is reflected in **Figures 5.5** and **5.6** and offsets some of the traffic added through Phase 1 and Phase 2 of the South Fork

development. Since Phase 2 of the proposed development (with the Nixon Road extension) is not expected to have a significant adverse impact on operations at this intersection, no mitigation improvements are recommended for capacity purposes as part of Phase 2 of the South Fork development.

2029 Phase 3

When the proposed site traffic for full build-out is added to the 2029 background volumes, the overall intersection is expected to drop from LOS E to LOS F during the AM peak hour and significantly increase in delay while already operating at LOS F during the PM peak hour. Given the LOS degradation and increase in delay by more than 25% during both peak hours, identification of potential mitigation improvements is required. The following two mitigation options were considered and evaluated at this intersection to potentially mitigate the operational impact and accommodate the added Phase 3 site traffic, while minimizing disruption to the background traffic:

- Option 1 – Westbound right-turn lane along S Main Street with 150 feet of storage
- Option 2 – Southbound right-turn lane along Eagle Road with 100 feet of storage

Widening for the eastbound approach of S Main Street was also considered. However, recognizing the relatively low volume for this movement with no traffic projected to be added by the proposed site (given the circuitous route this movement would provide that Eastwood Drive instead serves) along with the narrow right-of-way and extent of impacts on either side of S Main Street necessary to widen, improvements to the eastbound approach were not further evaluated for potential mitigation.

Option 1 – Westbound Right-Turn Lane

The westbound approach of S Main Street is projected to operate over capacity as a single-lane approach with v/c ratios well over 1.0 during both peak hours; therefore, Option 1 evaluated installation of a westbound right-turn lane along S Main Street. **Table 6.8** shows that with this improvement in place, the overall intersection is expected to improve from LOS F to LOS C during the AM peak hour and reduce delay beyond background conditions during the PM peak hour.

Option 2 – Southbound Right-Turn Lane

Option 2 evaluated installation of a southbound right-turn lane along Eagle Road. **Table 6.8** shows that with this improvement in place, the overall intersection is expected to improve from LOS F to LOS D during the AM peak hour and operate with similar delay to 2029 background conditions during the PM peak hour.

Review of Phase 3 Mitigation Options

Based on review of the two mitigation options, Option 1 is expected to provide the most significant benefit to the overall intersection and mainline operations during both peak hours. Additionally, Option 2 may impact existing on-street parking along Eagle Road. **Therefore, the following improvement was identified to mitigate the operational impact and accommodate the addition of Phase 3 (full build-out) site traffic:**

- **Westbound right-turn lane along S Main Street with 150 feet of storage**

Note that the recommended storage length is based on Synchro 95th percentile queue lengths.

6.9 S MAIN STREET AND JULIA AVENUE

Table 6.9 summarizes the LOS, control delay and 95th percentile queue lengths at the unsignalized, tee-intersection of S Main Street and Julia Avenue.

Table 6.9 - S Main Street and Julia Avenue					
Condition	Measure	EB	WB	NB	
		EBTR	WBLT	NBL	NBR
AM Peak Hour					
2020 Existing	LOS (Delay)	A (0.0)	A (6.3)	F (196.5)	
	Synchro 95th Q	0'	22'	233'	-
2025 Phase 1					
2025 Background	LOS (Delay)	A (0.0)	A (4.7)	F (288.9)	
	Synchro 95th Q	0'	15'	307'	-
2025 Build Ph 1	LOS (Delay)	A (0.0)	A (4.7)	F (306.7)	
	Synchro 95th Q	0'	15'	315'	-
2029 Phases 2 & 3					
2029 Background	LOS (Delay)	A (0.0)	A (5.0)	F (361.7)	
	Synchro 95th Q	0'	16'	345'	-
2029 Build Ph 2	LOS (Delay)	A (0.0)	A (5.1)	F (402.7)	
	Synchro 95th Q	0'	17'	360'	-
2029 Build Ph 2 IMP NBL	LOS (Delay)	A (0.0)	A (5.1)	F (270.8)	
	Synchro 95th Q	0'	17'	272'	14'
2029 Build Ph 3	LOS (Delay)	A (0.0)	A (5.2)	F (477.0)	
	Synchro 95th Q	0'	18'	364'	16'
2034 Build +5					
2034 Build +5	LOS (Delay)	A (0.0)	A (5.8)	F (600.7)	
	Synchro 95th Q	0'	20'	401'	17'
PM Peak Hour					
2020 Existing	LOS (Delay)	A (0.0)	A (1.0)	F (151.4)	
	Synchro 95th Q	0'	3'	279'	-
2025 Phase 1					
2025 Background	LOS (Delay)	A (0.0)	A (1.5)	F (820.2)	
	Synchro 95th Q	0'	4'	600'	-
2025 Build Ph 1	LOS (Delay)	A (0.0)	A (1.5)	F (842.7)	
	Synchro 95th Q	0'	4'	605'	-
2029 Phases 2 & 3					
2029 Background	LOS (Delay)	A (0.0)	A (1.7)	F (965.2)	
	Synchro 95th Q	0'	4'	648'	-
2029 Build Ph 2	LOS (Delay)	A (0.0)	A (1.7)	F (Err)	
	Synchro 95th Q	0'	4'	Err	-
2029 Build Ph 2 IMP NBL	LOS (Delay)	A (0.0)	A (1.7)	F (797.1)	
	Synchro 95th Q	0'	4'	532'	11'
2029 Build Ph 3	LOS (Delay)	A (0.0)	A (2.2)	F (8064.5)	
	Synchro 95th Q	0'	4'	Err	12'
2034 Build +5					
2034 Build +5	LOS (Delay)	A (0.0)	A (2.5)	F (8069.0)	
	Synchro 95th Q	0'	5'	Err	13'

Julia Avenue was included in the study area as it was noted during the TIA Scoping Meeting that it carries a relatively high amount of traffic between S Point Road (NC 273) and Armstrong Ford Road/S Main Street, and that the proposed commercial will likely serve some of the residents located along or in the vicinity of Julia Avenue.

Table 6.9 shows the stop-controlled northbound approach of Julia Avenue currently operates, and is expected to continue to operate with long delays during both peak hours under both 2025 and 2029 background conditions. The increase in delay on the side street between existing and background conditions is due to the reduction in the gaps available to be able to turn onto the mainline, primarily caused by the non-specific background growth and some of the nearby approved development traffic.

2025 Phase 1

When the proposed Phase 1 site traffic is added to the 2025 background volumes, the northbound approach is expected to operate similar to 2025 background operations with minimal increases in delay during both peak hours. Since Phase 1 of 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 as part of Phase 1 of the South Fork development.

2029 Phase 2

When the proposed Phase 1 and Phase 2 site traffic is added to the 2029 background volumes, available gaps for the northbound approach traffic to be able to turn onto the mainline are further reduced, thus increasing the approach delay. **Table 6.9** shows the delay along Julia Avenue is well over theoretical capacity and cannot be calculated during the peak hours. 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. Currently operating as a stop-controlled intersection, the analysis shows that modifying access control at this intersection, such as installing a traffic signal, would be required to significantly reduce the side-street approach delay at this intersection during the peak hours. However, because this issue is shown prior to build-out conditions of the proposed site, signalization of this intersection is not recommended as mitigation for the impacts of the proposed development. Still, given the increased delay shown in **Table 6.9**, identification of potential mitigation improvements is required. **The following improvement was identified to mitigate the operational impact to the northbound approach associated with the Phase 2 site traffic:**

- **Northbound left-turn lane along Julia Avenue (maximize storage)**

Table 6.9 shows that with this improvement in place, the stop-controlled northbound approach of Julia Avenue is expected to be improved with less delay than 2029 background conditions during both peak hours. This turn lane would help right-turn traffic bypass the left-turn traffic and would only need to yield to the eastbound traffic, thus significantly improving delay specifically for the northbound right-turn movement.

Based on review of the SimTraffic simulation, the maximum northbound approach queues are reported to be over 1,000 feet during the PM peak hour under both 2029 background and 2029 build-out improved Phase 2 conditions. This is due to the high volume of traffic along S Main Street, limiting the number of gaps for northbound vehicles to turn left. Separating the northbound left- and right- lanes allows some right-turn traffic to bypass the left-turn traffic, thus reducing the average delay for the overall approach. However, as shown in the SimTraffic simulation, due to long northbound left-turn queues, some northbound right-turn vehicles are queued behind the northbound left-turn vehicles causing SimTraffic to report long maximum queues for both the northbound left- and right-turn movements. **Therefore, the northbound left-turn lane storage should be maximized between S Main Street and the first residential driveway along the east side of Julia Avenue (located approximately 250 feet south of S Main Street).**

Note that the existing homes along the west side of Julia Avenue are located relatively close (30 to 40 feet) from the western edge of pavement. Therefore, the construction of a northbound left-turn lane would presumably require widening of Julia Avenue to the east to avoid encroaching closer to the houses to the west.

2029 Phase 3

When the proposed site traffic for full build-out is added to the 2029 background volumes (along with the Phase 2 improvement identified above), the northbound approach delay is expected to increase while continuing to operate at LOS F during both peak hours. Given the increase in delay, identification of potential mitigation improvements is required.

Eastbound right- and westbound left-turn lanes along S Main Street were considered for mitigation for Phase 3 site traffic. With both of these turn lanes in place, the stop-controlled northbound approach delay was shown to decrease by 0.2 seconds during the PM peak hour. Furthermore, as later described in **Section 7**, based on review of auxiliary turn-lane warrants, the increase in total intersection volume from the proposed site is not expected to increase the warranted storage at this intersection. **Given the limited projected benefit along with the results of the turn-lane warrants, no additional mitigation improvements are recommended for capacity purposes as part of Phase 3 of the South Fork development.**

6.10 EAGLE ROAD AND EASTWOOD DRIVE

Table 6.10 summarizes the LOS, control delay and 95th percentile queue lengths at the unsignalized, tee-intersection of Eagle Road and Eastwood Drive.

Table 6.10 - Eagle Road and Eastwood Drive					
Condition	Measure	EB	WB	NB	
		EBTR	WBLT	NBL	NBR
AM Peak Hour					
2020 Existing	LOS (Delay)	A (0.0)	A (1.7)	F (148.1)	
	Synchro 95th Q	0'	4'	544'	-
2025 Phase 1					
2025 Background	LOS (Delay)	A (0.0)	A (1.1)	F (114.9)	
	Synchro 95th Q	0'	2'	486'	-
2025 Build Ph 1	LOS (Delay)	A (0.0)	A (1.1)	F (129.5)	
	Synchro 95th Q	0'	2'	533'	-
2029 Phases 2 & 3					
2029 Background	LOS (Delay)	A (0.0)	A (1.1)	F (146.6)	
	Synchro 95th Q	0'	3'	568'	-
2029 Build Ph 2	LOS (Delay)	A (0.0)	A (1.2)	F (172.0)	
	Synchro 95th Q	0'	3'	644'	-
2029 Build Ph 3	LOS (Delay)	A (0.0)	A (1.7)	F (275.1)	
	Synchro 95th Q	0'	4'	877'	-
2029 Build Ph 3 IMP NBL	LOS (Delay)	A (0.0)	A (1.7)	F (197.9)	
	Synchro 95th Q	0'	4'	699'	10'
2034 Build +5					
2034 Build +5	LOS (Delay)	A (0.0)	A (1.6)	F (240.6)	
	Synchro 95th Q	0'	4'	797'	10'
PM Peak Hour					
2020 Existing	LOS (Delay)	A (0.0)	A (0.8)	C (16.5)	
	Synchro 95th Q	0'	2'	35'	-
2025 Phase 1					
2025 Background	LOS (Delay)	A (0.0)	A (0.7)	C (18.1)	
	Synchro 95th Q	0'	1'	39'	-
2025 Build Ph 1	LOS (Delay)	A (0.0)	A (0.7)	C (18.8)	
	Synchro 95th Q	0'	1'	44'	-
2029 Phases 2 & 3					
2029 Background	LOS (Delay)	A (0.0)	A (0.7)	C (19.2)	
	Synchro 95th Q	0'	2'	44'	-
2029 Build Ph 2	LOS (Delay)	A (0.0)	A (0.7)	C (20.5)	
	Synchro 95th Q	0'	2'	53'	-
2029 Build Ph 3	LOS (Delay)	A (0.0)	A (1.4)	E (35.6)	
	Synchro 95th Q	0'	3'	132'	-
2029 Build Ph 3 IMP NBL	LOS (Delay)	A (0.0)	A (1.4)	D (29.4)	
	Synchro 95th Q	0'	3'	106'	5'
2034 Build +5					
2034 Build +5	LOS (Delay)	A (0.0)	A (1.4)	D (33.5)	
	Synchro 95th Q	0'	3'	121'	6'

Table 6.10 shows the stop-controlled northbound approach of Eastwood Drive currently operates, and is expected to continue to operate with long delays during the AM peak hour and short delays during the PM peak hour under both 2025 and 2029 background conditions. The long delays during the AM peak hour reflect the heavy stream of traffic traveling north towards US 74 and I-85 during the morning with over 400 vehicles making a northbound left at this intersection.

The decrease in northbound approach delay during the AM peak hour reflects the change in the peak-hour factors (PHFs). Field-observed PHFs were used for existing conditions, while a PHF of 0.9 was used for all future year conditions to meet [NCDOT Congestion Management Capacity Analysis Guidelines](#). The existing PHF for multiple movements, including one movement on all three approaches during the AM peak hour, are less than 0.70. An increase in PHF to 0.9 causes the traffic volume to be more evenly distributed throughout the 60-minute peak-hour in the model, which results in a reduction in the average approach delay.

2025 Phase 1

When the proposed Phase 1 site traffic is added to the 2025 background volumes, the stop-controlled northbound approach of Eastwood Drive is expected to operate similar to 2025 background operations with minimal increases in delay during both peak hours. Since Phase 1 of 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 as part of Phase 1 of the South Fork development.

2029 Phase 2

When the proposed Phase 1 and Phase 2 site traffic is added to the 2029 background volumes, the stop-controlled northbound approach of Eastwood Drive is expected to operate similar to 2029 background operations with relatively minor increases in delay during both peak hours. Since Phase 2 of 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 as part of Phase 2 of the South Fork development.

2029 Phase 3

When the proposed site traffic for full build-out is added to the 2029 background volumes, available gaps for the stop-controlled northbound approach traffic to be able to turn onto the mainline are further reduced, thus increasing the approach delay along Eastwood Drive, including a drop from LOS C to LOS E during the PM peak hour. 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. Currently operating as a stop-controlled intersection, the analysis shows that modifying access control at this intersection, such as installing a traffic signal, or realigning the intersection would be required to significantly reduce the side-street approach delay at this intersection during the peak hours. However, because this issue, particularly for the AM peak hour, is shown prior to build-out conditions of the proposed site, signalization of this intersection and/or realignment is not recommended as mitigation for the impacts of the proposed development. Still, given the increased delay and LOS degradation shown in **Table 6.10**, identification of potential mitigation improvements is required. **The following improvement was identified to mitigate the operational impact to the northbound approach associated with the Phase 3 site traffic:**

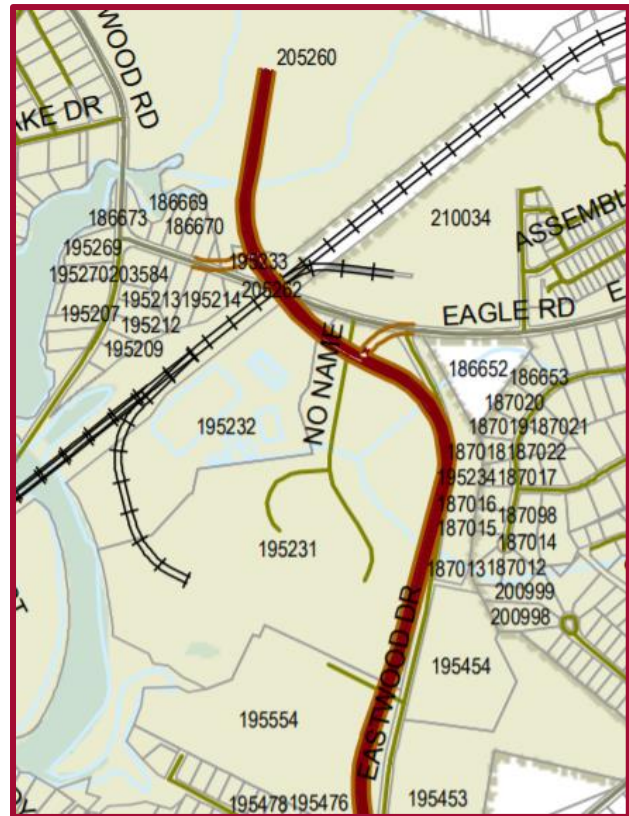
- **Northbound left-turn lane along Eastwood Drive with 100 feet of storage**

Table 6.10 shows that with this improvement in place, the stop-controlled northbound approach of Eastwood Drive is expected to be significantly improved during the AM peak hour and improved from LOS E to LOS D during the PM peak hour. This turn lane would help right-turn traffic bypass the left-turn traffic and would only need to yield to the eastbound traffic, thus significantly improving delay specifically for the northbound right-turn movement.

Note the recommended storage length is based on review of Synchro 95th percentile and SimTraffic maximum queue lengths for the northbound left- and right-turn movements. As shown in the aerial to the right, the Eastwood Drive approach is approximately 100 feet wide at its intersection with Eagle Road and tapers down to 24 feet approximately 150 feet south of Eagle Road. Therefore, the incorporation of a northbound left-turn lane with 100 feet of storage may be able to be achieved with minimal widening.



As described in **Section 4.3**, the Belmont-Mt. Holly Loop (interchangeably referred to as Belmont-Mt. Holly *Connector*) has been identified in [GCLMPO's 2045 MTP](#) as well as [Belmont's Comprehensive Land Use Plan](#) as a new four-lane boulevard and multi-use path ultimately connecting S Point Road (NC 273) in Belmont to N Main Street (NC 273) in Mount Holly. GCLMPO has specifically developed a [preliminary functional design](#) (shown in the image to the right) for the southern portion of the Belmont-Mt. Holly Loop as it has been identified as one of the corridors most threatened by development. Based on this functional design, the alignment is currently planned to realign the Eagle Road/Eastwood Drive intersection to make Eastwood Drive the mainline, free-flow approach and Eagle Road the stop-controlled approach. As shown in **Figure 5.7**, 500 vehicles are projected to turn left from Eastwood Drive onto Eagle Road during the AM peak hour under 2029 Phase 3 build-out conditions. Reconfiguring the intersection to allow Eastwood Drive to be the mainline through movement would significantly improve northbound approach operations at this intersection. This project is currently being scored for potential funding as part of NCDOT's strategic prioritization process (P6.0), which is used to update the STIP for the years 2023-2032. NCDOT is expected to complete their scoring process in April 2021 and release the Draft 2023-2032 STIP in May 2022. Since this project is not currently funded, the identified improvements were not included in the future year analyses at this intersection summarized in **Table 6.10** above. However, the identified existing issues at this intersection should still be considered when mitigation improvements are finalized.



6.11 EAGLE ROAD AND LAKEWOOD ROAD

Table 6.11 summarizes the LOS, control delay and 95th percentile queue lengths at the unsignalized, tee-intersection of Eagle Road and Lakewood Road.

Table 6.11 - Eagle Road and Lakewood Road					
Condition	Measure	WB		NB	SB
		WBL	WBR	NBTR	SBLT
AM Peak Hour					
2020 Existing	LOS (Delay)	F (293.1)		A (0.0)	A (5.8)
	Synchro 95th Q	1054'	1054'	0'	19'
2025 Phase 1					
2025 Background	LOS (Delay)	F (303.9)		A (0.0)	A (5.7)
	Synchro 95th Q	1176'	1176'	0'	15'
2025 Build Ph 1	LOS (Delay)	F (318.1)		A (0.0)	A (5.7)
	Synchro 95th Q	1220'	1220'	0'	15'
2029 Phases 2 & 3					
2029 Background	LOS (Delay)	F (365.1)		A (0.0)	A (5.8)
	Synchro 95th Q	1334'	1334'	0'	16'
2029 Build Ph 2	LOS (Delay)	F (400.9)		A (0.0)	A (5.9)
	Synchro 95th Q	1428'	1428'	0'	17'
2029 Build Ph 3	LOS (Delay)	F (479.4)		A (0.0)	A (6.7)
	Synchro 95th Q	1604'	1604'	0'	22'
2034 Build +5					
2034 Build +5	LOS (Delay)	F (577.9)		A (0.0)	A (6.9)
	Synchro 95th Q	1806'	1806'	0'	23'
PM Peak Hour					
2020 Existing	LOS (Delay)	F (117.0)		A (0.0)	A (6.3)
	Synchro 95th Q	381'	381'	0'	25'
2025 Phase 1					
2025 Background	LOS (Delay)	F (111.3)		A (0.0)	A (5.9)
	Synchro 95th Q	412'	412'	0'	23'
2025 Build Ph 1	LOS (Delay)	F (141.2)		A (0.0)	A (6.0)
	Synchro 95th Q	473'	473'	0'	24'
2029 Phases 2 & 3					
2029 Background	LOS (Delay)	F (158.7)		A (0.0)	A (6.0)
	Synchro 95th Q	508'	508'	0'	24'
2029 Build Ph 2	LOS (Delay)	F (224.4)		A (0.0)	A (6.2)
	Synchro 95th Q	622'	622'	0'	26'
2029 Build Ph 3	LOS (Delay)	F (422.5)		A (0.0)	A (6.6)
	Synchro 95th Q	939'	939'	0'	31'
2034 Build +5					
2034 Build +5	LOS (Delay)	F (535.3)		A (0.0)	A (6.8)
	Synchro 95th Q	1076'	1076'	0'	33'

Table 6.11 shows the stop-controlled westbound approach of Eagle Road currently operates, and is expected to continue to operate with long delays during both peak hours under both 2025 and 2029 background conditions. The long delays, particularly during the AM peak hour, reflect the heavy stream of traffic traveling north towards US 74 and I-85 during the morning with over 600 vehicles turning right from the westbound approach of Eagle Road onto Lakewood Road. Review of the 2025 and 2029 background analyses shows that this approach is already well over capacity (v/c ratio of 1.75) under background conditions during the AM peak hour, showing that this

approach is already constrained prior to the added traffic from the proposed South Fork development.

Note that the decrease in westbound approach delay during the PM peak hour reflects the change in the PHFs as previously discussed.

2025 Phase 1

When the proposed Phase 1 site traffic is added to the 2025 background volumes, the stop-controlled westbound approach of Eagle Road is expected to operate similar to 2025 background operations with relatively minor increases in delay during both peak hours. Based on review of **Figures 5.3** and **5.4**, Phase 1 is projected to add less than 2% of the total intersection traffic during both peak hours, including only 8 of the 700 westbound right-turn volume during the AM. Since Phase 1 of 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 as part of Phase 1 of the South Fork development.

2029 Phase 2

When the proposed Phase 1 and Phase 2 site traffic is added to the 2029 background volumes, the stop-controlled westbound approach of Eagle Road is expected to operate similar to 2029 background operations with relatively minor increases in delay during both peak hours. Based on review of **Figures 5.5** and **5.6**, Phase 2 is projected to add less than 2% of the total intersection traffic during the AM peak hour and less than 3% during the PM peak hour, including only 13 of the 731 westbound right-turn volume during the AM and 9 of the 272 during the PM peak hour. Since Phase 2 of 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 as part of Phase 2 of the South Fork development.

2029 Phase 3

When the proposed site traffic for full build-out is added to the 2029 background volumes, available gaps for the stop-controlled westbound approach traffic to be able to turn onto the mainline are reduced, thus increasing the approach delay along Eagle Road. It is typical for stop sign-controlled side streets and driveways intersecting major streets to experience long delays during peak hours. The majority of the traffic moving through the intersection on the major street experiences little or no delay. Currently operating as a stop-controlled intersection, the analysis shows that modifying access control at this intersection, such as installing a traffic signal, or realigning the intersection would be required to significantly reduce the side-street approach delay at this intersection during the peak hours. However, because this issue is shown prior to build-out conditions of the proposed site, signalization of this intersection and/or realignment is not recommended as mitigation for the impacts of the proposed development. Still, given the increased delay shown in **Table 6.11**, identification of potential mitigation improvements is required.

Since separate westbound left- and right-turn lanes are already provided along Eagle Road, the following improvements were considered and evaluated to potentially mitigate the operational impact and accommodate the added Phase 3 site traffic, while minimizing disruption to the background traffic:

- Northbound right-turn lane and southbound left-turn lane along Lakewood Road

With northbound right- and southbound left-turn lanes in place, the westbound approach delay was shown to decrease by less than 15% while continuing to operate with over 350 seconds of delay during both peak hours.

As discussed in **Section 4.3**, this intersection has been identified for improvements by the City of Belmont and GCLMPO. The Belmont-Mt. Holly Loop (interchangeably referred to as Belmont-Mt. Holly Connector) has been identified in [GCLMPO's 2045 MTP](#) as well as [Belmont's Comprehensive Land Use Plan](#) as a new four-lane boulevard and multi-use path ultimately connecting S Point Road (NC 273) in Belmont to N Main Street (NC 273) in Mount Holly. GCLMPO has specifically developed a [preliminary functional design](#) (shown in the image to the right) for the southern portion of the Belmont-Mt. Holly Loop as it has been identified as one of the corridors most threatened by development. Based on this functional design, the alignment is currently planned to realign to Lakewood Road, Eagle Road, and Eastwood Drive to allow for a direct, free-flow connection between Wilkinson Boulevard (US 74/US 29) and Armstrong Ford Road.



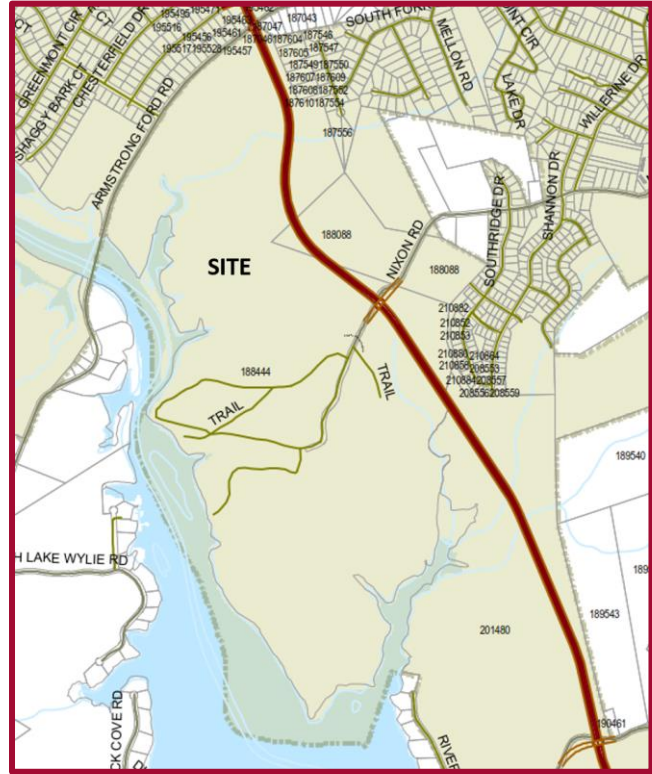
As shown in **Figure 5.7**, 752 vehicles are projected to turn right from Eagle Road onto Lakewood Road during the AM peak hour under 2029 Phase 3 build-out conditions. Reconfiguring these intersections and allowing Eagle Road to operate as the free flow through movement at Lakewood Road would significantly improve westbound approach operations at this intersection. This project is currently being scored for potential funding as part of NCDOT's strategic prioritization process (P6.0), which is used to update the STIP for the years 2023-2032. NCDOT is expected to complete their scoring process in April 2021 and release the Draft 2023-2032 STIP in May 2022. Since this project is not currently funded, the identified improvements were not included in the future year analyses at this intersection summarized in **Table 6.11** above. However, the identified existing issues at this intersection should still be considered when mitigation improvements are finalized.

No improvements are recommended as mitigation for the proposed South Fork development at this intersection based on review of the potential mitigation options discussed above and summarized below:

- Based on review of **Figures 5.7** and **5.8**, the proposed site is projected to add less than 5% of the total intersection traffic during each of the AM and PM peak hours, including only 34 of the 752 westbound right-turn volume during the AM.
- The limited projected benefit expected to be provided with the addition of both turn lanes along Lakewood Road.
- The capacity issues at this intersection is shown prior to the build-out conditions of the proposed site.
- As later described in **Section 7**, based on review of auxiliary turn-lane warrants, the increase in total intersection volume from the proposed site is not expected to increase the warranted storage at this intersection.
- Need for improvements at this intersection have already been identified by the City of Belmont and GCLMPO (Belmont-Mt. Holly Loop/Connector - **H190754**).

6.12 ARMSTRONG FORD RD AND EASTWOOD DR/ (ACCESS 1)

As discussed in **Section 4.3**, the southern portion of the planned Belmont-Mt. Holly Loop (interchangeably referred to as Belmont-Mt. Holly Connector) is a critical component that impacts this site and was discussed at the TIA Scoping Meeting as to how to appropriately incorporate into this TIA. GCLMPO has specifically developed a [preliminary functional design](#) (shown in the image to the right) for the southern portion of the Belmont-Mt. Holly Loop as it has been identified as one of the corridors most threatened by development. The intent of the boulevard is to alleviate traffic and reduce congestion along S Point Road (NC 273) by providing a new north/south alternative as the southern portion of the peninsula continues to develop. Based on this alignment, the recommended four-lane boulevard is currently planned along the eastern side of the proposed South Fork development site with a connection to Armstrong Ford Road at the existing intersection with Eastwood Drive. Based on input from the applicant, the feasibility of a connection to Armstrong Ford Road at Eastwood Drive is potentially constrained by existing residential homes on the northwest and southeast quadrants and presence of major utilities including an overhead transmission easement.



If feasible, this portion of the alignment within the proposed site is planned to be constructed as part of the proposed development to serve as both Access 1 (**Option A**) and as a spine road within the development. However, dependent on the results of a future feasibility study, this connection to Armstrong Ford Road at Eastwood Drive may be determined infeasible by City, NCDOT and GCLMPO staff, resulting in the need to provide alternative access and modify the current MTP and CTP alignments for the Belmont-Mt. Holly Loop. To continue moving the proposed South Fork development project forward, the applicant proposed an alternative access strategy that would evaluate the impacts of the proposed site under two separate access scenarios, resulting in two sets of transportation mitigation improvements. The alternative access option (**Option B**) moves Access 1 to connect to Armstrong Ford Road at Cimarron Boulevard, which would leave this intersection at Eastwood Drive as an unsignalized, tee-intersection. Two alignment alternatives for Access 1 were evaluated for the purposes of this TIA:

- **Option A** – full-movement connection to Armstrong Ford Road at Eastwood Drive
- **Option B** – full-movement connection to Armstrong Ford Road at Cimarron Boulevard

Sections 6.12A and **6.12B** below summarize the results of **Option A** as a four-legged intersection and **Option B** as a tee-intersection (maintaining the existing configuration), respectively.

6.12A Option A (Access 1 at Eastwood Drive)

Table 6.12A summarizes the LOS, control delay and 95th percentile queue lengths at the existing unsignalized, tee-intersection of Armstrong Ford Road and Eastwood Drive under existing and background conditions. Upon build-out of the proposed site under access **Option A**, Table 6.12A reflects the addition of Access 1, creating the fourth leg.

Table 6.12A - Armstrong Ford Road and Eastwood Drive/Access 1 (Option A)										
Condition	Measure	EB		WB		NB		SB		Intersection LOS (Delay)
		EBL	EBTR	WBL	WBTR	NBL	NBTR	SBL	SBTR	
AM Peak Hour										
2020 Existing	LOS (Delay)	A (6.2)		A (0.0)		-		F (146.2)		-
	Synchro 95th Q	-	31'	-	0'	-	-	-	147'	
2025 Phase 1										
2025 Background	LOS (Delay)	A (9.6)		A (0.0)		-		F (443.7)		-
	Synchro 95th Q	-	45'	-	0'	-	-	-	233'	
2025 Build Ph 1	LOS (Delay)	A (9.6)		A (0.4)		F (Err)		F (Err)		-
	Synchro 95th Q	-	45'	-	1'	-	Err	-	Err	
2025 Build Ph 1 IMP NBL + SBL	LOS (Delay)	A (9.6)		A (0.4)		F (630.0)		F (3797.6)		-
	Synchro 95th Q	-	45'	-	1'	105'	92'	Err	48'	
2029 Phases 2 & 3										
2029 Background	LOS (Delay)	B (10.4)		A (0.0)		-		F (612.3)		-
	Synchro 95th Q	-	49'	-	0'	-	-	-	270'	
2029 Build Ph 2	LOS (Delay)	B (10.6)		A (0.6)		F (4427.9)		F (Err)		-
	Synchro 95th Q	-	49'	-	2'	Err	159'	Err	91'	
2029 Build Ph 2 IMP Signal + EBL	LOS (Delay)	B (16.1)		C (31.0)		D (37.8)		D (39.4)		C (21.9)
	Synchro 95th Q	#362'	370'	-	360'	54'	70'	58'	86'	
2029 Build Ph 3	LOS (Delay)	C (20.5)		F (175.0)		F (115.8)		D (54.4)		E (69.4)
	Synchro 95th Q	#377'	418'	-	#649'	#220'	#150'	59'	#176'	
2029 Build Ph 3 IMP WBL + Prot EB/WBL	LOS (Delay)	D (46.2)		D (45.4)		E (64.6)		D (48.9)		D (48.2)
	Synchro 95th Q	#495'	#1064'	#213'	416'	#222'	158'	67'	176'	
2029 Build Ph 3 IMP WBL + Perm EB/WBL	LOS (Delay)	B (16.3)		B (15.3)		D (42.2)		C (33.0)		C (20.1)
	Synchro 95th Q	#275'	#497'	#72'	103'	#145'	99'	44'	#120'	
2034 Build +5										
2034 Build +5 (w/ Prot EB/WBL)	LOS (Delay)	D (50.5)		D (47.1)		E (68.2)		D (49.9)		D (51.5)
	Synchro 95th Q	#527'	#1134'	#213'	438'	#225'	158'	70'	178'	
PM Peak Hour										
2020 Existing	LOS (Delay)	A (2.4)		A (0.0)		-		E (40.6)		-
	Synchro 95th Q	-	7'	-	0'	-	-	-	74'	
2025 Phase 1										
2025 Background	LOS (Delay)	A (4.6)		A (0.0)		-		F (226.1)		-
	Synchro 95th Q	-	15'	-	0'	-	-	-	212'	
2025 Build Ph 1	LOS (Delay)	A (4.6)		A (0.7)		F (820.4)		F (775.7)		-
	Synchro 95th Q	-	15'	-	2'	-	146'	-	362'	
2025 Build Ph 1 IMP NBL + SBL	LOS (Delay)	A (4.6)		A (0.7)		F (491.2)		F (247.3)		-
	Synchro 95th Q	-	15'	-	2'	90'	25'	131'	116'	
2029 Phases 2 & 3										
2029 Background	LOS (Delay)	A (5.0)		A (0.0)		-		F (292.8)		-
	Synchro 95th Q	-	16'	-	0'	-	-	-	243'	
2029 Build Ph 2	LOS (Delay)	A (5.0)		A (1.4)		F (4851.7)		F (521.5)		-
	Synchro 95th Q	-	16'	-	3'	Err	56'	162'	192'	
2029 Build Ph 2 IMP Signal + EBL	LOS (Delay)	B (11.8)		D (51.3)		D (51.3)		E (74.4)		D (39.0)
	Synchro 95th Q	#136'	152'	-	#1118'	55'	57'	66'	#168'	
2029 Build Ph 3	LOS (Delay)	B (14.7)		F (206.8)		F (724.5)		F (171.5)		F (220.0)
	Synchro 95th Q	#174'	175'	-	#1415'	#437'	#261'	#89'	#297'	
2029 Build Ph 3 IMP WBL + Prot EB/WBL	LOS (Delay)	D (51.5)		F (88.1)		F (98.0)		D (44.9)		E (74.7)
	Synchro 95th Q	#239'	731'	#291'	#1371'	#410'	194'	67'	218'	
2029 Build Ph 3 IMP WBL + Perm EB/WBL	LOS (Delay)	C (25.0)		D (42.8)		E (67.8)		C (25.4)		D (39.5)
	Synchro 95th Q	#96'	268'	#148'	#673'	#222'	107'	38'	119'	
2034 Build +5										
2034 Build +5 (w/ Prot EB/WBL)	LOS (Delay)	D (54.7)		F (103.6)		F (100.9)		D (45.1)		F (83.3)
	Synchro 95th Q	#251'	#778'	#291'	#1457'	#413'	194'	70'	222'	

95th percentile volume exceeds capacity, queue may be longer
m Volume for 95th percentile queue is metered by upstream signal

Table 6.12A shows the stop-controlled southbound approach of Eastwood Drive is expected to operate with long delays during both peak hours under both 2025 and 2029 background conditions. The increase in delay on the side street between existing and background conditions is due to the reduction in the gaps available to be able to turn onto the mainline, primarily caused by the non-specific background growth and some of the nearby approved development traffic.

2025 Phase 1 (Option A)

Upon build-out of the proposed site under access **Option A**, Access 1 is proposed as the fourth leg to this unsignalized intersection. The results shown in **Table 6.12A** for 2025 Build Phase 1 (unimproved) conditions reflect a single-lane northbound approach to mirror the existing approaches.

When the proposed Phase 1 site traffic is added to the 2025 background volumes along with the addition of the fourth leg, available gaps for the southbound approach traffic to be able to turn onto the mainline are further reduced, thus increasing the approach delay, and appropriate gaps are not expected to be provided for the northbound approach of Access 1. **Table 6.12A** shows the delay along the side street approaches is well over theoretical capacity and cannot be calculated during the peak hours. 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. Still, given the significant increase in delay expected during the peak hours, identification of mitigation improvements is required. **The following improvements were identified to potentially mitigate the operational impact and accommodate the added Phase 1 site traffic, while minimizing disruption to the background traffic:**

- **Northbound left-turn lane along Access 1 with 175 feet of storage**
- **Southbound left turn lane along Eastwood Drive with 225 feet of storage**

As shown in **Table 6.12A**, while the southbound approach delay is expected to decrease with the addition of northbound and southbound left-turn lanes, the side-street approaches are still projected to operate with long delays. Currently operating as a stop-controlled intersection, the analysis shows that modifying access control at this intersection, such as installing a traffic signal, would be required to significantly reduce the side-street approach delay at this intersection during the peak hours. However, based on a preliminary peak-hour signal warrant assessment (Warrant 3), the 2025 Phase 1 **Option A** build-out volumes are not projected to satisfy the peak-hour warrant criteria. Furthermore, installation of a traffic signal would impact the eastbound/westbound approaches, which accommodate the vast majority of the traffic volume and experience little to no delay under unsignalized operations, while also introducing the potential for increased rear-end collisions. Therefore, signalization of this intersection is not recommended as mitigation for the impacts of the proposed Phase 1 of the South Fork development.

Note that the storage lengths identified above are based on review of both the Synchro 95th percentile and SimTraffic maximum queue lengths for the side-street left-turn and through/right movements.

Additionally, a minimum 175-foot internal protected stem (IPS) should be provided along the proposed Access 1 based on review of Synchro 95th percentile and SimTraffic maximum queues. The IPS is defined as the length required to be protected along the driveway stem from Armstrong Ford Road before any crossing or left-turn conflicts are allowed.

2029 Phase 2 (Option A)

When the proposed Phase 1 and 2 site traffic is added to the 2029 background volumes (along with the Phase 1 improvements identified above), appropriate gaps for the side-street traffic to turn onto the mainline are further reduced. Given the significant increase in delay expected during both peak hours, identification of mitigation improvements is required. **The following improvements were identified to mitigate the operational impact and accommodate the added Phase 2 site traffic, while minimizing disruption to the background traffic:**

- **Installation of a traffic signal**
- **Eastbound left-turn lane along Armstrong Ford Road with 375 feet of storage**

Given the expected delays shown in **Table 6.12A** under unsignalized operations, a change in operational control (such as a traffic signal) would be needed to improve operations at this intersection. With a traffic signal in place along with an eastbound left-turn lane, the overall intersection is expected to operate at LOS C and LOS D during the AM and PM peak hours, respectively. Note that RTOR operations were not allowed for modeling purposes based on [NCDOT Congestion Management Capacity Analysis Guidelines](#); with RTOR allowed, the intersection is expected to operate at LOS C or better during both peak hours.

Note that the storage length identified above is based on review of both the Synchro 95th percentile and SimTraffic maximum queue lengths. Based on a preliminary peak-hour signal warrant assessment (Warrant 3), only the PM peak hour satisfies the warrant criteria for Phase 2. A full signal warrant analysis should be conducted if a traffic signal is required for mitigation by the City and/or NCDOT at this intersection.

2029 Phase 3 (Option A)

When the proposed site traffic for full build-out is added to the 2029 background volumes (along with the Phase 1 and 2 improvements identified above), the signalized intersection is expected to significantly increase in delay and operate at LOS E during the AM peak hour and LOS F during the PM peak hour. Given the LOS degradation, identification of mitigation improvements is required. **The following improvements were identified to mitigate the operational impact and accommodate the addition of Phase 3 (full build-out) site traffic:**

- **Westbound left-turn lane along Armstrong Ford Road with 300 feet of storage**
- **Extension of the eastbound left-turn lane along Armstrong Ford Road from 375 feet to 500 feet of storage**
- **Extension of the northbound left-turn lane along Access 1 from 175 feet to 425 feet of storage (along with extension of the IPS to a minimum of 425 feet)**

The full storages identified for Phase 3 should be considered for installation as part of the applicable Phase 1 or Phase 2 improvements to potentially avoid multiple phases of construction impacts.

With these improvements in place, the overall intersection is expected to significantly improve to operate at LOS D during the AM peak hour and LOS E during the PM peak hour. Note that the recommended storage and IPS lengths are based on review of Synchro 95th percentile queue lengths.

As shown in **Table 6.12A**, the westbound approach of Armstrong Ford Road is shown to operate at LOS F during the PM peak hour under 2029 Phase 3 build improved conditions with a traffic signal and left-turn lanes on each approach. Based on review of the [NCDOT Congestion Management Capacity Analysis Guidelines](#), one of the four criteria are met for use of protected left-turn phasing for the eastbound and westbound left-turn movements. Therefore, protected

eastbound and westbound left-turn phasing was assumed for both movements. However, further evaluation of the intersection with permitted eastbound and westbound left-turn phasing shows that the overall intersection and westbound approach are both projected to operate more efficiently and operate at LOS D during the PM peak hour. Therefore, consideration should be given to allowing permitted phasing for all left-turn movements at this intersection contingent on review for appropriate sight distance design.

6.12B Option B (Access 1 at Cimarron Boulevard)

Table 6.12B summarizes the LOS, control delay and 95th percentile queue lengths at the existing unsignalized, tee-intersection of Armstrong Ford Road and Eastwood Drive under access **Option B** in which proposed Access 1 is assumed to tie into the Cimarron Boulevard intersection.

Table 6.12B - Armstrong Ford Road and Eastwood Drive (Option B)								
Condition	Measure	EB		WB		SB		Intersection LOS (Delay)
		EBL	EBTR	WBL	WBTR	SBL	SBTR	
AM Peak Hour								
2020 Existing	LOS (Delay)	A (6.2)		A (0.0)		F (146.2)		-
	Synchro 95th Q	-	31'	-	0'	-	147'	
2025 Phase 1								
2025 Background	LOS (Delay)	A (9.6)		A (0.0)		F (443.7)		-
	Synchro 95th Q	-	45'	-	0'	-	233'	
2025 Build Ph 1	LOS (Delay)	B (10.2)		A (0.0)		F (534.1)		-
	Synchro 95th Q	-	49'	-	0'	-	263'	
2025 Build Ph 1 IMP EBL + SBL	LOS (Delay)	A (3.2)		A (0.0)		F (261.4)		-
	Synchro 95th Q	49'	0'	-	0'	132'	10'	
2029 Phases 2 & 3								
2029 Background	LOS (Delay)	B (10.4)		A (0.0)		F (612.3)		-
	Synchro 95th Q	-	49'	-	0'	-	270'	
2029 Build Ph 2	LOS (Delay)	A (3.4)		A (0.0)		F (371.3)		-
	Synchro 95th Q	55'	0'	-	0'	152'	12'	
2029 Build Ph 3	LOS (Delay)	A (4.0)		A (0.0)		F (2322.8)		-
	Synchro 95th Q	76'	0'	-	0'	Err	31'	
2029 Build Ph 3 IMP Signal	LOS (Delay)	B (15.8)		C (30.6)		C (30.0)		C (20.7)
	Synchro 95th Q	m291'	m169'	-	538'	74'	110'	
2034 Build +5								
2034 Build +5	LOS (Delay)	B (15.0)		C (32.2)		C (30.1)		C (20.6)
	Synchro 95th Q	m290'	m171'	-	563'	77'	112'	
PM Peak Hour								
2020 Existing	LOS (Delay)	A (2.4)		A (0.0)		E (40.6)		-
	Synchro 95th Q	-	7'	-	0'	-	74'	
2025 Phase 1								
2025 Background	LOS (Delay)	A (4.6)		A (0.0)		F (226.1)		-
	Synchro 95th Q	-	15'	-	0'	-	212'	
2025 Build Ph 1	LOS (Delay)	A (5.2)		A (0.0)		F (265.4)		-
	Synchro 95th Q	-	17'	-	0'	-	249'	
2025 Build Ph 1 IMP EBL + SBL	LOS (Delay)	A (1.8)		A (0.0)		F (88.6)		-
	Synchro 95th Q	17'	0'	-	0'	93'	52'	
2029 Phases 2 & 3								
2029 Background	LOS (Delay)	A (5.0)		A (0.0)		F (292.8)		-
	Synchro 95th Q	-	16'	-	0'	-	243'	
2029 Build Ph 2	LOS (Delay)	A (2.0)		A (0.0)		F (121.1)		-
	Synchro 95th Q	20'	0'	-	0'	113'	69'	
2029 Build Ph 3	LOS (Delay)	A (3.5)		A (0.0)		F (323.3)		-
	Synchro 95th Q	49'	0'	-	0'	159'	224'	
2029 Build Ph 3 IMP Signal	LOS (Delay)	C (22.6)		D (45.2)		E (66.9)		D (38.6)
	Synchro 95th Q	m#275'	m315'	-	#1643'	91'	266'	
2034 Build +5								
2034 Build +5	LOS (Delay)	C (21.3)		E (57.1)		E (67.0)		D (44.3)
	Synchro 95th Q	m#236'	m255'	-	#1745'	94'	271'	

95th percentile volume exceeds capacity, queue may be longer

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

Table 6.12B shows the stop-controlled southbound approach of Eastwood Drive is expected to operate with long delays during both peak hours under both 2025 and 2029 background conditions. The increase in delay on the side street between existing and background conditions is due to the reduction in the gaps available to be able to turn onto the mainline, primarily caused by the non-specific background growth and some of the nearby approved development traffic.

2025 Phase 1 (Option B)

When the proposed Phase 1 site traffic is added to the 2025 background volumes, available gaps for the southbound approach traffic to be able to turn onto the mainline are further reduced, thus increasing the approach delay. 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. Still, given the increased delay shown in **Table 6.12B**, identification of mitigation improvements is required. **The following improvements were identified to mitigate the operational impact and accommodate the added Phase 1 site traffic, while minimizing disruption to the background traffic:**

- **Eastbound left-turn lane along Armstrong Ford Road with 175 feet of storage**
- **Southbound left turn lane along Eastwood Drive with 150 feet of storage**

Table 6.12B shows that with these improvements in place, the stop-controlled southbound approach of Eastwood Drive is expected to be improved with less delay than 2025 background conditions during both peak hours. Note that the storage lengths identified above are based on review of both the Synchro 95th percentile and SimTraffic maximum queue lengths.

2029 Phase 2 (Option B)

When the proposed Phase 1 and Phase 2 site traffic is added to the 2029 background volumes (along with the Phase 1 improvements identified above), the stop-controlled southbound approach of Eastwood Drive is expected to operate with less delay than 2029 background conditions (which does not include the turn lane improvements from Phase 1 build). Since the capacity improvements identified in Phase 1 are shown to mitigate the operational impact and accommodate the addition of Phase 2 site traffic, no additional mitigation improvements are recommended for capacity purposes as part of Phase 2 of the South Fork development.

2029 Phase 3 (Option B)

When the proposed site traffic for full build-out is added to the 2029 background volumes (along with the Phase 1 improvements identified above), appropriate gaps for the side-street traffic to turn onto the mainline are further reduced, thus increasing the southbound approach delay. Given the significant increase in delay, identification of mitigation improvements is required. **The following improvements were identified to mitigate the operational impact and accommodate the addition of Phase 3 (full build-out) site traffic, while minimizing disruption to the background traffic:**

- **Installation of a traffic signal**
- **Extension of the eastbound left-turn lane along Armstrong Ford Road from 175 feet to 425 feet of storage**

The full storage identified for Phase 3 should be considered for installation as part of the Phase 1 improvements to potentially avoid multiple phases of construction impacts.

Given the expected delays shown in **Table 6.12B** under unsignalized operations, a change in operational control (such as a traffic signal) would be needed to significantly improve operations at

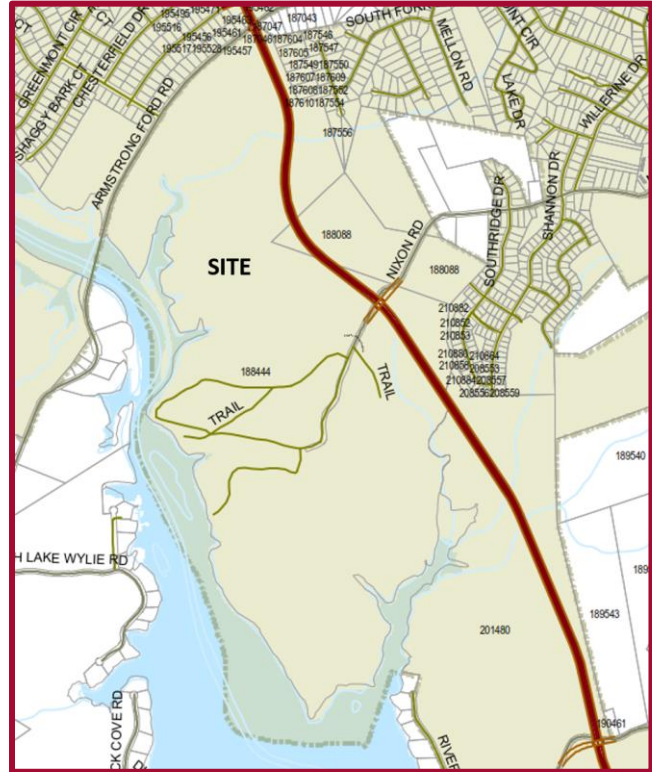
this intersection. With a traffic signal in place along with the eastbound and southbound left-turn lanes, the overall intersection is expected to operate at LOS C and LOS D during the AM and PM peak hours, respectively. Note that RTOR operations were not allowed for modeling purposes based on [NCDOT Congestion Management Capacity Analysis Guidelines](#); with RTOR allowed, the intersection is expected to operate at LOS C or better during both peak hours.

Note that the storage length identified above is based on review of both the Synchro 95th percentile and SimTraffic maximum queue lengths. Based on a preliminary peak-hour signal warrant assessment (Warrant 3), both peak hours satisfy the warrant criteria for Phase 3 (full build-out). A full signal warrant analysis should be conducted if a traffic signal is required for mitigation by the City and/or NCDOT at this intersection.

Note that as shown in **Table 6.12B**, the westbound approach queue is projected to be greater than 1,600 feet during the PM peak hour under 2029 Phase 3 build-out improved conditions with the addition of traffic signal. Based on review of the [NCDOT Congestion Management Capacity Analysis Guidelines](#), one of the four criteria are met for use of protected left-turn phasing for the eastbound left-turn movement. Therefore, the eastbound left-turn movement was assumed to operate with protected phasing. The added phase to serve the protected eastbound left-turn movement reduces available green time from the opposing westbound approach, causing the longer westbound approach delays and queues than would be expected if the eastbound left-turn movement were to instead operate with permitted phasing. Therefore, consideration should be given to allowing permitted phasing for the eastbound left-turn movement at this intersection contingent on review for appropriate sight distance design.

6.13 ARMSTRONG FORD RD AND CIMARRON BLVD/ (ACCESS 1)

As discussed in **Section 4.3**, the southern portion of the planned Belmont-Mt. Holly Loop (interchangeably referred to as Belmont-Mt. Holly *Connector*) is a critical component that impacts this site and was discussed at the TIA Scoping Meeting as to how to appropriately incorporate into this TIA. GCLMPO has specifically developed a [preliminary functional design](#) (shown in the image to the right) for the southern portion of the Belmont-Mt. Holly Loop as it has been identified as one of the corridors most threatened by development. The intent of the boulevard is to alleviate traffic and reduce congestion along S Point Road (NC 273) by providing a new north/south alternative as the southern portion of the peninsula continues to develop. Based on this alignment, the recommended four-lane boulevard is currently planned along the eastern side of the proposed South Fork development site with a connection to Armstrong Ford Road at the existing intersection with Eastwood Drive. Based on input from the applicant, the feasibility of a connection to Armstrong Ford Road at Eastwood Drive is potentially constrained by existing residential homes on the northwest and southeast quadrants and presence of major utilities including an overhead transmission easement.



If feasible, this portion of the alignment within the proposed site is planned to be constructed as part of the proposed development to serve as both Access 1 (**Option A**) and as a spine road within the development. However, dependent on the results of a future feasibility study, this connection to Armstrong Ford Road at Eastwood Drive may be determined infeasible by City, NCDOT and GCLMPO staff, resulting in the need to provide alternative access and modify the current MTP and CTP alignments for the Belmont-Mt. Holly Loop. To continue moving the proposed South Fork development project forward, the applicant proposed an alternative access strategy that would evaluate the impacts of the proposed site under two separate access scenarios, resulting in two sets of transportation mitigation improvements. The alternative access option (**Option B**) moves Access 1 to connect to Armstrong Ford Road at Cimarron Boulevard, creating the fourth leg of this existing unsignalized, tee-intersection. Two alignment alternatives for Access 1 were evaluated for the purposes of this TIA:

- **Option A** – full-movement connection to Armstrong Ford Road at Eastwood Drive
- **Option B** – full-movement connection to Armstrong Ford Road at Cimarron Boulevard

Sections 6.13A and **6.13B** below summarize the results of **Option A** as a tee-intersection (maintaining the existing configuration) and **Option B** as a four-legged intersection, respectively.

6.13A Option A (Access 1 at Eastwood Drive)

Table 6.13A summarizes the LOS, control delay and 95th percentile queue lengths at the existing unsignalized, tee-intersection of Armstrong Ford Road and Cimarron Boulevard under access Option A in which proposed Access 1 is assumed to tie into the Eastwood Drive intersection.

Table 6.13A - Armstrong Ford Road and Cimarron Boulevard (Option A)							
Condition	Measure	EB		WB		SB	
		EBLT	EBR	WBL	WBTR	SBL	SBTR
AM Peak Hour							
2020 Existing	LOS (Delay)	A (0.1)		A (0.0)		D (28.5)	
	Synchro 95th Q	0'	-	-	0'	34'	-
2025 Phase 1							
2025 Background	LOS (Delay)	A (0.3)		A (0.0)		E (49.8)	
	Synchro 95th Q	0'	-	-	0'	51'	-
2025 Build Ph 1	LOS (Delay)	A (0.3)		A (0.0)		F (53.2)	
	Synchro 95th Q	0'	-	-	0'	54'	-
2025 BuildPh 1 IMP SBR	LOS (Delay)	A (0.3)		A (0.0)		E (47.0)	
	Synchro 95th Q	0'	-	-	0'	42'	4'
2029 Phases 2 & 3							
2029 Background	LOS (Delay)	A (0.3)		A (0.0)		F (58.8)	
	Synchro 95th Q	0'	-	-	0'	61'	-
2029 Build Ph 2	LOS (Delay)	A (0.4)		A (0.0)		F (57.8)	
	Synchro 95th Q	0'	-	-	0'	52'	4'
2029 Build Ph 3	LOS (Delay)	A (0.6)		A (0.0)		F (165.2)	
	Synchro 95th Q	1'	-	-	0'	116'	5'
2034 Build +5							
2034 Build +5	LOS (Delay)	A (0.9)		A (0.0)		F (211.2)	
	Synchro 95th Q	1'	-	-	0'	131'	5'
PM Peak Hour							
2020 Existing	LOS (Delay)	A (0.8)		A (0.0)		D (32.1)	
	Synchro 95th Q	2'	-	-	0'	30'	-
2025 Phase 1							
2025 Background	LOS (Delay)	A (1.4)		A (0.0)		F (112.2)	
	Synchro 95th Q	4'	-	-	0'	80'	-
2025 Build Ph 1	LOS (Delay)	A (1.4)		A (0.0)		F (124.1)	
	Synchro 95th Q	4'	-	-	0'	85'	-
2025 BuildPh 1 IMP SBR	LOS (Delay)	A (1.4)		A (0.0)		F (99.4)	
	Synchro 95th Q	4'	-	-	0'	65'	7'
2029 Phases 2 & 3							
2029 Background	LOS (Delay)	A (1.5)		A (0.0)		F (135.9)	
	Synchro 95th Q	4'	-	-	0'	91'	-
2029 Build Ph 2	LOS (Delay)	A (1.6)		A (0.0)		F (126.4)	
	Synchro 95th Q	4'	-	-	0'	76'	8'
2029 Build Ph 3	LOS (Delay)	A (2.1)		A (0.0)		F (447.5)	
	Synchro 95th Q	5'	-	-	0'	162'	10'
2034 Build +5							
2034 Build +5	LOS (Delay)	A (2.4)		A (0.0)		F (561.1)	
	Synchro 95th Q	5'	-	-	0'	176'	10'
# 95th percentile volume exceeds capacity, queue may be longer							
m Volume for 95th percentile queue is metered by upstream signal							

Table 6.13A shows the stop-controlled southbound approach of Cimarron Boulevard is expected to operate with long delays during both peak hours under both 2025 and 2029 background conditions (with the exception of 2025 AM in which the delay is 0.2 seconds shy of LOS F). The increase in delay on the side street between existing and background conditions is due to the

reduction in the gaps available to be able to turn onto the mainline, primarily caused by the non-specific background growth and some of the nearby approved development traffic.

2025 Phase 1 (Option A)

When the proposed Phase 1 site traffic is added to the 2025 background volumes, available gaps for the southbound approach traffic to be able to turn onto the mainline are further reduced, thus increasing the approach delay. Given the LOS degradation and increased delay shown in **Table 6.13A**, identification of mitigation improvements is required. **The following improvement was identified to mitigate the operational impact and accommodate the added Phase 1 site traffic, while minimizing disruption to the background traffic:**

- **Stripe the southbound approach of Cimarron Boulevard to include a right-turn lane with a minimum of 100 feet of storage**

Table 6.13A shows that with this improvement in place, the stop-controlled southbound approach of Cimarron Boulevard is expected to be improved with less delay than 2025 background conditions during both peak hours. Note that the storage lengths identified above are based on review of both the Synchro 95th percentile and SimTraffic maximum queue lengths.

Based on measurements performed during a field visit, the southbound approach of Cimarron Boulevard (ingress/egress are separated by a landscaped median) is approximately 24 feet wide with no pavement markings (and therefore assumed to operate as a single-lane approach). The existing pavement provides opportunity to stripe exclusive right- and left-turn lanes along the southbound approach.

2029 Phase 2 (Option A)

When the proposed Phase 1 and Phase 2 site traffic is added to the 2029 background volumes (along with the Phase 1 improvement identified above), the stop-controlled southbound approach of Cimarron Boulevard is expected to operate with less delay than 2029 background conditions (which does not include the turn lane improvement from Phase 1 build). Since the capacity improvement identified in Phase 1 is shown to mitigate the operational impact and accommodate the addition of Phase 2 site traffic, no additional mitigation improvements are recommended for capacity purposes as part of Phase 2 of the South Fork development.

2029 Phase 3 (Option A)

When the proposed site traffic for full build-out is added to the 2029 background volumes (along with the Phase 1 improvement identified above), appropriate gaps for the side-street traffic to turn onto the mainline are further reduced, thus increasing the southbound approach delay. Given the increased delay, identification of potential mitigation improvements is required.

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. Currently operating as a stop-controlled intersection, the analysis shows that modifying access control at this intersection, such as installing a traffic signal, would be required to significantly reduce the side-street approach delay at this intersection during the peak hours. Based on a preliminary peak-hour signal warrant assessment (Warrant 3), the 2029 Phase 3 **Option A** build volumes are not projected to satisfy the peak-hour warrant criteria. Additionally, long delays along the southbound approach are shown prior to build-out conditions of the proposed site. Therefore, signalization of this intersection is not recommended as mitigation for the impacts of the proposed development under **Option A**.

Remaining as an unsignalized intersection, eastbound left- and westbound right-turn lanes along Armstrong Ford Road were considered to potentially mitigate the increase in delay associated with the addition of Phase 3 site traffic. Review of the mitigation analyses shows that these improvements are projected to provide minimal benefit to the southbound approach delay, projecting over 160 seconds of delay for the AM peak hour and over 400 seconds of delay for the PM peak hour.

It should also be noted that given the connectivity provided in the Timberlake neighborhood, installation of an eastbound left-turn lane could promote and increase the likelihood of cut-through traffic along Cimarron Boulevard and Timberlane Drive for drivers trying to avoid the Armstrong Ford Road/Eastwood Drive/Access 1 intersection, where a traffic signal has been identified for potential mitigation under access **Option A** as described in **Section 6.12**.

Furthermore, the traffic signal identified for potential mitigation at the Armstrong Ford Road/Eastwood Drive/Access 1 intersection under access **Option A** (described in **Section 6.12**) would provide residential traffic from the Timberlake neighborhood a safe alternative to access Armstrong Ford Road given the connection from Timberlane Drive to Eastwood Drive. Therefore, under this access scenario, the mitigation at the adjacent intersection would provide a mitigation option for the southbound approach traffic on Cimarron Boulevard.

No additional mitigation improvements are recommended at this intersection for capacity purposes as part of Phase 3 of the South Fork development based on review of the potential mitigation options discussed above and summarized below:

- Peak-hour signal warrants are not met based on the projected volumes.
- Long delays along the southbound approach are shown prior to build-out conditions of the proposed site.
- The limited projected benefit expected to be provided through installation of turn lanes along Armstrong Ford Road.
- Eastbound left-turn lane under access **Option A** could increase cut-through traffic.
- The signal under access **Option A** at Armstrong Ford Road/Eastwood Dr/Access 1 would provide a safe alternative to access Armstrong Ford Road.

6.13B Option B (Access 1 at Cimarron Boulevard)

Table 6.13B summarizes the LOS, control delay and 95th percentile queue lengths at the existing unsignalized, tee-intersection of Armstrong Ford Road and Cimarron Boulevard under existing and background conditions. Upon build-out of the proposed site under access Option B, Table 6.13B reflects the addition of Access 1, creating the fourth leg.

Table 6.13B - Armstrong Ford Road and Cimarron Boulevard/Access 1 (Option B)										
Condition	Measure	EB		WB		NB		SB		Intersection
		EBLT	EBR	WBL	WBTR	NBL	NBTR	SBL	SBTR	LOS (Delay)
AM Peak Hour										
2020 Existing	LOS (Delay)	A (0.1)		A (0.0)		-		D (28.5)		-
	Synchro 95th Q	0'	-	-	0'	-	-	34'	-	-
2025 Phase 1										
2025 Background	LOS (Delay)	A (0.3)		A (0.0)		-		E (49.8)		-
	Synchro 95th Q	0'	-	-	0'	-	-	51'	-	-
2025 Build Ph 1	LOS (Delay)	A (0.3)		A (1.0)		F (124.9)		F (167.9)		-
	Synchro 95th Q	0'	-	-	3'	-	97'	109'	-	-
2025 Build Ph 1 IMP NBL + SBL	LOS (Delay)	A (0.3)		A (1.0)		F (78.7)		F (131.1)		-
	Synchro 95th Q	0'	-	-	3'	54'	18'	79'	4'	-
2029 Phases 2 & 3										
2029 Background	LOS (Delay)	A (0.3)		A (0.0)		-		F (58.8)		-
	Synchro 95th Q	0'	-	-	0'	-	-	61'	-	-
2029 Build Ph 2	LOS (Delay)	A (0.3)		A (1.6)		F (136.5)		F (259.6)		-
	Synchro 95th Q	0'	-	-	4'	98'	36'	105'	4'	-
2029 Build Ph 2 IMP EBR + WBL	LOS (Delay)	A (0.3)		A (0.7)		F (131.8)		F (249.5)		-
	Synchro 95th Q	0'	0'	4'	0'	97'	35'	104'	4'	-
2029 Build Ph 3	LOS (Delay)	A (0.3)		A (6.6)		F (Err)		F (4366.9)		-
	Synchro 95th Q	0'	0'	66'	0'	Err	239'	Err	128'	-
2029 Build Ph 3 IMP Signal	LOS (Delay)	E (61.7)		E (61.7)		F (198.3)		E (73.8)		E (76.2)
	Synchro 95th Q	#1486'	m26'	#380'	13'	#260'	#243'	#81'	81'	-
2029 Build Ph 3 IMP Signal + 2 EBTs	LOS (Delay)	C (20.0)		C (22.9)		E (66.9)		D (50.0)		C (26.7)
	Synchro 95th Q	500'	-	#266'	21'	#188	164'	59'	75'	-
2034 Build +5										
2034 Build +5	LOS (Delay)	E (78.4)		E (60.3)		F (198.3)		E (75.9)		F (85.5)
	Synchro 95th Q	#1583'	m25'	m#368'	13'	#260'	#243'	#87'	82'	-
PM Peak Hour										
2020 Existing	LOS (Delay)	A (0.8)		A (0.0)		-		D (32.1)		-
	Synchro 95th Q	2'	-	-	0'	-	-	30'	-	-
2025 Phase 1										
2025 Background	LOS (Delay)	A (1.4)		A (0.0)		-		F (112.2)		-
	Synchro 95th Q	4'	-	-	0'	-	-	80'	-	-
2025 Build Ph 1	LOS (Delay)	A (1.4)		A (1.7)		F (155.1)		F (333.8)		-
	Synchro 95th Q	4'	-	-	3'	-	82'	130'	-	-
2025 Build Ph 1 IMP NBL + SBL	LOS (Delay)	A (1.4)		A (1.7)		F (125.2)		F (253.9)		-
	Synchro 95th Q	4'	-	-	3'	59'	4'	99'	7'	-
2029 Phases 2 & 3										
2029 Background	LOS (Delay)	A (1.5)		A (0.0)		-		F (135.9)		-
	Synchro 95th Q	4'	-	-	0'	-	-	91'	-	-
2029 Build Ph 2	LOS (Delay)	A (1.5)		A (3.1)		F (255.1)		F (406.3)		-
	Synchro 95th Q	4'	-	-	6'	108'	8'	117'	7'	-
2029 Build Ph 2 IMP EBR + WBL	LOS (Delay)	A (1.4)		A (0.5)		F (219.9)		F (379.7)		-
	Synchro 95th Q	4'	0'	6'	0'	103'	8'	115'	7'	-
2029 Build Ph 3	LOS (Delay)	A (1.2)		A (2.7)		F (Err)		F (Err)		-
	Synchro 95th Q	4'	0'	51'	0'	Err	331'	Err	131'	-
2029 Build Ph 3 IMP Signal	LOS (Delay)	D (53.0)		C (27.1)		F (89.4)		E (56.8)		D (44.4)
	Synchro 95th Q	#1053'	97'	m#340'	m435'	#400'	205'	71'	71'	-
2029 Build Ph 3 IMP Signal + 2 EBTs	LOS (Delay)	C (33.0)		C (24.2)		E (78.2)		D (52.5)		C (34.8)
	Synchro 95th Q	481'	-	m285'	m617'	#363'	198'	68'	68'	-
2034 Build +5										
2034 Build +5	LOS (Delay)	F (97.4)		C (27.7)		F (92.7)		E (57.1)		E (59.5)
	Synchro 95th Q	#1220'	97'	m#309'	m437'	#400'	205'	74'	71'	-

95th percentile volume exceeds capacity, queue may be longer
m Volume for 95th percentile queue is metered by upstream signal

Table 6.13B shows the stop-controlled southbound approach of Cimarron Boulevard is expected to operate with long delays during both peak hours under both 2025 and 2029 background conditions (with the exception of 2025 AM in which the delay is 0.2 seconds shy of LOS F). The increase in delay on the side street between existing and background conditions is due to the reduction in the gaps available to be able to turn onto the mainline, primarily caused by the non-specific background growth and some of the nearby approved development traffic.

2025 Phase 1 (Option B)

Upon build-out of the proposed site under access **Option B**, Access 1 is proposed as the fourth leg to this unsignalized intersection. The results shown in **Table 6.13B** for 2025 Build Phase 1 (unimproved) conditions reflect a single-lane northbound approach to mirror the existing approaches.

When the proposed Phase 1 site traffic is added to the 2025 background volumes along with the addition of the fourth leg, available gaps for the southbound approach traffic to be able to turn onto the mainline are further reduced, thus increasing the approach delay, and appropriate gaps are not expected to be provided for the northbound approach of Access 1 resulting in long delays. 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. Still, given the significant increase in delay expected during the peak hours, identification of mitigation improvements is required. **The following improvements were identified to potentially mitigate the operational impact and accommodate the added Phase 1 site traffic, while minimizing disruption to the background traffic:**

- **Northbound left-turn lane along Access 1 with 100 feet of storage**
- **Stripe the southbound approach of Cimarron Boulevard to include a left-turn lane with a minimum of 125 feet of storage and a shared through/right lane**

Based on measurements performed during a field visit, the southbound approach of Cimarron Boulevard (ingress/egress are separated by a landscaped median) is approximately 24 feet wide with no pavement markings (and therefore assumed to operate as a single-lane approach). The existing pavement provides opportunity to stripe an exclusive left-turn lane and a shared through/right lane along the southbound approach.

As shown in **Table 6.13B**, while the southbound approach delay is expected to decrease with the addition of northbound and southbound left-turn lanes, the side-street approaches are still projected to operate with long delays. Currently operating as a stop-controlled intersection, the analysis shows that modifying access control at this intersection, such as installing a traffic signal, would be required to significantly reduce the side-street approach delay at this intersection during the peak hours. However, based on a preliminary peak-hour signal warrant assessment (Warrant 3), the 2025 Phase 1 **Option B** build-out volumes are not projected to satisfy the peak-hour warrant criteria. Furthermore, installation of a traffic signal would impact the eastbound/westbound approaches, which accommodate the vast majority of the traffic volume and experience little to no delay under unsignalized operations, while also introducing the potential for increased rear-end collisions. Therefore, signalization of this intersection is not recommended as mitigation for the impacts of the proposed Phase 1 of the South Fork development.

Note that the storage lengths identified above are based on review of both the Synchro 95th percentile and SimTraffic maximum queue lengths at this intersection.

Additionally, a minimum 100-foot internal protected stem (IPS) should be provided along the proposed Access 1 based on review of Synchro 95th percentile and SimTraffic maximum queues. The IPS is defined as the length required to be protected along the driveway stem from Armstrong Ford Road before any crossing or left-turn conflicts are allowed.

2029 Phase 2 (Option B)

When the proposed Phase 1 and Phase 2 site traffic is added to the 2029 background volumes (along with the Phase 1 improvements identified above), appropriate gaps for the side-street traffic to turn onto the mainline are further reduced. Given the significant increase in delay expected during both peak hours, identification of mitigation improvements is required. **The following improvements were identified to mitigate the operational impact and accommodate the added Phase 2 site traffic, while minimizing disruption to the background traffic:**

- **Eastbound right-turn lane along Armstrong Ford Road with 100 feet of storage**
- **Westbound left-turn lane along Armstrong Ford Road with 100 feet of storage**

Note that the storage lengths identified above are based on review of both the Synchro 95th percentile and SimTraffic maximum queue lengths. Both of these turn lanes are also warranted based on NCDOT’s auxiliary turn lane warrants as discussed in **Section 7**.

As shown in **Table 6.13B**, while the southbound approach delay is expected to decrease with the addition of eastbound right- and westbound left-turn lanes, the side-street approaches are still projected to operate with long delays. Currently operating as a stop-controlled intersection, the analysis shows that modifying access control at this intersection, such as installing a traffic signal, would be required to significantly reduce the side-street approach delay at this intersection during the peak hours. However, based on a preliminary peak-hour signal warrant assessment (Warrant 3), the 2029 Phase 2 **Option B** build-out volumes are not projected to satisfy the peak-hour warrant criteria. Furthermore, installation of a traffic signal would impact the eastbound/westbound approaches, which accommodate the vast majority of the traffic volume and experience little to no delay under unsignalized operations, while also introducing the potential for increased rear-end collisions. Therefore, signalization of this intersection is not recommended as mitigation for the impacts of the proposed Phase 2 of the South Fork development.

Remaining as an unsignalized intersection, eastbound left- and westbound right-turn lanes along Armstrong Ford Road were also considered. Review of the mitigation analyses shows that these improvements are projected to provide minimal benefit to the southbound approach delay, projecting over 200 seconds of delay for the AM peak hour and over 350 seconds of delay for the PM peak hour.

It should also be noted that given the connectivity provided in the Timberlake neighborhood, installation of an eastbound left-turn lane could promote and increase the likelihood of cut-through traffic along Cimarron Boulevard and Timberlane Drive for drivers trying to avoid the Armstrong Ford Road/Eastwood Drive intersection.

2029 Phase 3 (Option B)

When the proposed site traffic for full build-out is added to the 2029 background volumes (along with the Phase 1 and 2 improvements identified above), appropriate gaps for the side-street traffic to turn onto the mainline are further reduced. **Table 6.13B** shows the delay along the side street approaches is well over theoretical capacity and cannot be calculated during the peak hours. Given the significant increase in delay expected during the peak hours, identification of mitigation improvements is required. **The following improvements were identified to mitigate the**

operational impact and accommodate the added Phase 3 (full build-out) site traffic, while minimizing disruption to the background traffic:

- Installation of a traffic signal
- Extension of the westbound left-turn lane along Armstrong Ford Road from 100 feet to 400 feet of storage
- Extension of the northbound left-turn lane along Access 1 from 100 feet to 425 feet of storage (along with extension of the IPS to a minimum of 425 feet)

The full storages identified for Phase 3 should be considered for installation as part of the applicable Phase 1 or Phase 2 improvements to potentially avoid multiple phases of construction impacts.

Given the expected delays shown in **Table 6.13B** under unsignalized operations, a change in operational control (such as a traffic signal) would be needed to significantly improve operations at this intersection. With a traffic signal in place along with the turn-lane improvements, the overall intersection is expected to operate at LOS E and LOS D during the AM and PM peak hours, respectively. Note that the storage lengths identified above are based on review of both the Synchro 95th percentile and SimTraffic maximum queue lengths. Based on a preliminary peak-hour signal warrant assessment (Warrant 3), both peak hours satisfy the warrant criteria for Phase 3. A full signal warrant analysis should be conducted if a traffic signal is required for mitigation by the City and/or NCDOT at this intersection.

Note that as shown in **Table 6.13B**, the eastbound approach queue is projected to be greater than 1,400 feet during the AM peak hour and greater than 1,000 feet during the PM peak hour under 2029 Phase 3 build-out improved conditions with the addition of traffic signal. Given the significant increase in eastbound approach queues associated with the signalization of Cimarron Boulevard/Access 1, additional eastbound approach mitigation was considered. An eastbound right-turn lane along Armstrong Ford Road is already identified for mitigation as part of Phase 2. As shown in **Figures 5.7** and **5.8**, since the eastbound left-turn movement is only projected to serve 5 and 26 vehicles during the AM and PM peak hours, respectively, under 2029 Phase 3 build conditions, a left-turn lane is not warranted. Therefore, consideration was given for additional eastbound through-lane capacity by potentially restriping the eastbound right-turn lane along Armstrong Ford Road to provide an eastbound through/right lane. **Table 6.13B** shows that with two eastbound through lanes in place, the eastbound approach queue is expected to drop to approximately 500 feet during both peak hours and each approach is expected to operate at LOS E or better. Therefore, **consideration should be given to potentially converting the eastbound right-turn lane to a through/right lane, providing two eastbound through lanes that would extend to Eastwood Drive with one dropping as a left-turn lane at Eastwood Drive. If required, this should be installed as part of Phase 3 to potentially reduce the long eastbound approach queues projected upon installation of the traffic signal identified for mitigation.**

6.14 S NEW HOPE RD (NC 279) AND ARMSTRONG FORD/TWIN TOPS

Table 6.14 summarizes the LOS, control delay and 95th percentile queue lengths at the signalized intersection of S New Hope Road (NC 279) and Armstrong Ford Road/Twin Tops Road. Note that under future conditions with U-5821 included, two signalized nodes are modeled per NCDOT guidelines, providing two overall intersection LOS and delay results as shown in **Table 6.14**.

Table 6.14 - S New Hope Road (NC 279) and Armstrong Ford Road/Twin Tops Road										
Condition	Measure	EB		WB		NB		SB		Intersection
		EBLTR	EBR	WBLT	WBR	NBL	NBTR	SBL	SBTR	LOS (Delay)
AM Peak Hour										
2020 Existing	LOS (Delay)	F (165.9)		E (75.9)		F (123.0)		F (100.0)		F (117.2)
	Synchro 95th Q	#480'	-	#216'	158'	2'	#1129'	#243'	97'	
2025 Phase 1										
2025 Background	LOS (Delay)	C (21.4)		C (29.0)		A (9.0)	B (13.3)	C (34.1)	B (11.8)	B (18.7)/B (15.6)
	Synchro 95th Q	-	153'	-	#128'	2'	293'	#201'	118'	
2025 Build Ph 1	LOS (Delay)	C (21.4)		C (29.7)		A (9.0)	B (13.5)	C (34.4)	B (11.8)	B (19.1)/B (15.6)
	Synchro 95th Q	-	153'	-	#142'	2'	294'	#206'	120'	
2029 Phases 2 & 3										
2029 Background	LOS (Delay)	C (21.3)		C (29.6)		A (9.0)	B (14.8)	D (35.0)	B (12.3)	C (20.0)/B (15.8)
	Synchro 95th Q	-	158'	-	#142'	2'	315'	#211'	124'	
2029 Build Ph 2	LOS (Delay)	C (21.3)		C (30.9)		A (9.0)	B (15.2)	D (35.6)	B (12.3)	C (20.7)/B (15.8)
	Synchro 95th Q	-	158'	-	#153'	2'	316'	#218'	125'	
2029 Build Ph 3	LOS (Delay)	C (21.3)		D (35.4)		A (9.0)	B (15.9)	D (40.2)	B (12.4)	C (22.8)/B (15.8)
	Synchro 95th Q	-	158'	-	#172'	2'	#347'	#235'	132'	
2034 Build +5										
2034 Build +5	LOS (Delay)	C (21.0)		D (37.3)		A (9.0)	B (18.4)	D (43.2)	B (13.1)	C (25.2)/B (16.2)
	Synchro 95th Q	-	162'	-	#180'	2'	#447'	#248'	140'	
PM Peak Hour										
2020 Existing	LOS (Delay)	C (21.4)		D (47.3)		E (56.7)		C (29.8)		D (43.8)
	Synchro 95th Q	-	65'	189'	215'	12'	#541'	#150'	202'	
2025 Phase 1										
2025 Background	LOS (Delay)	C (23.5)		C (21.4)		B (18.9)	B (18.8)	B (13.3)	A (6.3)	B (19.1)/A (7.5)
	Synchro 95th Q	-	59'	-	228'	12'	219'	119'	173'	
2025 Build Ph 1	LOS (Delay)	C (23.5)		C (21.6)		B (18.9)	B (18.9)	B (13.5)	A (6.3)	B (19.3)/A (7.5)
	Synchro 95th Q	-	59'	-	231'	12'	220'	123'	174'	
2029 Phases 2 & 3										
2029 Background	LOS (Delay)	C (23.5)		C (22.5)		B (18.8)	B (19.5)	B (13.4)	A (6.5)	C (20.0)/A (7.7)
	Synchro 95th Q	-	61'	-	#248'	12'	227'	123'	183'	
2029 Build Ph 2	LOS (Delay)	C (23.5)		C (23.1)		B (18.8)	B (19.9)	B (13.6)	A (6.5)	C (20.4)/A (7.7)
	Synchro 95th Q	-	61'	-	#261'	12'	230'	130'	184'	
2029 Build Ph 3	LOS (Delay)	C (23.5)		C (26.0)		B (18.8)	C (22.0)	B (13.8)	A (6.7)	C (22.6)/A (7.8)
	Synchro 95th Q	-	61'	-	#312'	12'	#247'	139'	194'	
2034 Build +5										
2034 Build +5	LOS (Delay)	C (24.1)		C (28.5)		B (19.1)	C (24.0)	B (13.9)	A (6.8)	C (24.5)/A (8.0)
	Synchro 95th Q	-	65'	-	#332'	13'	#291'	143'	195'	
Background Storage					325'	175'		300'		

Intersection LOS and Delay presented as Western Node (includes NBL, SBTR, EBR)/Eastern Node (includes NBT, NBR, SBL, and # 95th percentile volume exceeds capacity, queue may be longer

As discussed in **Section 4.3**, NCDOT TIP Project No. U-5821 is currently funded to widen S New Hope Road (NC 279) to a four-lane divided section with access restrictions and intersection improvements. As shown on [NCDOT's project information page](#), which includes the August 2019 public hearing maps included in the **Appendix** and shown in the image to the right, this project

includes converting the current full-movement configuration at this existing signalized intersection to a RCI where the major-street left-turn movements from S New Hope Road (NC 279) will remain; however, the minor-street left-turn and through movements from Twin Tops Road and Armstrong Ford Road will be redirected to unsignalized U-turn bulbs planned to be located approximately 1,400 feet both north and south of the main intersection at Armstrong Ford Road/Twin Tops Road. As currently planned, the left-over at Armstrong Ford Road/Twin Tops Road will be signalized and was modeled as such. An image from the most recent concept plans is shown to the right to help illustrate the planned improvements. These plans are also included in the **Appendix**.



Additionally, as noted in **Section 4.2**, the following additional improvement is required to be added to this design and installed at this future RCI as part of the approved Riverside development and was also assumed to be in place under future-year conditions:

- Westbound right-turn lane along Armstrong Ford Road with 325 feet of storage (to create dual westbound right-turn lanes)

Table 6.14 shows that with these planned improvements in place along with redirecting the minor-street left-turn and through movements, this intersection is expected to operate acceptably with the overall intersection and all approaches at LOS D or better during both peak hours through both 2025 and 2029 background conditions.

2025 Phase 1

When the proposed Phase 1 site traffic is added to the 2025 background volumes, the overall intersection is expected to continue to operate at LOS B with minimal increases in delay during both peak hours. Since Phase 1 of 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 as part of Phase 1 of the South Fork development.

2029 Phase 2

When the proposed Phase 1 and 2 site traffic is added to the 2029 background volumes, the overall intersection is expected to continue to operate at LOS C with minimal increases in delay during both peak hours. Since Phase 2 of 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 as part of Phase 2 of the South Fork development.

2029 Phase 3

When the proposed site traffic for full build-out is added to the 2029 background volumes, the overall intersection is expected to continue to operate at LOS C with minimal increases in delay during both peak hours. **Since the proposed development is not expected to have a significant adverse impact on operations at this intersection, no mitigation improvements are recommended for the proposed South Fork development.**

6.15 ARMSTRONG FORD ROAD AND ACCESS 3

Table 6.15 summarizes the LOS, control delay and 95th percentile queue lengths at the proposed unsignalized right-in/right-out intersection of Armstrong Ford Road and Access 3.

Table 6.15 - Armstrong Ford Road and Access 3					
Condition	Measure	EB		WB	NB
		EBT	EBR	WBT	NBR
AM Peak Hour					
2029 Phase 3					
2029 Build Ph 3 Opt A	LOS (Delay)	A (0.0)		A (0.0)	F (56.6)
	Synchro 95th Q	0'	-	0'	75'
2029 Build Ph 3 IMP Opt A - EBR	LOS (Delay)	A (0.0)		A (0.0)	E (46.5)
	Synchro 95th Q	0'	0'	0'	64'
2029 Build Ph 3 Opt B	LOS (Delay)	A (0.0)		A (0.0)	F (77.4)
	Synchro 95th Q	0'	-	0'	109'
2029 Build Ph 3 IMP Opt B - EBR	LOS (Delay)	A (0.0)		A (0.0)	F (660.5)
	Synchro 95th Q	0'	0'	0'	268'
2034 Build +5					
2034 Build +5 Opt A	LOS (Delay)	A (0.0)		A (0.0)	F (53.5)
	Synchro 95th Q	0'	0'	0'	72'
2034 Build +5 Opt B	LOS (Delay)	A (0.0)		A (0.0)	F (982.8)
	Synchro 95th Q	0'	0'	0'	298'
PM Peak Hour					
2029 Phase 3					
2029 Build Ph 3 Opt A	LOS (Delay)	A (0.0)		A (0.0)	C (20.1)
	Synchro 95th Q	0'	-	0'	30'
2029 Build Ph 3 IMP Opt A - EBR	LOS (Delay)	A (0.0)		A (0.0)	C (18.0)
	Synchro 95th Q	0'	0'	0'	26'
2029 Build Ph 3 Opt B	LOS (Delay)	A (0.0)		A (0.0)	C (24.4)
	Synchro 95th Q	0'	-	0'	56'
2029 Build Ph 3 IMP Opt B - EBR	LOS (Delay)	A (0.0)		A (0.0)	C (21.9)
	Synchro 95th Q	0'	0'	0'	50'
2034 Build +5					
2034 Build +5 Opt A	LOS (Delay)	A (0.0)		A (0.0)	C (18.7)
	Synchro 95th Q	0'	0'	0'	28'
2034 Build +5 Opt B	LOS (Delay)	A (0.0)		A (0.0)	C (23.4)
	Synchro 95th Q	0'	0'	0'	54'

Based on input from the applicant and reflected in the proposed site plan included in the **Appendix**, Access 3 is planned to serve the Phase 3 commercial portion of the proposed development as a proposed right-in/right-out (RIRO) driveway and assumed to be located approximately 600 feet east of Cimarron Boulevard.

Note that the two access alternatives for proposed Access 1 discussed in **Sections 6.12** and **6.13** would each impact proposed Access 3 differently as drivers would be provided different alternatives to enter/exit the commercial portion of the proposed site depending on which Access 1 alternative is selected. Therefore, Access 3 was evaluated under both access alternatives for Access 1 (**Option A** and **Option B**) and is summarized in **Table 6.15** and below.

2029 Phase 3 (Option A)

Table 6.15 shows the stop-controlled northbound approach of Access 3 is expected to operate with long delays during the AM peak hour and short delays during the PM peak hour under 2029 Phase 3 build conditions with Access 1 located east of Access 3 (**Option A**). Due to the high volume of

eastbound through traffic (over 1,200 vehicles per hour during the AM peak) being processed through a single lane along Armstrong Ford Road at this location, the exiting site traffic is shown to have difficulty finding acceptable gaps to turn right out of the site. Given the long delays projected during the AM peak hour, **the following improvement was identified to improve operations for the proposed northbound approach of Access 3:**

- **Eastbound right-turn lane along Armstrong Ford Road with 100 feet of storage**

With this improvement in place, the stop-controlled northbound approach of Access 3 is expected to operate with moderate delays during the AM peak hour and short delays during the PM peak hour. Note that this turn lane was also warranted based on NCDOT’s auxiliary turn lane warrants as discussed in **Section 7**. 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 storage length identified above is based on review of both the Synchro 95th percentile and SimTraffic maximum queue lengths.

Additionally, a minimum 100-foot internal protected stem (IPS) should be provided along the proposed Access 3 based on review of Synchro 95th percentile and SimTraffic maximum queues. The IPS is defined as the length required to be protected along the driveway stem from Armstrong Ford Road before any crossing or left-turn conflicts are allowed.

2029 Phase 3 (Option B)

Table 6.15 shows the stop-controlled northbound approach of Access 3 is expected to operate with long delays during the AM peak hour and short delays during the PM peak hour under 2029 Phase 3 build conditions with Access 1 located west of Access 3 (**Option B**). Due to the high volume of eastbound through traffic (over 1,200 vehicles per hour during the AM peak) being processed through a single lane along Armstrong Ford Road at this location, the exiting site traffic is shown to have difficulty finding acceptable gaps to turn right out of the site. Given the long delays projected during the AM peak hour, **the following improvement was identified to improve operations for the proposed northbound approach of Access 3:**

- **Eastbound right-turn lane along Armstrong Ford Road with 100 feet of storage**

Note that this turn lane was also warranted based on NCDOT’s auxiliary turn lane warrants as discussed in **Section 7**.

With this improvement in place, **Table 6.15** shows that the northbound approach delay is expected to significantly increase during the AM peak hour. However, the increase is related to the adjacent signals identified for mitigation in **Section 6.12** and **6.13** under the 2029 Phase 3 build conditions under **Option B**. The increase in delay reflected in the model is a result of queues occurring along Armstrong Ford Road at the new signals, where the model shows Access 3 as being blocked for traffic to exit the site. However, the new traffic signals will likely provide gaps in traffic along Armstrong Ford Road to exit as well as the slower traffic allowing drivers to turn out of the site. Further review of the SimTraffic simulation showed that the maximum northbound approach queue is expected to be less than 125 feet during the AM peak hour. Additionally, if long delays and queues are present along the northbound approach of Access 3 during the AM peak hour under **Option B**, the connectivity provided with the proposed site would allow drivers a safe alternative to access Armstrong Ford Road using the traffic signal identified as mitigation.

Based on review of the Synchro 95th percentile and SimTraffic maximum queue lengths, **a minimum 275-foot IPS should be provided along the proposed Access 3**. The IPS is defined as the length required to be protected along the driveway stem from Armstrong Ford Road before any crossing or left-turn conflicts are allowed.

7.0 Auxiliary Turn-Lane Warrants

Warrants for additional turn-lane improvements for unsignalized driveways 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 and 2029 background and build-out conditions are summarized by intersection below and included in the **Appendix**.

2025 Background

12. Armstrong Ford Road and Eastwood Drive

- Eastbound left-turn lane along Armstrong Ford Rd with a minimum storage length of 450’
- Westbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 75’

13. Armstrong Ford Road and Cimarron Boulevard

- Eastbound left-turn lane along Armstrong Ford Rd with a minimum storage length of 75’
- Westbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 50’

2025 Build Phase 1

12. Armstrong Ford Road and Eastwood Drive/Access 1

Option A (Access 1 at Eastwood Drive)

- Eastbound left-turn lane along Armstrong Ford Rd with a minimum storage length of 450’
- Westbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 75’
- Eastbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 50’
- Westbound left-turn lane along Armstrong Ford Rd with a minimum storage length of 50’

The proposed site is not expected to increase the warranted storage for the eastbound left- or westbound right-turn lanes at this intersection; therefore, extension of the eastbound left- or westbound right-turn lanes is **not recommended** as mitigation for Phase 1 of the proposed South Fork development under access **Option A**.

Based on [NCDOT Congestion Management Capacity Analysis Guidelines](#), full storage for both right- and left-turn lanes should accommodate a minimum of 100 feet. Based on coordination with NCDOT staff, since the turn-lane warrant does not meet the 100-foot minimum, an eastbound right- and westbound left-turn lane along Armstrong Ford Road are **not recommended** as mitigation for Phase 1 of the proposed South Fork development under access **Option A**.

Option B (Access 1 at Cimarron Boulevard)

- Eastbound left-turn lane along Armstrong Ford Rd with a minimum storage length of 500’
- Westbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 75’

As discussed in **Section 6.12**, an eastbound left-turn lane along Armstrong Ford Road with **175 feet of storage** is identified as mitigation for capacity purposes for Phase 1 of the proposed South Fork development under access **Option B**. Since the proposed site is expected to increase the warranted storage by 50 feet, additional storage beyond the 175 feet identified in **Section 6.12** is not recommended as mitigation for Phase 1 of the proposed South Fork development.

The proposed site is not expected to increase the warranted storage for the westbound right-turn lane; therefore, extension of the westbound right-turn lane is **not recommended** as mitigation for Phase 1 of the proposed South Fork development under access **Option B**.

13. Armstrong Ford Road and Cimarron Boulevard/Access 1

Option A (Access 1 at Eastwood Drive)

- Eastbound left-turn lane along Armstrong Ford Rd with a minimum storage length of 75'
- Westbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 50'

The proposed site is not expected to increase the warranted storage for either turn lane at this intersection; therefore, extension of these turn lanes is **not recommended** as mitigation for Phase 1 of the proposed South Fork development under access **Option A**.

Option B (Access 1 at Cimarron Boulevard)

- Eastbound left-turn lane along Armstrong Ford Rd with a minimum storage length of 75'
- Westbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 50'
- Eastbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 50'
- Westbound left-turn lane along Armstrong Ford Rd with a minimum storage length of 50'

The proposed site is not expected to increase the warranted storage for the eastbound left- or westbound right-turn lanes at this intersection; therefore, extension of the eastbound left- or westbound right-turn lanes is **not recommended** as mitigation for Phase 1 of the proposed South Fork development under access **Option B**.

Based on [NCDOT Congestion Management Capacity Analysis Guidelines](#), full storage for both right- and left-turn lanes should accommodate a minimum of 100 feet. Based on coordination with NCDOT staff, since the turn-lane warrant does not meet the 100-foot minimum, an eastbound right- and westbound left-turn lane along Armstrong Ford Road are **not recommended** as mitigation for Phase 1 of the proposed South Fork development under access **Option B**.

2029 Background

12. Armstrong Ford Road and Eastwood Drive

- Eastbound left-turn lane along Armstrong Ford Rd with a minimum storage length of 500'
- Westbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 75'

13. Armstrong Ford Road and Cimarron Boulevard

- Eastbound left-turn lane along Armstrong Ford Rd with a minimum storage length of 75'
- Westbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 50'

2029 Build Phase 2

12. Armstrong Ford Road and Eastwood Drive/Access 1

Option A (Access 1 at Eastwood Drive)

As described in **Section 6.12**, this intersection is identified for signalization as part of Phase 2 of the proposed South Fork development under access **Option A**; auxiliary turn lane warrants are not applicable for signalized intersections.

Option B (Access 1 at Cimarron Boulevard)

- Eastbound left-turn lane along Armstrong Ford Rd with a minimum storage length of 500'
- Westbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 75'

The proposed site is not expected to increase the warranted storage for the eastbound left- or westbound right-turn lanes at this intersection; therefore, extension of the eastbound left- or westbound right-turn lanes is **not recommended** as mitigation for Phase 2 of the proposed South Fork development under access **Option B**.

13. Armstrong Ford Road and Cimarron Boulevard/Access 1

Option A (Access 1 at Eastwood Drive)

- Eastbound left-turn lane along Armstrong Ford Rd with a minimum storage length of 75'
- Westbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 50'

The proposed site is not expected to increase the warranted storage for either turn lane at this intersection; therefore, extension of these turn lanes is **not recommended** as mitigation for Phase 2 of the proposed South Fork development under access **Option A**.

Option B (Access 1 at Cimarron Boulevard)

- Eastbound left-turn lane along Armstrong Ford Rd with a minimum storage length of 75'
- Westbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 50'
- Eastbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 50'
- Westbound left-turn lane along Armstrong Ford Rd with a minimum storage length of 75'

The proposed site is not expected to increase the warranted storage for the eastbound left- or westbound right-turn lanes at this intersection; therefore, extension of the eastbound left- or westbound right-turn lanes is **not recommended** as mitigation for Phase 2 of the proposed South Fork development under access **Option B**.

As discussed in **Section 6.13**, eastbound right- and westbound left-turn lanes along Armstrong Ford Road with **100 feet of storage** are identified as mitigation for capacity purposes for Phase 1 of the proposed South Fork development under access **Option B** which would accommodate the warranted storage for both turn lanes.

2029 Build Phase 3

12. Armstrong Ford Road and Eastwood Drive/Access 1

Option A (Access 1 at Eastwood Drive)

As described in **Section 6.12**, this intersection is identified for signalization as part of Phase 2 of the proposed South Fork development under access **Option A**; auxiliary turn lane warrants are not applicable for signalized intersections.

Option B (Access 1 at Cimarron Boulevard)

As described in **Section 6.12**, this intersection is identified for signalization as part of Phase 3 of the proposed South Fork development under access **Option B**; auxiliary turn lane warrants are not applicable for signalized intersections.

13. Armstrong Ford Road and Cimarron Boulevard/Access 1

Option A (Access 1 at Eastwood Drive)

- Eastbound left-turn lane along Armstrong Ford Rd with a minimum storage length of 100'
- Westbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 75'

The proposed site is expected to increase the warranted storage for the eastbound left-turn lane by 25 feet yet is not projected to add traffic to this movement. As discussed in **Section 6.13**, addition of an eastbound left-turn lane is expected to provide only minimal benefit to intersection operations, while also increasing the likelihood of cut-through traffic along Cimarron Boulevard and Timberlane Drive given the connectivity provided in the Timberlake neighborhood. Therefore, an eastbound left-turn lane is **not recommended** as mitigation for the proposed South Fork development under access **Option A**.

The proposed site is expected to increase the warranted storage for the westbound right-turn lane by from 50 feet to 75 feet. Based on [NCDOT Congestion Management Capacity Analysis Guidelines](#), full storage for both right- and left-turn lanes should accommodate a minimum of 100 feet. Based on coordination with NCDOT staff, since the turn-lane warrant does not meet the 100-foot minimum, a westbound right-turn lane along Armstrong Ford Road is **not recommended** as mitigation for the proposed South Fork development under access **Option A**.

Option B (Access 1 at Cimarron Boulevard)

As described in **Section 6.13**, this intersection is identified for signalization as part of Phase 3 of the proposed South Fork development under access **Option B**; auxiliary turn lane warrants are not applicable for signalized intersections.

15. Armstrong Ford Road and Access 3

Option A (Access 1 at Eastwood Drive)

- Eastbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 100'

As discussed in **Section 6.15**, an eastbound right-turn lane along Armstrong Ford Road with **100 feet of storage** is identified as mitigation for capacity purposes for Phase 3 of the proposed South Fork development under access **Option A** which would accommodate the warranted storage for the eastbound right-turn lane.

Option B (Access 1 at Cimarron Boulevard)

- Eastbound right-turn lane along Armstrong Ford Rd with a minimum storage length of 75'

As discussed in **Section 6.15**, an eastbound right-turn lane along Armstrong Ford Road with **100 feet of storage** is identified as mitigation for capacity purposes for Phase 3 of the proposed South Fork development under access **Option B** which would accommodate the warranted storage for the eastbound right-turn lane.

8.0 Crash Data Analysis

Crash data was obtained at the study intersections for crashes that occurred between May 1, 2016, and April 30, 2019. Over this three-year period, 130 total crashes were reported at the existing study intersections. The breakdown of crashes at these study intersections 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	5
Class C	16
Property Damage Only	109
Total	130

Table 8.1 above shows the total number of crashes by severity type from most to least severe. As shown, 84% of the crashes over the past three 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 – Crash Frequency Summary

Location	Crashes/100 MEV
2. S Point Rd (NC 273) and S Point HS/Red Raider Run	32.38
3. S Point Rd (NC 273) and R L Stowe Rd/Nixon Rd	61.52
4. Keener Blvd (NC 273) and R L Stowe Rd/Ft William Ave	119.23
5. Keener Blvd/Park St (NC 273) and Catawba St (NC 7)	48.17
6. N Main St (NC 7) and N Central Ave	18.01
7. S Main St and Central Ave	115.33
8. S Main St and Eagle Rd	6.62
9. S Main St and Julia Ave	32.22
10. Eagle Rd and Eastwood Dr	16.61
11. Eagle Rd and Lakewood Rd	137.52
12. Armstrong Ford Rd and Eastwood Dr	65.22
13. Armstrong Ford Rd and Cimarron Blvd	21.74
14. S New Hope Rd (NC 279) and Armstrong Ford Rd	23.30
Average	56.06

Table 8.2 shows the crash rates at the study area intersections resulted in a weighted average crash rate of 56.06 crashes per 100 million entering vehicles (MEV), with the highest rates occurring at two of the signalized intersections at Keener Boulevard (NC 273)/R L Stowe Road/Ft William Avenue and S Main Street/Central Avenue, along with one unsignalized intersection of Eagle

Road/Lakewood Road. There have been 32, 24, and 14 total crashes reported over this three-year period at these three intersections, respectively.

Table 8.3 – Crash Type Summary

Crash Type	2. S Point Rd (NC 273) and S Point HS/Red Raider Run	3. S Point Rd (NC 273) and R L Stowe Rd/Nixon Rd	4. Keener Blvd (NC 273) and R L Stowe Rd/Ft William Ave	5. Keener Blvd/Park St (NC 273) and Catawba St (NC 7)	6. N Main St (NC 7) and N Central Ave	7. S Main St and Central Ave	8. S Main St and Eagle Rd	9. S Main St and Julia Ave	10. Eagle Rd and Eastwood Dr	11. Eagle Rd and Lakewood Rd	12. Armstrong Ford Rd and Eastwood Dr	13. Armstrong Ford Rd and Cimarron Blvd	14. S New Hope Rd (NC 279) and Armstrong Ford Rd
Angle	1	2	1	4	0	6	0	1	0	0	0	0	0
Fixed Object	0	0	0	1	0	0	0	0	0	0	1	0	0
Left-Turn, Different	0	0	0	1	0	1	0	1	1	1	0	0	1
Left-Turn, Same Roadway	0	0	0	1	0	2	0	0	0	0	2	0	1
Other Collision with Vehicle	0	0	0	1	0	0	0	0	0	0	0	0	0
Ran off Road - Left	1	0	0	0	0	0	0	0	0	0	0	0	0
Ran off Road - Right	0	0	0	0	0	3	0	0	0	1	1	1	0
Rear End, Slow or Stop	2	10	30	9	4	9	1	1	0	12	2	1	2
Rear End, Turn	0	1	0	0	0	0	0	0	0	0	0	0	1
Right-Turn, Different	0	1	0	0	0	1	0	0	0	0	0	0	0
Right-Turn, Same Roadway	0	0	0	0	0	1	0	0	0	0	0	0	0
Sideswipe, Same Direction	1	0	0	1	1	1	0	0	0	0	0	0	0
Sideswipe, Opposite	0	0	0	1	0	0	0	0	0	0	0	0	0
Total	5	13	32	19	5	24	1	3	1	14	6	2	5

The most common crash types within the study area were rear-end collisions caused by slowing or stopping vehicles, making up 63% of total crashes. Rear-end collisions are often associated with higher levels of congestion at both signalized and unsignalized intersections. As shown in **Table 8.3**, rear-end collisions were most prevalent at two of the signalized intersections at S Point Road (NC 273)/R L Stowe Road/Nixon Road and Keener Boulevard (NC 273)/R L Stowe Road/Ft William Avenue, along with one unsignalized intersection of Eagle Road/Lakewood Road.

As discussed in **Section 4.2** and **6.3**, a southbound right-turn lane along S Point Road (NC 273) is required to be installed at the intersection with R L Stowe Road/Nixon Road as part of the approved Amberley development. Furthermore, an eastbound right-turn lane along Nixon Road has been identified to mitigate the operational impact of the proposed South Fork development traffic. These two intersection improvements would be expected to address safety issues at this intersection by increasing capacity and improving mobility. In addition to these two specific intersection improvements, as discussed in **Section 4.3**, this intersection has also been identified for improvements by the City of Belmont and GCLMPO through a roadway widening project along S Point Road (NC 273) (H184813), which is currently being scored for potential funding. Based on GCLMPO’s Draft P6.0 Project Submittal List, project H184813 includes widening S Point Road (NC 273) from two to four lanes between Henry Chapel Road and R L Stowe Road/Nixon Road.

As discussed in **Section 4.2** and **6.4**, the northbound approach of R L Stowe Road is required to be restriped at the intersection with Keener Boulevard (NC 273) to provide a shared left/through lane and an exclusive right-turn lane with permitted-overlap phasing, required as part of the approved Chronicle Mill development. There is a very heavy northbound right-turn demand at this intersection; however, because the right-turn movement is currently combined with the through movement, there is no permitted-overlap phase, requiring these drivers to stop when red before turning. Restriping this approach to provide a shared left/through lane and an exclusive right-turn lane along with the addition of permitted-overlap phasing for the right-turn movement would allow vehicles to more fluidly progress through the intersection and would be expected to reduce rear-end crashes on this approach.

As discussed in **Section 4.3**, the intersection of Eagle Road/Lakewood Road has been identified for improvements by the City of Belmont and GCLMPO as part of the planned Belmont-Mt. Holly Loop. Based on [GCLMPO's preliminary functional design](#), the alignment is currently planned to realign to Lakewood Road, Eagle Road, and Eastwood Drive to allow for a direct, free-flow connection between Wilkinson Boulevard (US 74/US 29) and Armstrong Ford Road. Reconfiguring

these intersections and allowing Eagle Road to operate as the free flow through movement at Lakewood Road would significantly improve westbound approach operations at this intersection, allowing vehicles to more fluidly progress through the intersection and would be expected to reduce rear-end crashes.

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

9.0 Mitigation Improvements

Based on the capacity analyses performed at each of the identified study intersections, along with review of the auxiliary turn-lane warrants and crash analyses contained herein, the following improvements are identified to mitigate the impact of the proposed development on the adjacent street network:

PHASE 1 (2025)

12. Armstrong Ford Road and Eastwood Drive/ (Access 1)

Option A (Access 1 at Eastwood Drive)

- Southbound left turn lane along Eastwood Drive with 225 feet of storage
- Northbound left-turn lane and a shared through/right lane along Access 1
 - Provide a minimum of 175 feet of storage for the northbound left-turn lane
- Provide a 175-foot internal protected stem (IPS) along Access 1

Option B (Access 1 at Cimarron Boulevard)

- Eastbound left-turn lane along Armstrong Ford Road with 175 feet of storage
- Southbound left turn lane along Eastwood Drive with 150 feet of storage

13. Armstrong Ford Road and Cimarron Boulevard/ (Access 1)

Option A (Access 1 at Eastwood Drive)

- Stripe the southbound approach of Cimarron Boulevard to include a right-turn lane with a minimum of 100 feet of storage

Option B (Access 1 at Cimarron Boulevard)

- Stripe the southbound approach of Cimarron Boulevard to include a left-turn lane with a minimum of 125 feet of storage and a shared through/right lane
- Northbound left-turn lane and a shared through/right lane along Access 1
 - Provide a minimum of 100 feet of storage for the northbound left-turn lane
- Provide a 100-foot internal protected stem (IPS) along Access 1

PHASE 2 (2029)

7. S Main Street and Central Avenue

- Eastbound right-turn lane along S Main Street with 300 feet of storage
- Reconfigure/restripe the existing eastbound approach along S Main Street to allow the through lane to serve as the continuous lane and the left-turn lane to serve as a standard turn lane pocket with 300 feet of storage

9. S Main Street and Julia Avenue

- Northbound left-turn lane along Julia Avenue with storage maximized between S Main Street and the first residential driveway along the east side of Julia Avenue (located approximately 250 feet south of S Main Street)

12. Armstrong Ford Road and Eastwood Drive/ (Access 1)

Option A (Access 1 at Eastwood Drive)

- Installation of a traffic signal
- Eastbound left-turn lane along Armstrong Ford Road with 375 feet of storage

13. Armstrong Ford Road and Cimarron Boulevard/ (Access 1)

Option B (Access 1 at Cimarron Boulevard)

- Eastbound right-turn lane along Armstrong Ford Road with 100 feet of storage
- Westbound left-turn lane along Armstrong Ford Road with 100 feet of storage

PHASE 3 (2029)

3. S Point Road (NC 273) and R L Stowe Road/Nixon Road

- Eastbound right-turn lane along Nixon Road with 100 feet of storage

Given the four total driveways along Nixon road, this improvement should be coordinated with City and High School staff to determine if the easternmost South Point High School driveway could potentially be eliminated by rerouting the buses to one of the other three existing driveways along Nixon Road.

7. S Main Street and Central Avenue

- Extension of the eastbound left-turn lane along S Main St from 300 feet to 425 feet of storage

The full storage identified for Phase 3 should be considered for installation as part of the Phase 2 improvements to potentially avoid multiple phases of construction impacts.

8. S Main Street and Eagle Road

- Westbound right-turn lane along S Main Street with 150 feet of storage

10. Eagle Road and Eastwood Drive

- Reconfigure the existing northbound approach of Eastwood Drive to provide a northbound left-turn lane with 100 feet of storage

12. Armstrong Ford Road and Eastwood Drive/ (Access 1)

Option A (Access 1 at Eastwood Drive)

- Westbound left-turn lane along Armstrong Ford Road with 300 feet of storage
- Extension of the eastbound left-turn lane along Armstrong Ford Road from 375 feet to 500 feet of storage
- Extension of the northbound left-turn lane along Access 1 from 175 feet to 425 feet of storage
- Extension of the IPS along Access 1 from 175 feet to 425 feet

The full storages identified for Phase 3 should be considered for installation as part of the applicable Phase 1 or Phase 2 improvements to potentially avoid multiple phases of construction impacts.

Option B (Access 1 at Cimarron Boulevard)

- Installation of a traffic signal
- Extension of the eastbound left-turn lane along Armstrong Ford Road from 175 feet to 425 feet of storage

The full storage identified for Phase 3 should be considered for installation as part of the Phase 1 improvements to potentially avoid multiple phases of construction impacts.

13. Armstrong Ford Road and Cimarron Boulevard/ (Access 1)

Option B (Access 1 at Cimarron Boulevard)

- Installation of a traffic signal
- Extension of the westbound left-turn lane along Armstrong Ford Road from 100 feet to 400 feet of storage
- Extension of the northbound left-turn lane along Access 1 from 100 feet to 425 feet of storage
- Extension of the IPS along Access 1 from 100 feet to 425 feet

Consideration should be given to potentially converting the eastbound right-turn lane to a through/right lane, providing two eastbound through lanes along Armstrong Ford Road that would extend to Eastwood Drive with one dropping as a left-turn lane at Eastwood Drive. If required, this should be installed as part of Phase 3 to potentially reduce the long eastbound approach queues projected upon installation of the traffic signal identified for mitigation.

The full storages identified for Phase 3 should be considered for installation as part of the applicable Phase 1 or Phase 2 improvements to potentially avoid multiple phases of construction impacts.

15. Armstrong Ford Road and Access 3

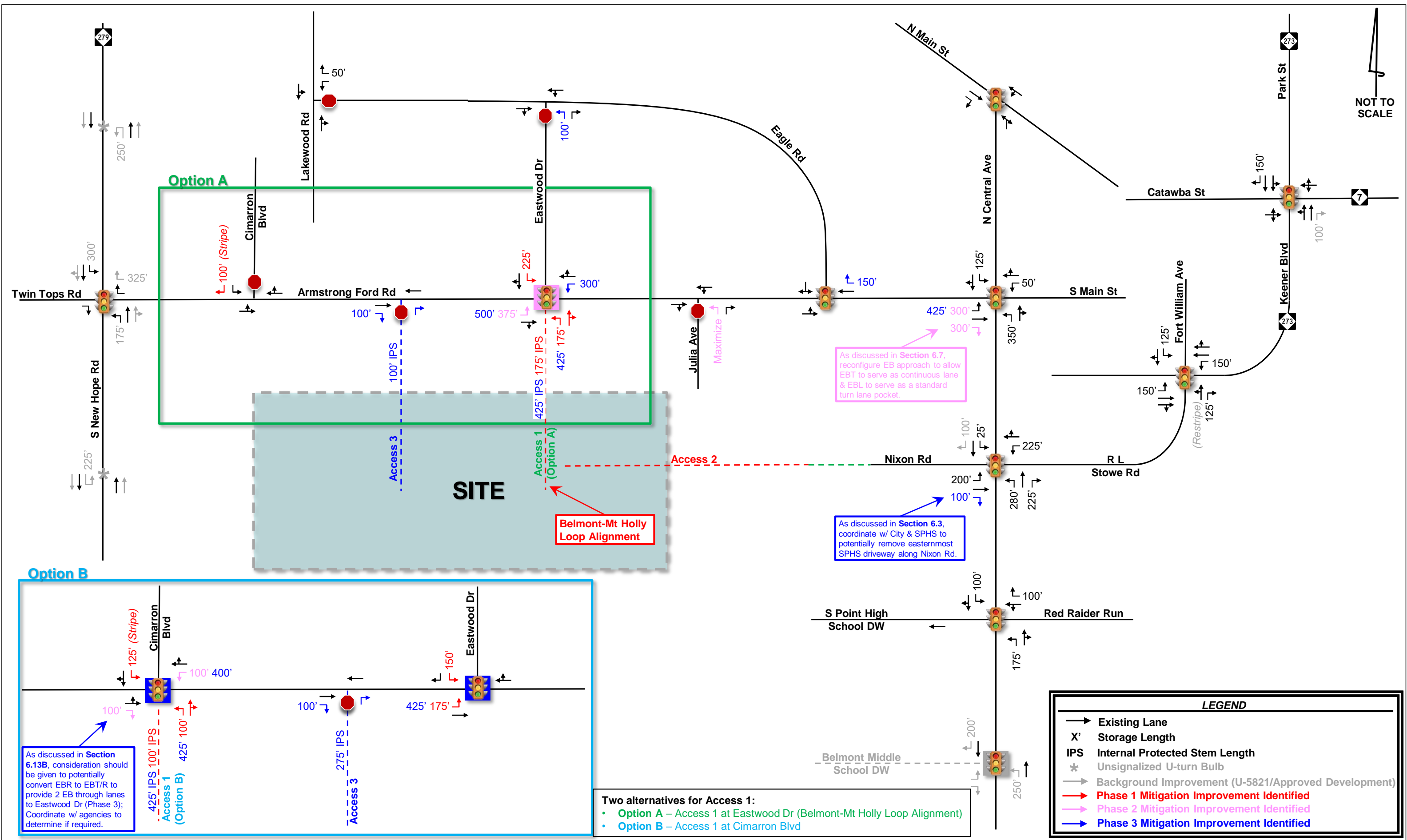
Option A (Access 1 at Eastwood Drive)

- Eastbound right-turn lane along Armstrong Ford Road with 100 feet of storage
- Single northbound right-out only egress lane and a single ingress lane along Access 3
- Provide a 100-foot internal protected stem (IPS) along Access 3

Option B (Access 1 at Cimarron Boulevard)

- Eastbound right-turn lane along Armstrong Ford Road with 100 feet of storage
- Single northbound right-out only egress lane and a single ingress lane along Access 3
- Provide a 275-foot internal protected stem (IPS) along Access 3

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 Belmont. 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.



APPENDIX