

FRIENDSHIP ROAD HOT SPOT INTERCHANGE STUDY



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EXECUTIVE SUMMARY

The NC Capital Area Metropolitan Planning Organization (CAMPO) is conducting a hot spot study on Friendship Road at US 1. The project limits include the proposed Friendship Road interchange at US 1 and proposed Friendship Road on new location from the existing Friendship Road in the Town of Holly Springs to Old US Hwy 1 in the Town of Apex.

The Friendship Road Hot Spot feasibility study addresses transportation strategies for the proposed Friendship Road interchange, including local mobility, connectivity, and ongoing and future land use relationships for the rapidly growing areas of the Town of Apex and the Town of Holly Springs. This study uses the currently adopted TRM 6.2, which is based on the CAMPO's 2050 MTP, to predict future traffic volumes for the roadway network and proposed improvements. The need for a four-lane median divided roadway was confirmed through evaluations that included a comparison of existing traffic volumes and future traffic forecast without and with the proposed US 1 interchange.

Surrounding land uses, environmental features, interchange spacing on US 1, and the proximity of the proposed US 1 interchange to the Friendship Road bridge were evaluated to determine the appropriate interchange location. Once the appropriate interchange location was determined, six distinct interchange types were evaluated to determine the best-fit interchange:

- Alternative 1 Tight Diamond (includes the replacement of Friendship Road bridge)
- Alternative 2 Tight Diamond with Roundabouts (includes the replacement of Friendship Road bridge)
- Alternative 3 Partial Cloverleaf with a Loop in the Southeast Quadrant
- Alternative 4 Standard Diamond (includes the removal of the Friendship Road bridge)
- Alternative 5 Tight Diamond with a New Access to the Amgen Facility
- Alternative 6 Tight Diamond with a New Access to the Amgen Facility and New Intersection at Friendship Road

An evaluation matrix was prepared to assist in preliminary decisions on location of the interchange and recommended interchange alternatives. The evaluation matrix (including stakeholder input, traffic/safety analyses, nearby developments, proximity to the Friendship Road bridge, environmental features, utility, right of way, and planning costs) assisted in recommending two best-fit interchanges – interchange alternatives 1 and 6.

Interchange Alternative 1 Tight Diamond consists of a six-lane roadway typical section divided by a median. Interchange Alternative 6 Tight Diamond with a New Access to the Amgen Facility and New Intersection at Friendship Road consists of a six-lane roadway typical section divided by a median. Both interchange configurations accommodate four through lanes, two left-turn lanes to access US 1, and bicycle and pedestrian facilities.

Jurisdictional responsibility and the extent of right of way preservation would conform to limits and right of way dimensions determined by interchange alternatives 1 and 6 and each municipality's roadway right of way requirements.

1 INTRODUCTION

The NC Capital Area Metropolitan Planning Organization (CAMPO) is conducting a hot spot study on Friendship Road at US 1. The Friendship Road Hot Spot project limits include the proposed Friendship Road interchange at US 1 and proposed Friendship Road on new location from the existing Friendship Road in the Town of Holly Springs to Old US Hwy 1 in the Town of Apex. The study limits for the purpose of roadway network traffic modeling and traffic forecasting include the New Hill Holleman Road (and US 1 interchange) to the west, the intersection of Friendship Road and Holly Springs New Hill Road to the south, NC 540 (and US 1 interchange) to the east, and Olive Chapel Road to the north.

The Friendship Road Hot Spot feasibility study addresses transportation strategies for the proposed Friendship Road interchange, including local mobility, connectivity, and ongoing and future land use relationships for the rapidly growing areas of the Town of Apex and the Town of Holly Springs. The study identifies the existing roadway network and proposed roadway and pedestrian/bicyclist improvements, analyzes traffic models/forecasts for the transportation network, evaluates the appropriate location of the proposed Friendship Road interchange at US 1, evaluates interchange alternatives and new Friendship Road roadway alignments in Holly Spring and in Apex, and determines the best-fit interchange and roadway alignments.

This study would support the North Carolina Department of Transportation's (NCDOT's) procedure in developing interchange justification studies and preparing an Interchange Justification Report (IJR). This feasibility study would also support the process of advancing the proposed Friendship Road interchange at US 1 for inclusion in the State Transportation Implementation Plan (STIP).

The Friendship Road Hot Spot Interchange is evaluated in three phases:

- Tech Memo 1 – Existing and future years analysis
- Tech Memo 2 – Project feasibility analysis
- Tech Memo 3 – Project impact analysis

Tech Memo 1 identifies and evaluates existing land use and traffic conditions and will determine future traffic volumes on the no-build and build roadway networks. Tech Memo 2 identifies and evaluate the feasibility of appropriate transportation improvements, focusing interchange location, interchange operations, corridor and alignment options, and safety of the new roadway and future roadway and mobility network. Tech Memo 3 identifies and develops sound concepts and determine the best fit interchange. Key elements from each tech memo contributed to this feasibility study report. The complete tech memos are included in Appendix A.



Figure 1. US 1 from the Friendship Road Bridge

At the study area, US 1 is a four-lane highway divided by a 36-foot grass median, with 12-foot paved shoulders on both sides. Adjacent interchanges are New Hill Holleman Road to the south and NC 540 to the north. Friendship Road is a two-lane undivided highway, with four-foot shoulders (two-foot paved) on both sides. The Friendship Road and Holly Springs New Hill Road intersection is a T-intersection that includes a stop sign for the westbound lane of Holly Springs New Hill Road. At the intersection, Friendship Road includes a shared through and right turn lane northbound and a shared through and left turn lane southbound and Holly Springs New Hill Road includes a shared left/right turn lane. Friendship Road continues south to a T-intersection with New Hill Holleman Road and continues north to a T-intersection with Woods Creek Road and further north on a bridge over US 1. The Friendship Road bridge over US 1 maintains the two-lane undivided roadway and does not provide access to US 1.

2 PLAN AND LAND USE REVIEWS

2.1 Plan Review

Proposed roadway improvements and existing travel conditions within the study area were obtained from reviews of the following key sources:

- The 2050 Metropolitan Transportation Plan (MTP)
- The Triangle Regional Model v6.2 (TRM)
- Traffic Impact Analyses (TIA) from nearby existing and planned developments: Amgen Manufacturing, Friendship Innovation Master Plan, Carolina Springs, Woods Creek Elementary, Duke Energy Operations, Fire Station #3, Green Oaks Tech Center, Oakview Innovation, and Goodwin Industrial in Holly Springs; Friendship Station, Retreat at Friendship, Friendship Village, Gracewood, Apex Friendship Elementary School, Apex Friendship High School in Apex.
- Holly Springs Comprehensive Transportation Plan (CTP) – Bicycle/Pedestrian Component (2011)
- Town of Holly Springs' Bicycle and Pedestrian System Plans 2022
- Traffic forecasts from nearby NCDOT projects U-6066, U-5981 and B-5321
- Town of Apex's planned Richardson Road Improvements
- Wake County Greenway Plan (2016)
- 2019 Southwest Area Study

2.2 Land Use Review

Existing and future land uses within the study area and nearby traffic generators outside of the study area were documented from review of geographic information system (GIS) data and field observations as follows:

- Town of Apex Interactive Development Map
- Friendship Station Subdivision Plans
- The Friendship Innovation Master Plan
- New Hill Subdivision Master Plan
- Amgen manufacturing facility plans
- Fujifilm Diosynth Biotechnologies manufacturing facility plans
- CAMPO Webmaps
- Wake County Imaps
- The North Carolina Department of Natural and Cultural Resources' HPOWEB 2.0



Figure 2. Amgen facility roadway construction

Community and environmental features within the study area include:

- Harris Lake County Park
- Wake County Fire Training Center
- Oakview Elementary School
- Holly Springs Fire Station No. 3
- New Hill Historic District
- Apex Friendship High School
- Little White Oak Creek
- White Oak Creek
- Farmlands along Friendship Road and Boscoe Road in Apex
- Duke Energy Utility Easements
- CSX Transportation Railway



Figure 3. Holly Springs Fire Station No. 3

Land uses, proposed developments, and community and environmental features are shown in the Project Location Map in Figure 4.

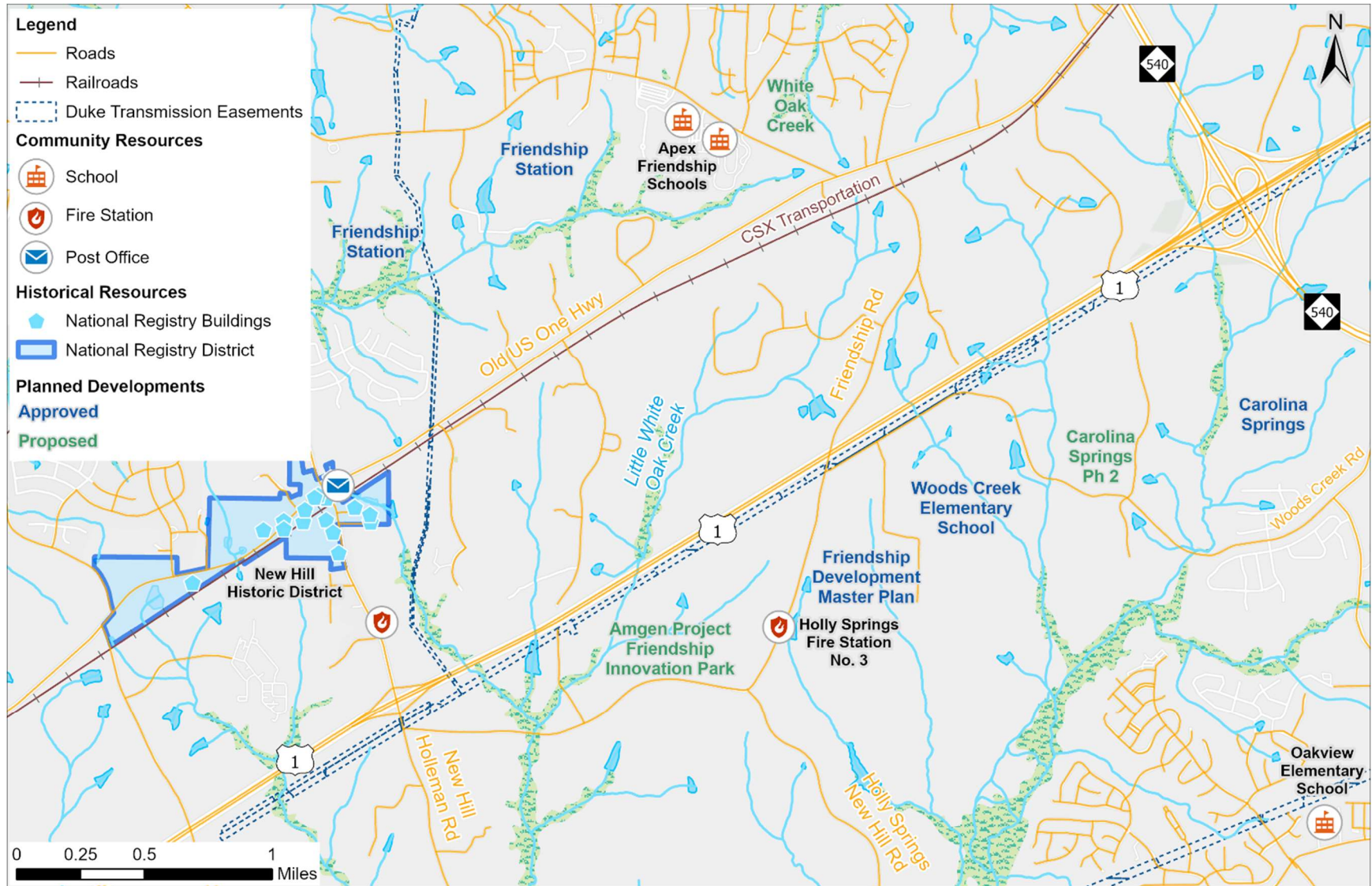


Figure 4. Project Location Map

3 TRAVEL DEMAND MODEL

As a major metropolitan and urbanized area, CAMPO utilizes the TRM for projecting future traffic volumes and transit ridership for transportation planning and for regional transportation funding. This study uses the currently adopted TRM version, TRM 6.2, which is based on the CAMPO's 2050 MTP. All traffic modeling files are available through CAMPO's project SharePoint site.

3.1 Review of Model Network and Socio-Economic Data

Traffic evaluation for the proposed Friendship Road interchange and new Friendship Road alignments is based on 2050 socio-economic data, and towns of Holly Springs and Apex CTPs and the 2050 MTP roadway networks near the study area.

Growth analysis considered development plans provided by the towns of Holly Springs and Apex and the 2050 total population and employment in seven traffic analysis zones (TAZs) near the study area. Since the total population and employment growths from 2020 to 2050 are consistent with proposed development growth, no changes are needed to the 2050 socio-economic data.

Daily traffic volumes considered traffic volumes from the 2050 MTP model run and traffic volumes from recently completed TIAs for major developments near the study area. The location of major developments within TAZs and proposed site access plans from TIAs were included in the evaluation; minor changes to the 2050 MTP model network included adjustments to centroid connector loadings.

3.2 Network Scenarios

Three different network scenarios were modeled for this feasibility study:

- No Build – 2050 MTP network without the Friendship Road interchange and new Friendship Road
- MTP – 2050 MTP network with Friendship Road interchange and new Friendship Road
- MTP+ – 2050 MTP network with the Friendship Road interchange, new Friendship Road and two additional projects from the Apex CTP
 - Richardson Road New Location from Old US 1 Hwy to Humie Olive Road
 - Richardson Road widening from Humie Olive Road to Olive Chapel Road

The two additional projects were included to evaluate future US 1/Friendship Road interchange traffic volumes with the extension of Richardson Road. Both the Richardson Road New Location and the Richardson Road widening are assumed four-lane median divided roadways, with posted speeds of 45 mph, based on traffic forecasts and for scenario comparison. The Apex CTP indicated a four-lane median divided roadway including a side path for the Richardson Road New Location from Old US 1 Hwy to Humie Olive Road. The need for a four-lane median divided roadway was confirmed through evaluations that included a comparison of existing traffic volumes and future traffic forecast with and without the proposed US 1 interchange.

Figure 5 shows projects in the three network scenarios. Project A represents the Friendship Road interchange and new Friendship Road. Project B represents Richardson Road New Location from Old US 1 Hwy to Humie Olive Road. Project C represents Richardson Road widening from Humie Olive Road to Olive Chapel Road. The No Build scenario does not include any of the projects. The MTP scenario includes project A only. The MTP+ scenario includes all three projects A, B and C.

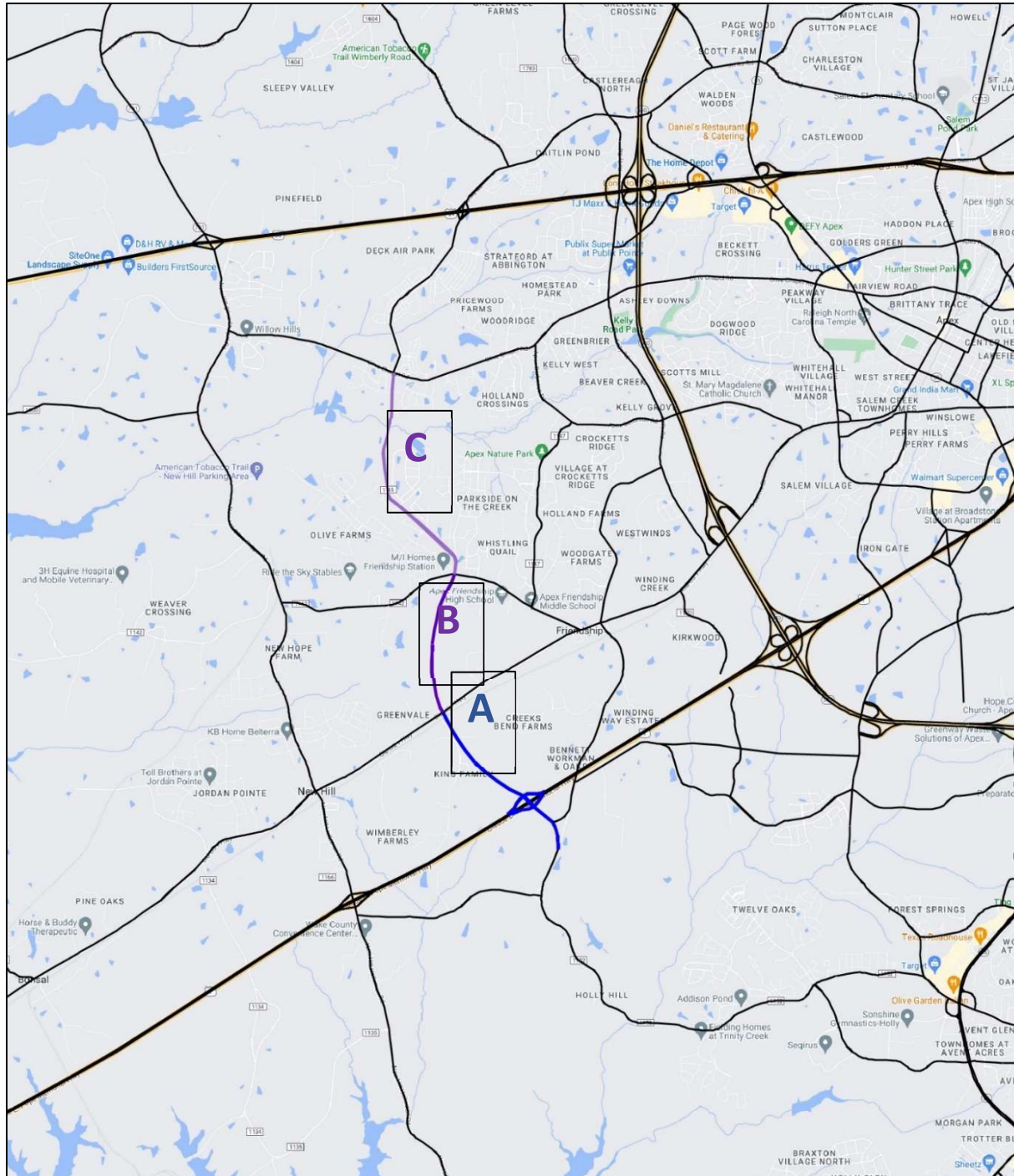


Figure 5. Model Network Scenarios

3.3 Model Volumes

Table 1 compares model daily volumes for key links for No-Build, MTP and MTP+ scenarios.

Table 11. Daily Volumes from Model

Roadway	Location	2050 No Build	2050 MTP	2050 MTP+
US 1	West of New Hill Holleman Rd	58,100	57,500	57,800
	Between New Hill Holleman Rd and Proposed Friendship Rd Interchange	76,500	76,700	76,200
	Between Proposed Friendship Rd Interchange and NC 540	76,500	84,400	86,500
	East of NC 540	90,400	94,800	94,200
Old US 1 Hwy	West of New Hill Holleman Rd	7,500	7,400	6,800
	Between New Hill Holleman Rd and Proposed Friendship Rd Intersection	12,600	10,700	8,200
	East of Proposed Friendship Rd Intersection	8,700	9,300	7,300
NC 540	North of Old US 1 Hwy / S Salem St	73,800	73,600	71,300
	Between Old US 1 Hwy and US 1	86,900	88,100	83,300
	South of US 1	64,800	63,500	62,800
Proposed Friendship Rd New Alignment	North of Old US 1 Hwy	-	-	21,100
	Between Old US 1 Hwy and US 1	-	11,700	21,000
	South of US 1	-	14,300	16,900
	North of Friendship Rd	7,000	15,200	17,200
New Hill Holleman Rd	North of US 1	31,200	23,000	21,200
	South of US 1	46,000	40,500	40,000
	South of Friendship Rd	37,100	36,800	37,000
Other	Holly Springs New Hill Rd South of Friendship Rd	7,300	7,800	8,900
	Old Holly Springs Apex Rd west of NC 540	38,600	36,400	36,100
	Old Holly Springs Apex Rd east of NC 540	19,400	18,400	18,200

3.6 Peak Hour Volume Estimates

Daily (24-hour) and peak hour (AM and PM) traffic volumes were estimated for the No-Build, the MTP, and the MTP+ scenarios. The estimated daily traffic volumes were based on the 2050 TRM. Details on TRM scenario assumptions and outputs are included in Appendix A, Tech Memo 1.

3.6.1 Estimated 2050 Daily Traffic Volumes

The estimated 2050 daily traffic volumes considered NCDOT's Annual Average Daily Traffic (AADT) volumes, nearby traffic forecasts, recent traffic counts, and TIAs provided by the towns of Holly Springs and Apex. Traffic design factors including design hour factor (K), peak hour directional split (D), and direction of peak for AM and PM were subsequently developed from these data.

Figure 6, Figure 7, and Figure 8 show estimated 2050 daily traffic volumes for the No Build, MTP scenario, and MTP+ scenario, respectively.

3.6.2 Estimated 2050 Peak Hour Traffic Volumes

The estimated 2050 peak hour volumes considered daily volume estimates and traffic design factors in the calculation. The calculation included the NCDOT's Intersection Analysis Utility (IAU) spreadsheet to determine peak hour turn movement traffic volumes at interchanges and intersections within the study area. Estimated peak hour traffic volumes were used for traffic operations and capacity analysis.

Figure 9, Figure 10, and Figure 11 show estimated 2050 peak hour traffic volumes the No Build, MTP scenario, and MTP+ scenario, respectively.



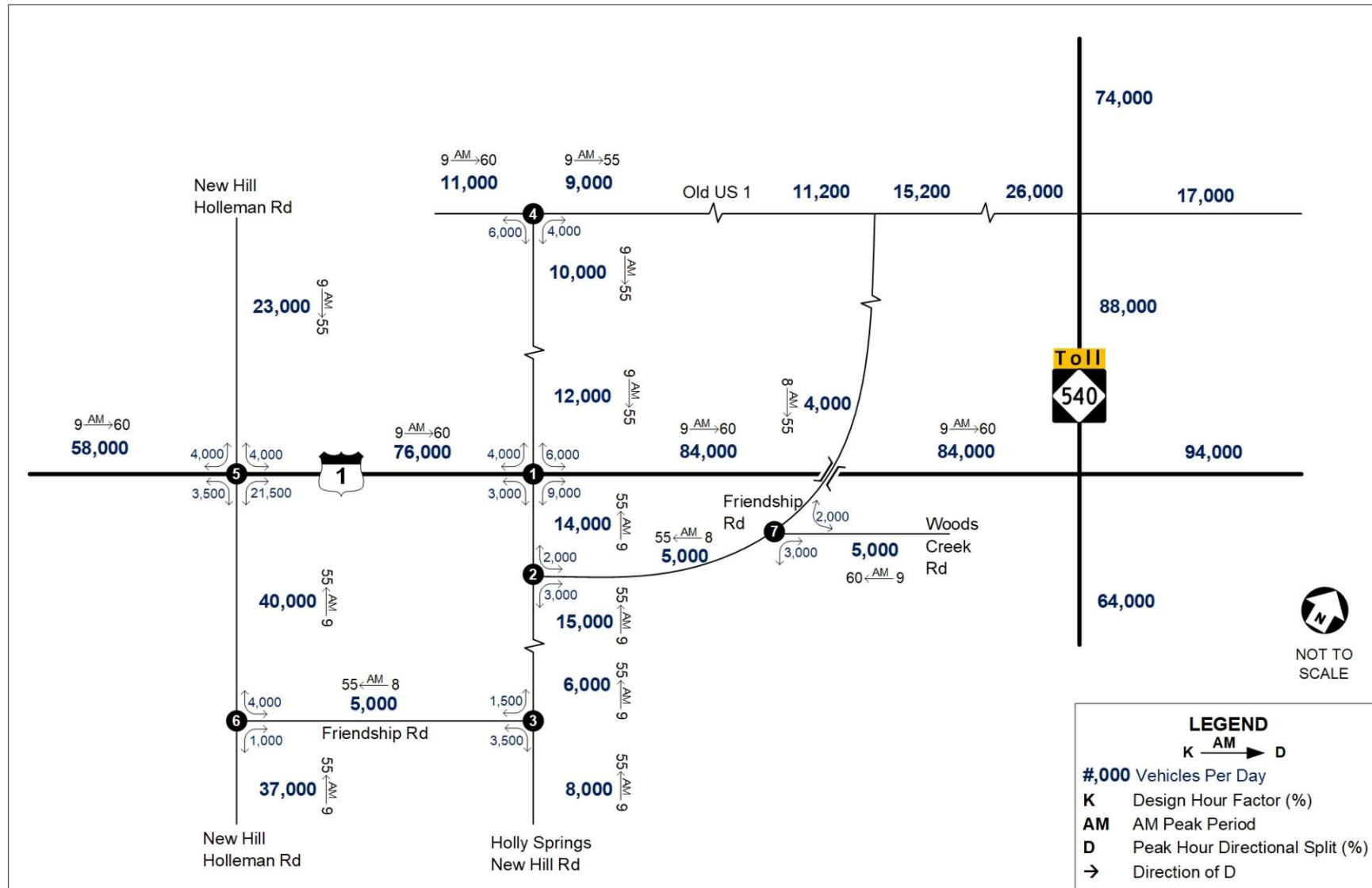


Figure 7. MTP Scenario 2050 Daily Traffic Volumes

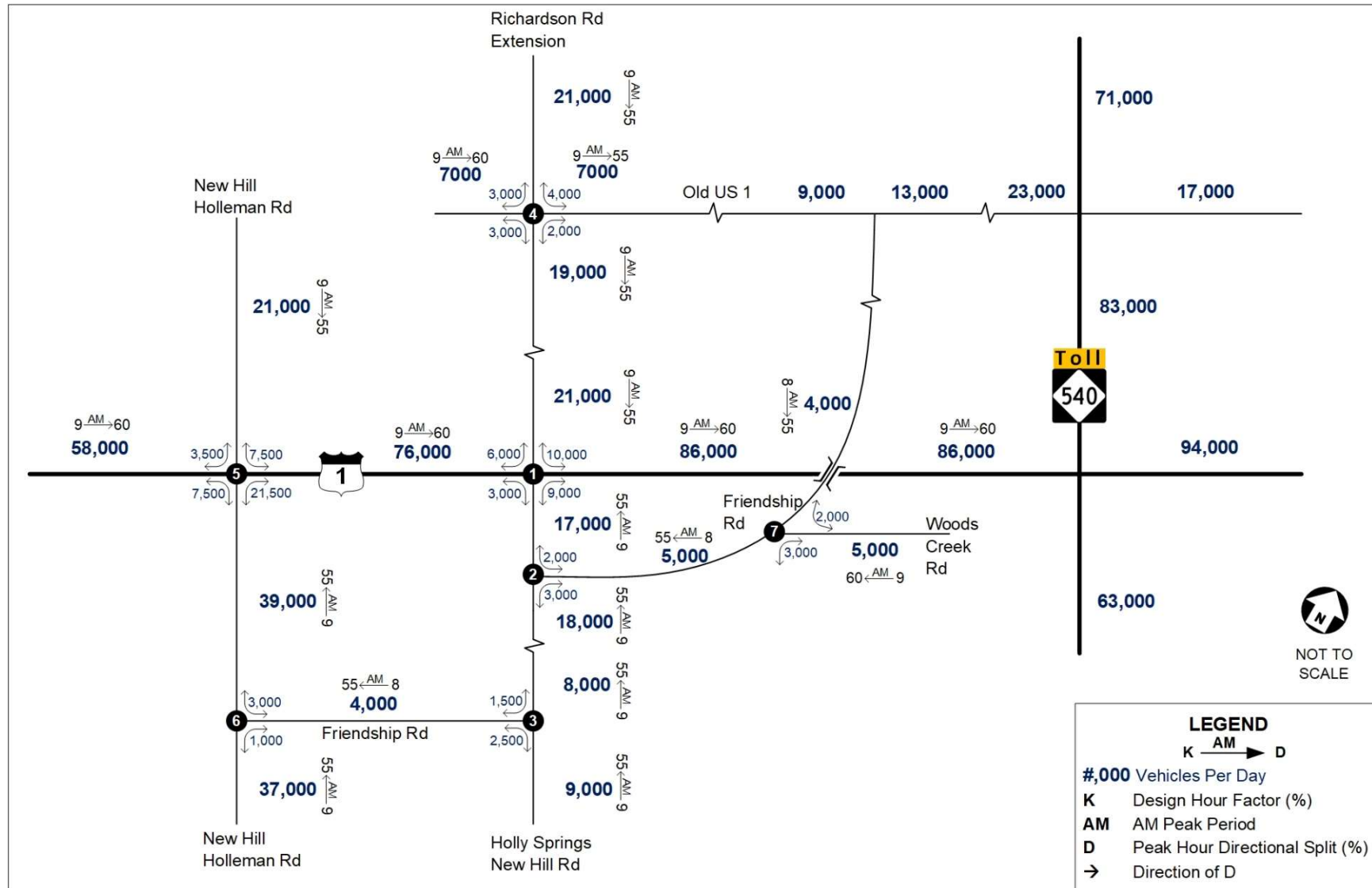


Figure 8. MTP+ Scenario 2050 Daily Traffic Volumes

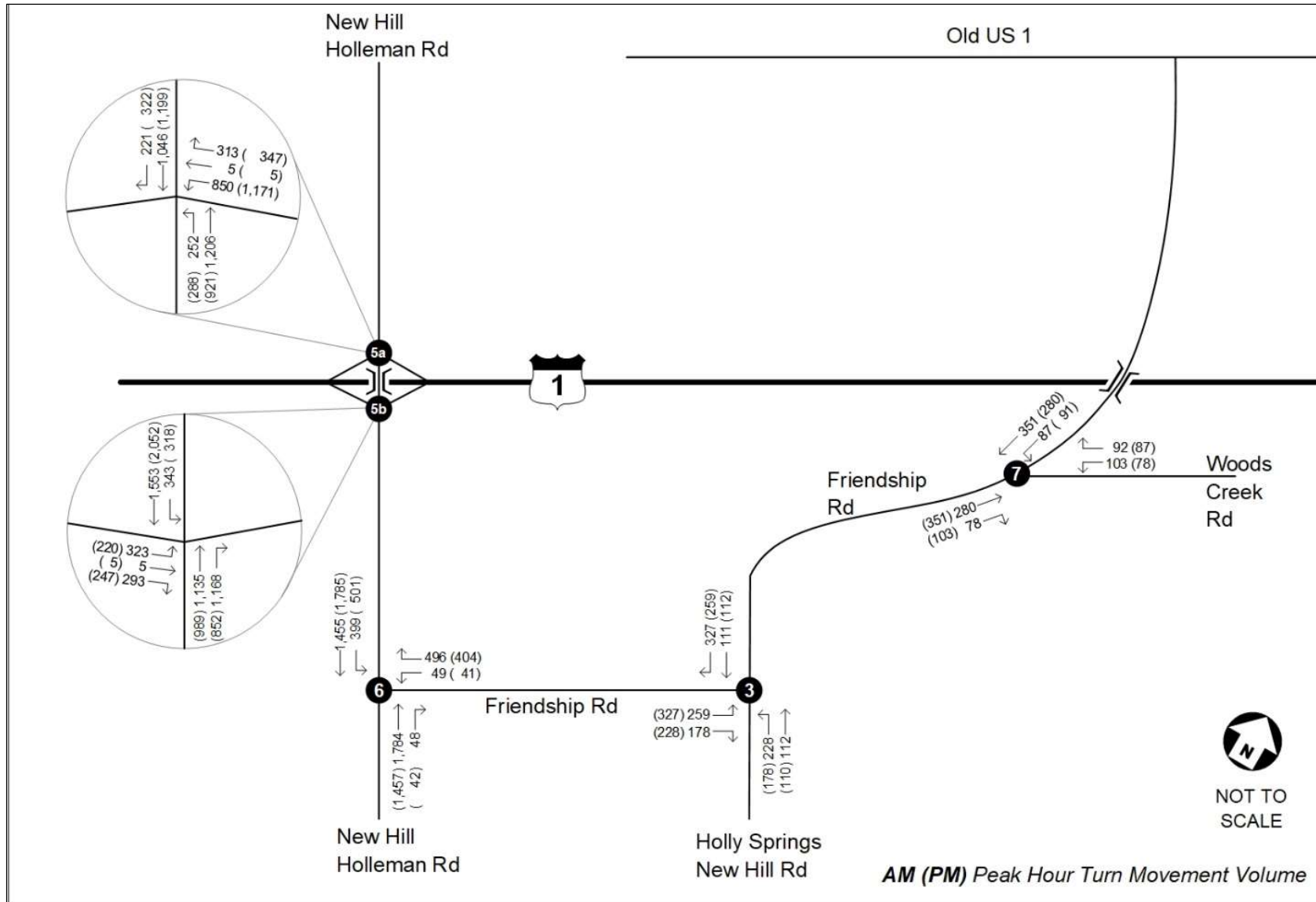


Figure 9. No Build Scenario 2050 Peak Hour Traffic Volumes

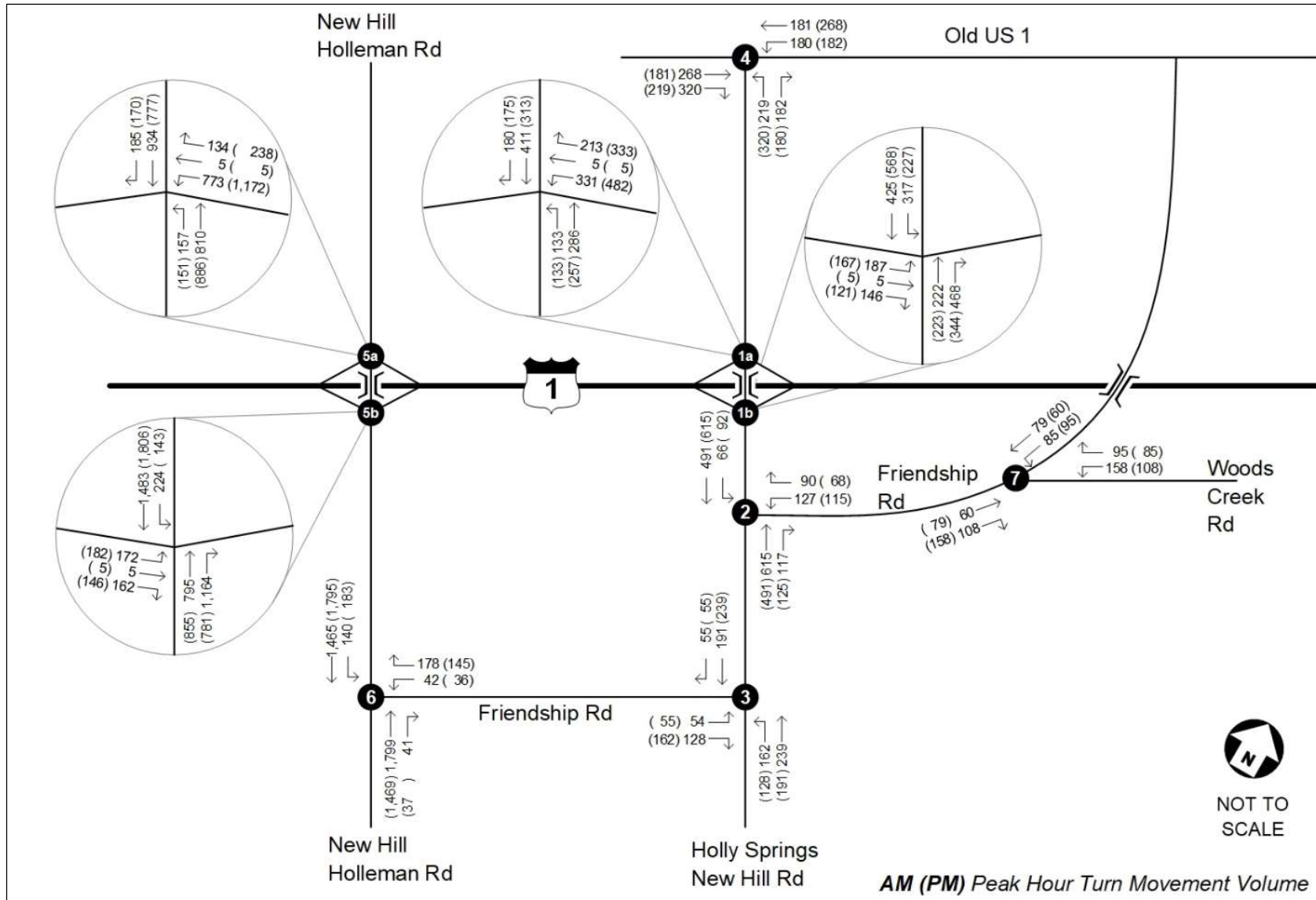


Figure 10. MTP Scenario 2050 Peak Hour Traffic Volumes

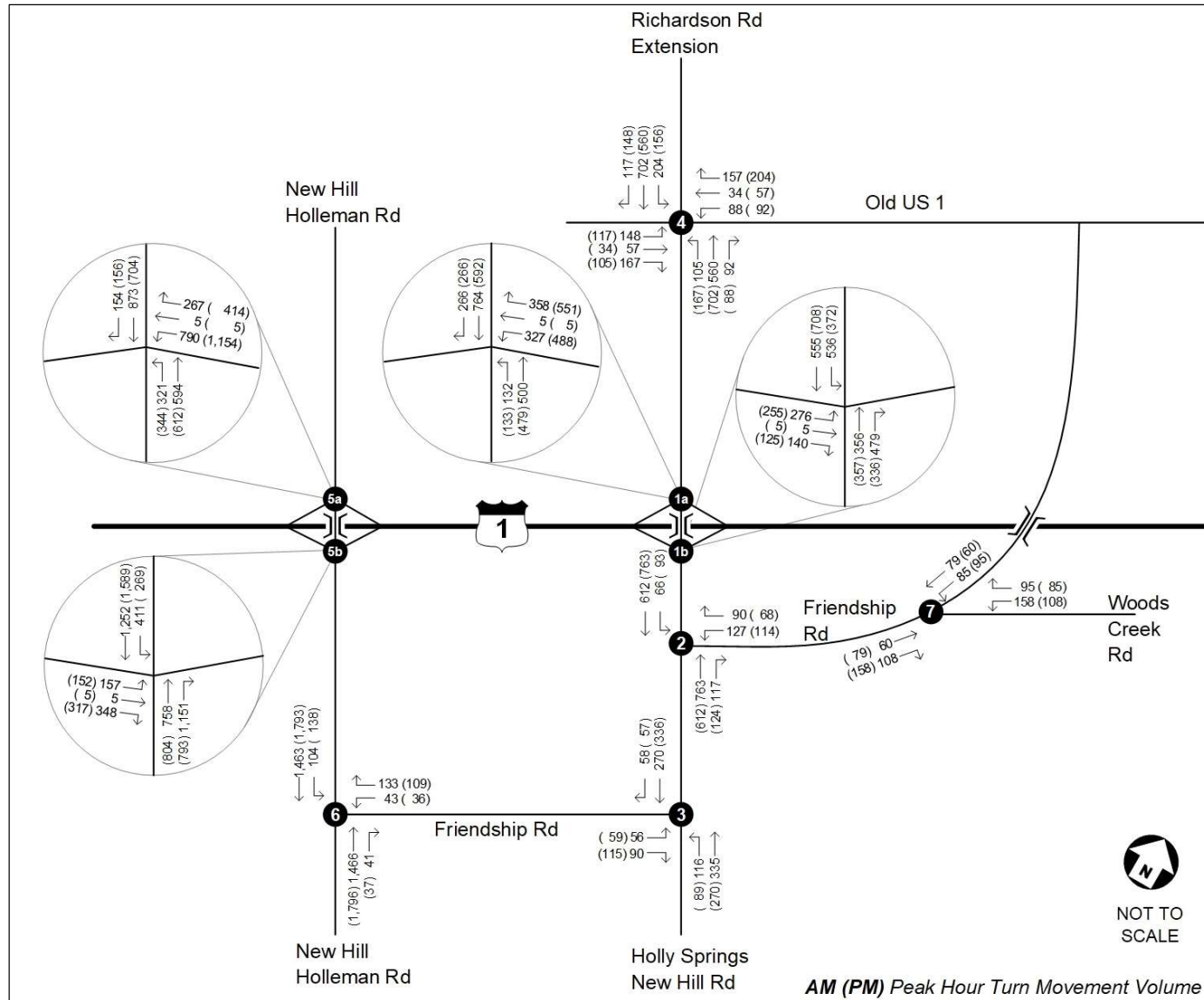


Figure 11. MTP+ Scenario 2050 Peak Hour Traffic Volumes

4 PLANNED IMPROVEMENTS

The Friendship Road Hot Spot Interchange Study includes proposed improvements which will enhance access to US 1 and improve connectivity/mobility between the towns of Holly Springs and Apex. This study considers roadway improvements included in the towns of Holly Springs and Apex CTPs and roadway improvements included in CAMPO's 2050 MTP. Each town currently maintains or have updated CTP's, which include roadways and pedestrian/bicyclist improvements that contribute to the Friendship Road Hot Spot Interchange study and are evaluated in this feasibility study. The CTP for the Town of Holly Springs is Vision Holly Springs 2018 Update approved by the town council May 2022. The CTP for the Town of Apex is the Advance Apex 2045 Plan adopted February 2019.

4.1 Proposed Roadway Network Improvements

The CTPs for the towns of Holly Springs and Apex include proposed roadway improvements within the Friendship Road Hot Spot study area:

- **Interchange at US 1 and New Location Road (Holly Springs CTP ID# 10)**
- **New Location Road and proposed sidewalk/side path from Friendship Road to the proposed US 1 Interchange (Holly Springs CTP ID# A648)**
- Friendship Road widening and proposed wide outside lane and sidewalks from the proposed US 1 Interchange to US 1 Highway (Holly Springs CTP ID # A186a)
- Friendship Road Widening and proposed wide outside lane and sidewalks from New Hill Holleman Road to Holly Springs New Hill Road (Holly Springs CTP ID# A163b)
- Holly Springs New Hill Road Widening and proposed wide outside lane and sidewalks from Friendship Road to Old Holly Springs Apex Road (Holly Springs CTP ID# A163c)
- New Hill Holleman Road and Friendship Road Intersection Improvement (Holly Springs CTP ID# 47))
- New Hill Holleman Road Widening and proposed sidewalk/side path from Friendship Road to Avent Ferry Road (Holly Springs CTP ID# A190)
- Woods Creek Road Widening and proposed sidewalk/side path from Woodfield Dead End Road to Old Holly Springs Apex Road (Holly Springs CTP ID# A423)
- Woodfield Dead End Road Extension and proposed wide outside lane from Holly Springs New Hill Road to Woods Creek Road (Holly Springs CTP ID# 415)
- New Location Road and proposed wide outside lane from New Hill Holleman Road to Holly Springs New Hill Road (Holly Springs CTP ID# 414)
- **New US 1 Interchange (Apex CTP)**
- **Richardson Road New Location (new location of Friendship Road) from the New US 1 Interchange to Old US 1 Hwy, three-lane roadway and side path (Apex CTP)**
- Richardson Road New Location from Old US 1 Hwy to Humie Olive Road, four-lane median divided roadway and side path (Apex CTP)

- New location of Boscoe Road and sidewalks from Boscoe Road to the new location of Friendship Road (Apex CTP)
- Old US 1 Hwy Widening and proposed sidewalks from New Hill Holleman Road to NC 540 (Apex CTP)
- New Hill Holleman Road Widening from US 1 to Old US 1 Hwy (Apex CTP)
- New Hill Holleman Road Intersection Improvement (Apex CTP)
- U-5981 US 1 at NC 55 Interchange Improvements (Apex CTP)
- U-6066 US 1 Widening from NC 55 to US 64 (Apex CTP)

Projects within the Friendship Road Hot Spot project limits are shown in bold text. These projects are also included in CAMPO's 2050 MTP. Other identified projects are part of the roadway network and multimodal transportation connectivity at the Friendship Road Hotspot. Roadway widening and new location/realignment projects from the Holly Springs CTP's Multimodal Assessment and Recommendations section are shown in Figure 12 and Figure 13. The Richardson Road New Location from the proposed Friendship Road interchange at US 1 to Old US 1 Hwy, and from Old US 1 Hwy to Humie Olive Road (Richardson Road Extension) are shown in Figure 14.

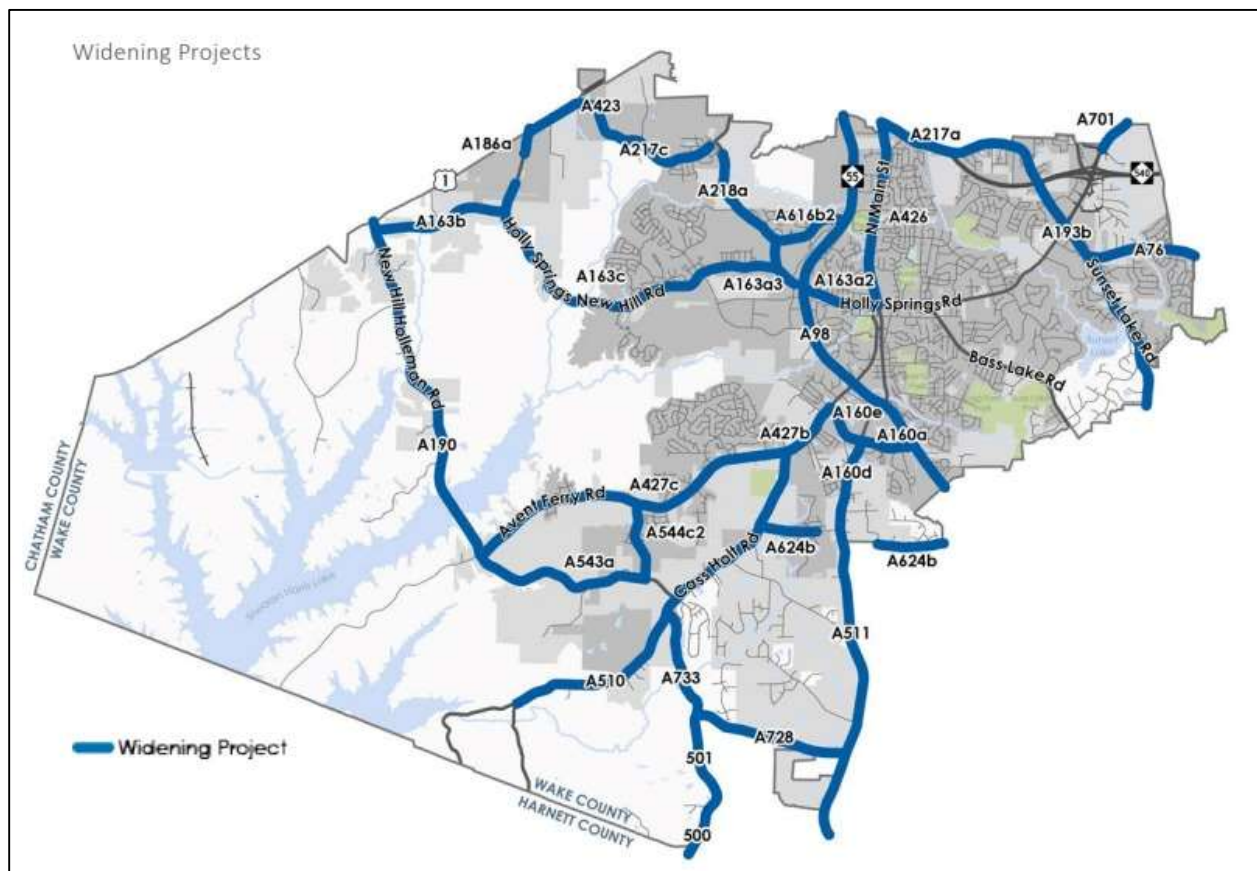


Figure 12. Holly Springs CTP Proposed Widening Projects

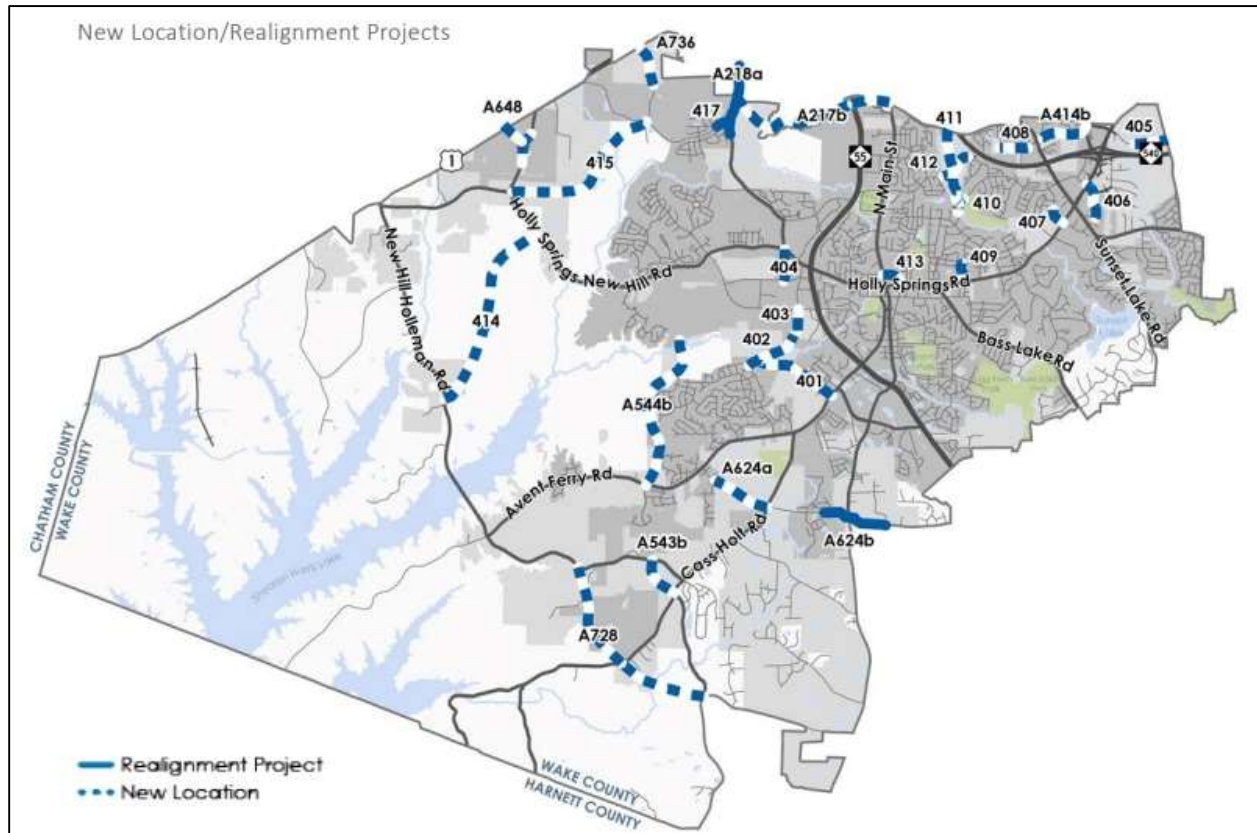


Figure 13. Holly Springs CTP Proposed New Location and Realignment Projects

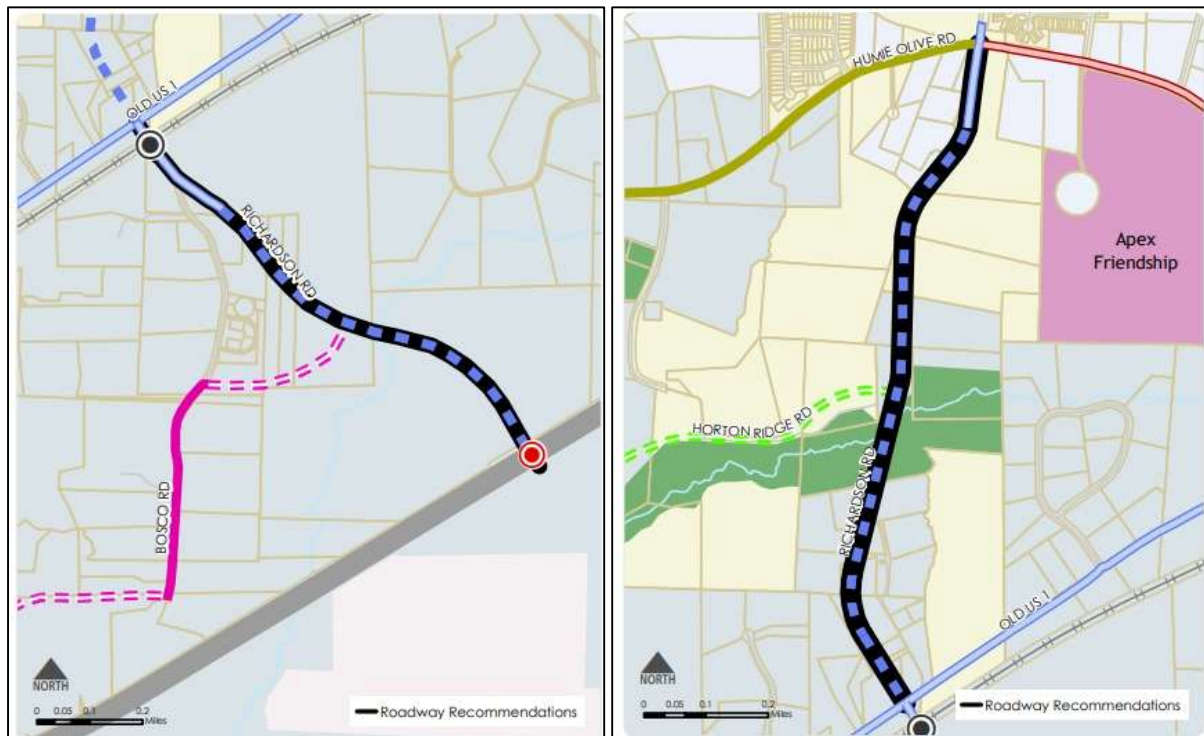


Figure 14. Apex CTP Proposed Location of Friendship Road and Richardson Rd Extension

4.2 Proposed Interchange Location

The surrounding land uses, environmental features and constraints, existing topography, interchange spacing on US 1, and the proximity of the proposed US 1 interchange to the Friendship Road bridge were evaluated to determine the appropriate interchange location.

Surrounding land uses include single-family residential properties, active farmlands, the Amgen facility (under construction) and Friendship Road Park developments, and utilities including the Duke Energy transmission lines adjacent to US 1. The proposed interchange location avoided single-family residential properties, active farmland accesses, and the site and access locations of the Amgen facility (see Figure 15). It is anticipated that the interchange and new roadway construction can avoid or minimally impact Duke Energy transmission lines.

Environmental features and topography provide significant constraints to locating the proposed US 1 interchange further west along US 1. Little White Oak Creek presents potential environmental concerns and anticipated permits, and the area near Little White Oak Creek exhibit significant changes in topography that could present difficulties in the design and construction of the proposed interchange.

The spacing of Friendship Road between the New Hill Holleman Road and NC 540 interchanges is integral in determining the interchange location. The proposed US 1 interchange could not encroach on the Friendship Road bridge. By avoiding Little White Oak Creek and the Friendship Road bridge, the proposed US 1 interchange would be located approximately 1.5 miles from the New Hill Holleman Road interchange and similarly 1.5 miles from the NC 540 interchange.

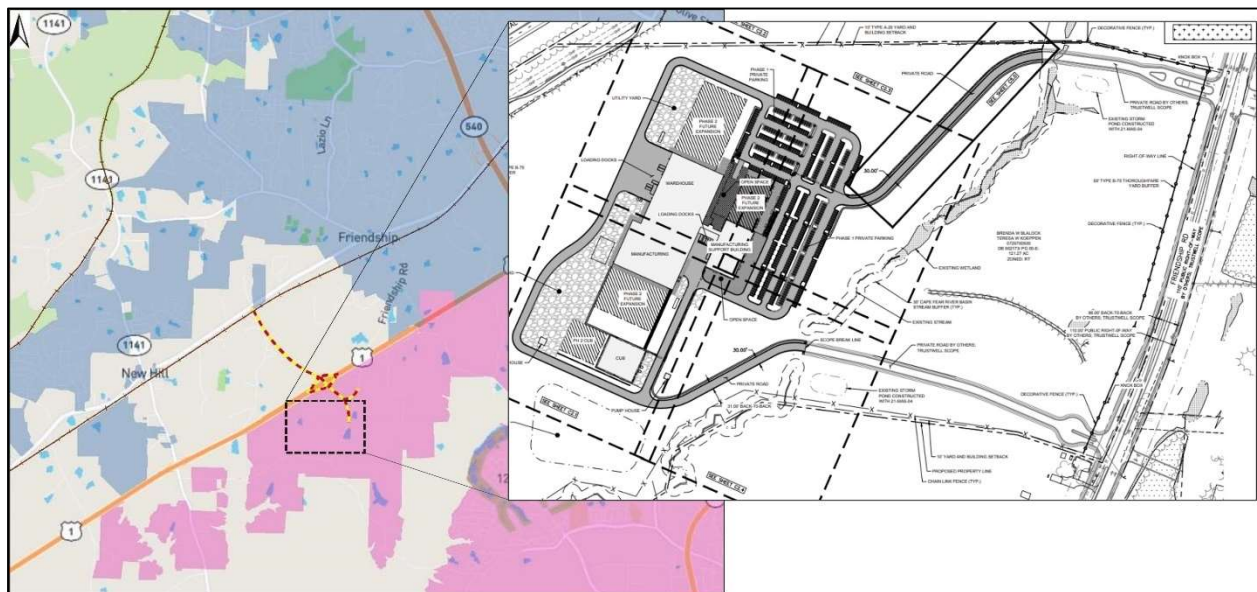


Figure 15. Amgen Facility Site Plan

4.3 Proposed Interchange Alternatives

The towns of Apex and Holly Springs indicate the need for a US 1 interchange between the New Hill Holleman Road interchange and the NC 540 interchange. The US 1 / Friendship Road interchange are included in their respective CTPs. During the course of this Hot Spot Study, six interchange alternatives were evaluated and presented for a US 1 / Friendship Road interchange:

- Alternative 1 Tight Diamond (includes replacement of existing Friendship Road bridge)
- Alternative 2 Tight Diamond with Roundabouts (includes replacement of existing Friendship Road bridge)
- Alternative 3 Partial Cloverleaf with a Loop in the Southeast Quadrant
- Alternative 4 Standard Diamond (includes removal of existing Friendship Road bridge)
- Alternative 5 Tight Diamond with a New Access to the Amgen Facility
- Alternative 6 Tight Diamond with a New Access to the Amgen Facility and New Intersection at Friendship Road

The new Friendship Road alignments included in the interchange alternative discussion calls for full capacity four-lane median divided thoroughfares, based on traffic analysis and for uniform interchange alternative comparisons. A four-lane median divided thoroughfare for the new Friendship Road is consistent with the Town of Holly Springs CTP, but not with the Town of Apex CTP. The Apex CTP calls for a three-lane undivided thoroughfare for their portion of the new Friendship Road. The three-lane undivided thoroughfare with a center turn lane currently proposed for the Richardson Road New Location (new location of Friendship Road) from the New US 1 Interchange to Old US 1 Hwy in the Advanced Apex 2045 Plan is presented in Section 4.4.2 New Friendship Road in Apex.

Each interchange concept is illustrated and described below, and alternative benefits and concern are summarized in Section 6.

4.3.1 Interchange Alternative 1

Interchange Alternative 1: Tight Diamond – Consists of a six-lane roadway typical section divided by a median. This interchange configuration accommodates four through lanes and two left-turn lanes to access US 1. Single-lane on ramps will include dedicated right-turn lanes. Double-lane off ramps will allow for dedicated left and right turn lanes. Intersections at the interchange will not be signalized. The tight diamond interchange, bridge cross-section, and roadway configuration are shown in Figure 16.

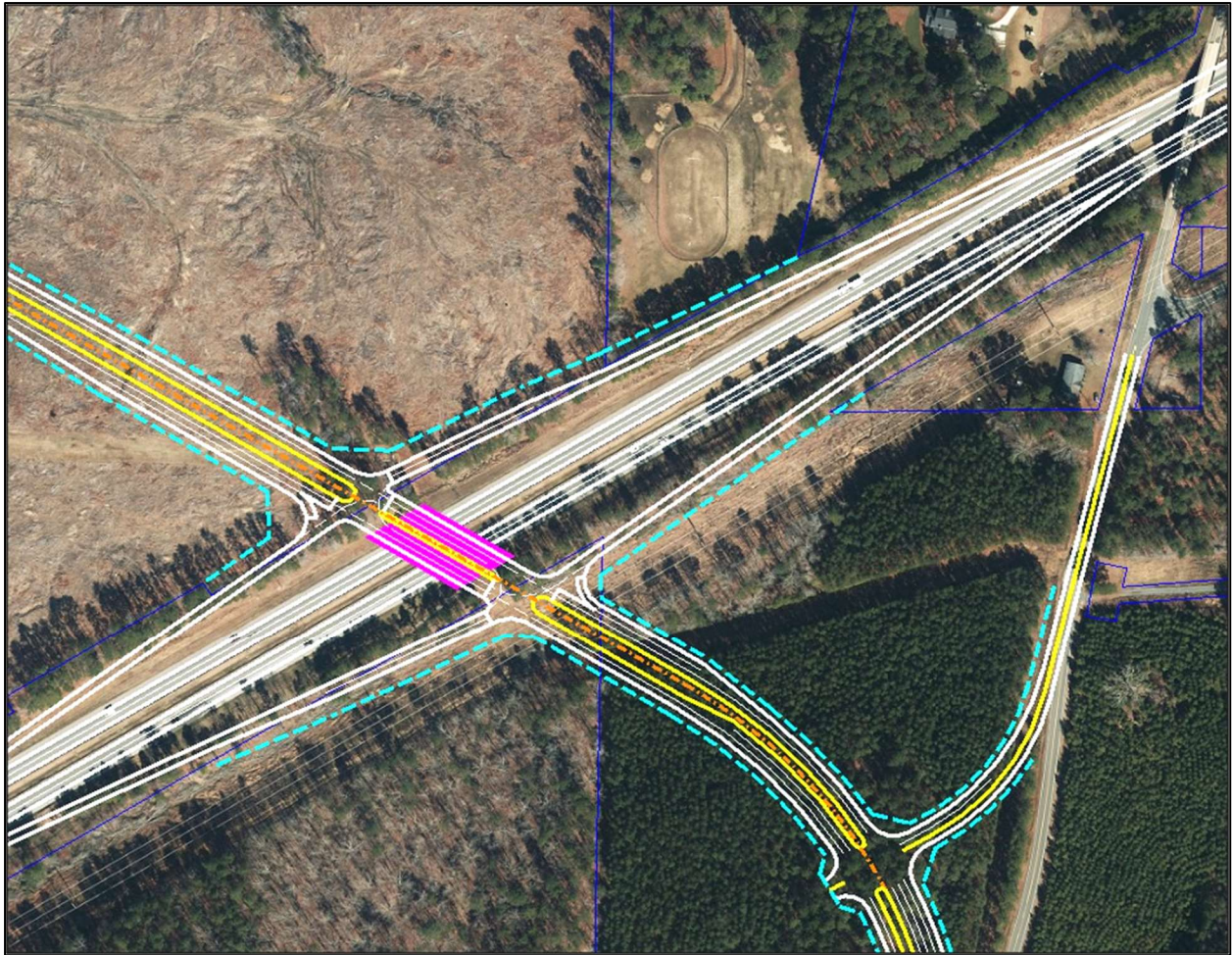


Figure 16. Interchange Alternative 1

Roadway and bridge improvements adjacent to interchange Alternative 1 will include the realignment and widening of Friendship Road to a four-lane median divided thoroughfare, a signalized intersection, and a new two-lane undivided roadway tie back to existing Friendship Road south of Woods Creek Road, and replacement of Friendship Road bridge to accommodate off and on ramps.

Benefits of interchange Alternative 1 include the least right of way acquisition or need for corridor preservation relative to the other interchange alternatives and allows for optimum intersection spacing to Friendship Road and the Amgen facility driveway. Interchange Alternative 1 concerns include the requirement for a wider bridge to accommodate both through lanes and full left turn lanes and the potential cost of replacement of the Friendship Road bridge.

4.3.2 Interchange Alternative 2

Interchange Alternative 2: Tight Diamond with Roundabouts – Consists of a four-lane roadway typical section divided by a median. This interchange configuration accommodates four through lanes and two double-lane roundabouts to access US 1. Single-lane on ramps will include dedicated right-turn lanes to access US 1 from the new Friendship Road, and dedicated roundabout exits to access US 1 from roundabouts. Double-lane off ramps will allow for dual right turns to access the new Friendship Road southbound (towards Holly Springs) or access the roundabout to access Friendship Road northbound (towards Apex). The tight diamond with roundabout interchange, bridge cross-section, and roadway configuration are shown in Figure 17.

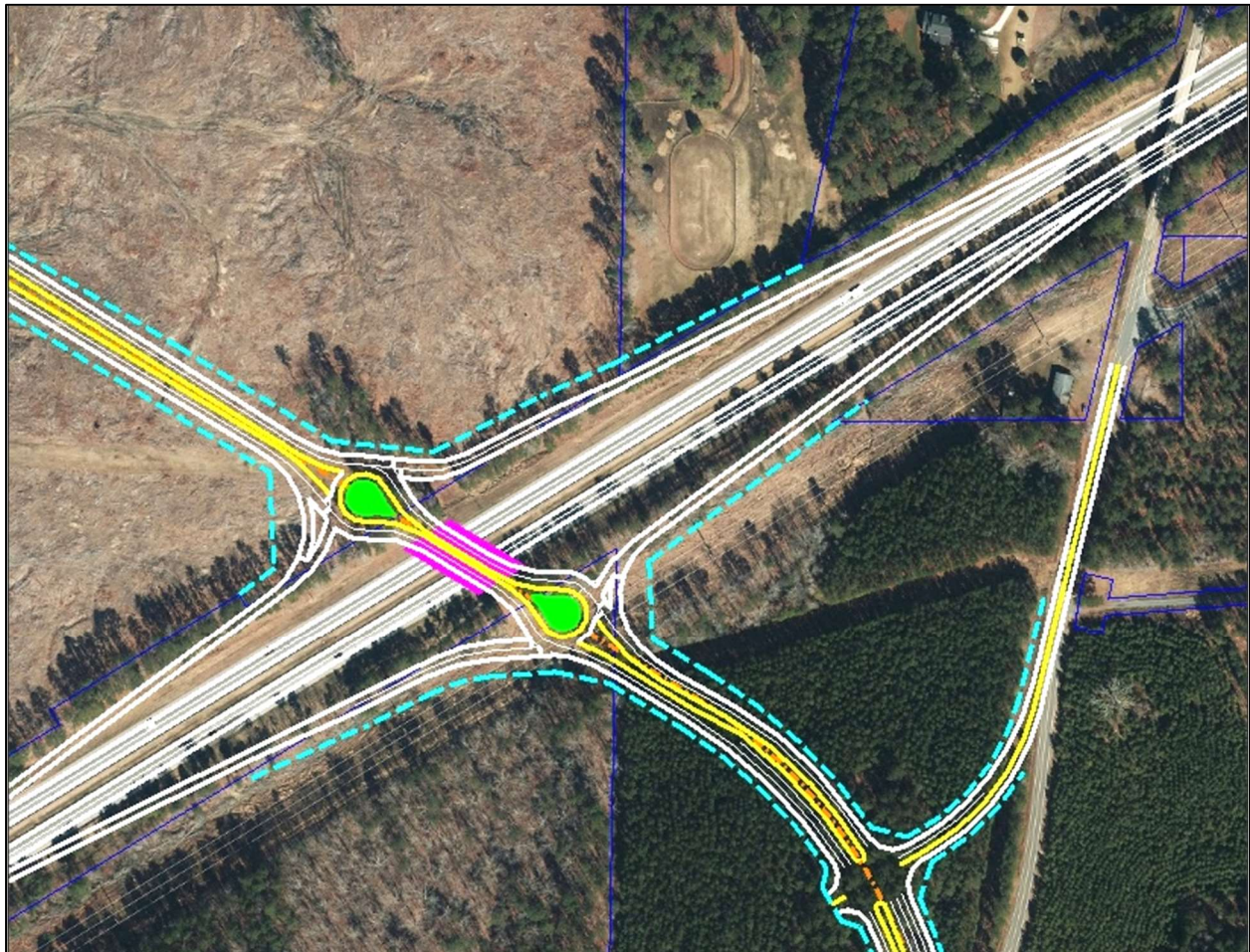


Figure 17. Interchange Alternative 2

Roadway and bridge improvements adjacent to interchange Alternative 2 will include the realignment and widening of Friendship Road to a four-lane median divided thoroughfare, a signalized intersection, and a new two-lane undivided roadway tie back to existing Friendship Road south of Woods Creek Road, and replacement of Friendship Road bridge to accommodate off and on ramps.

Benefits of interchange Alternative 2 include the least right of way acquisition or need for corridor preservation relative to the other interchange alternatives, allows for optimum intersection spacing to Friendship Road and the Amgen facility driveway, a narrower bridge, and

improved safety at ramp intersections. Interchange Alternative 2 concerns include the potential cost of replacement of the Friendship Road bridge and finite capacity of roundabout intersections which may lead to intersection failure.

4.3.3 Interchange Alternative 3

Interchange Alternative 3: Partial Cloverleaf with a Loop in the Southeast Quadrant – Consists of a five-lane roadway typical section divided by a median. This interchange configuration accommodates four through lanes and one left-turn lanes to access US 1 southbound. US 1 southbound can also be accessed through a dedicated right turn lane on the new Friendship Road. Access to US 1 northbound utilizes a loop ramp at the southeast quadrant of the partial cloverleaf interchange. Motorists travelling southbound on the new Friendship Road can access US 1 northbound by making a right turn at the loop ramp. Motorists travelling northbound on the realigned Friendship Road can access US 1 northbound by making a left turn at the partial cloverleaf ramp northbound ramp. Double-lane and multi-lane southbound and northbound off ramps, respectively, will allow for dedicated left and right turn lanes. The partial cloverleaf interchange, bridge cross-section, and roadway configuration are shown in Figure 18.

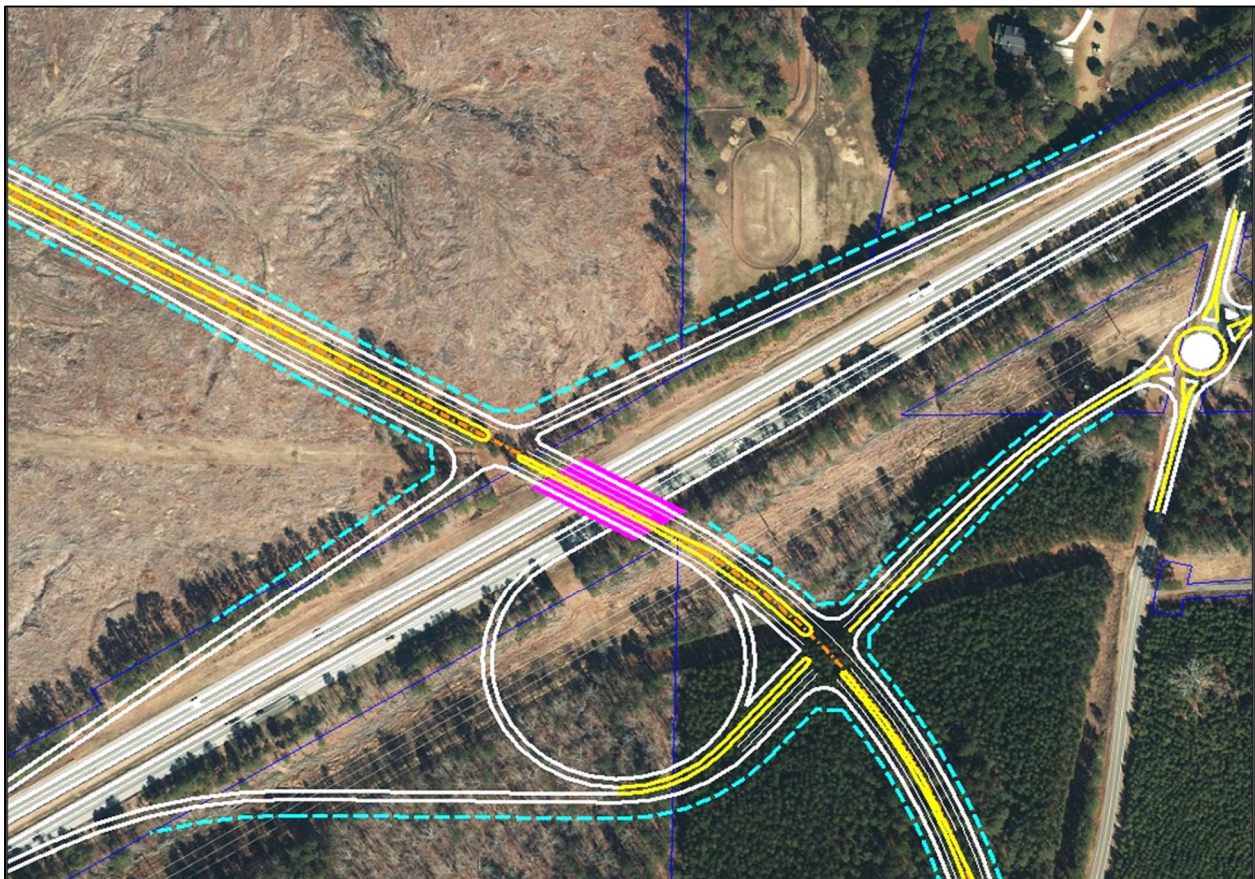


Figure 18. Interchange Alternative 3

This interchange configuration includes a signalized intersection at the partial cloverleaf ramp that accommodates the four-lane median divided Friendship Road realignment, and a new two-lane undivided roadway tie back to Woods Creek Road with a single lane roundabout.

Benefits of interchange Alternative 3 include a narrower five-lane bridge, better ramp terminal intersection spacing, allows for optimum intersection spacing to Friendship Road and the Amgen facility driveway, and Friendship Road bridge could be preserved and would not have to be replaced. Interchange Alternative 3 concerns include increased right of way acquisition or need for corridor preservation relative to other interchange alternatives (primarily on the Holly Springs side of US 1) and potential intersection conflict for motorist travelling northbound on the realigned Friendship Road and making a left turn at the partial cloverleaf to access US 1 northbound.

4.3.3.1 Interchange Alternative 3 Disposition

CAMPO, the NCDOT, the Town of Apex, and the Town of Holly Springs evaluated the functional design and effectiveness of Interchange Alternative 3 Partial Cloverleaf with a Loop in the Southeast Quadrant during the May 25, 2022 Teams meeting (project Meeting #2) and recommended the elimination of Alternative 3 from further consideration because the option shows no clear advantage with regards to functional design and right of way requirements and/or interchange and corridor preservation.

4.3.4 Interchange Alternative 4

Interchange Alternative 4: Standard Diamond – Consists of a six-lane roadway typical section divided by a median. This interchange configuration accommodates four through lanes and two left-turn lanes to access US 1. Single-lane on ramps will include dedicated right-turn lanes. Double-lane off ramps will allow for dedicated left and right turn lanes. Intersections at the interchange will not be signalized. The standard diamond interchange, bridge cross-section, and roadway configuration are shown in Figure 19.

Roadway and bridge improvements adjacent to interchange Alternative 4 will include the realignment of Friendship Road and widening to a four-lane median divided roadway, a signalized intersection, and a new two-lane undivided roadway tie back to existing Friendship Road south of Woods Creek Road, and replacement of Friendship Road bridge to accommodate off and on ramps. Benefits of interchange Alternative 4 include optimum ramp terminal intersection spacing, allows for optimum intersection spacing to Friendship Road and the Amgen facility driveway, eliminates Friendship Road bridge (lesser cost to demolish than to replace) and provides frontage road access from new Friendship Road north of the interchange to old Friendship Road. Interchange Alternative 4 concerns include increased right of way acquisition or need for corridor preservation relative to other interchange alternatives (primarily on the Apex side of US 1), additional right of way cost/corridor preservation due to the new Friendship Road alignment, and potentially longer trip time to travel from existing Friendship Road in Apex to the new Friendship Road connection.

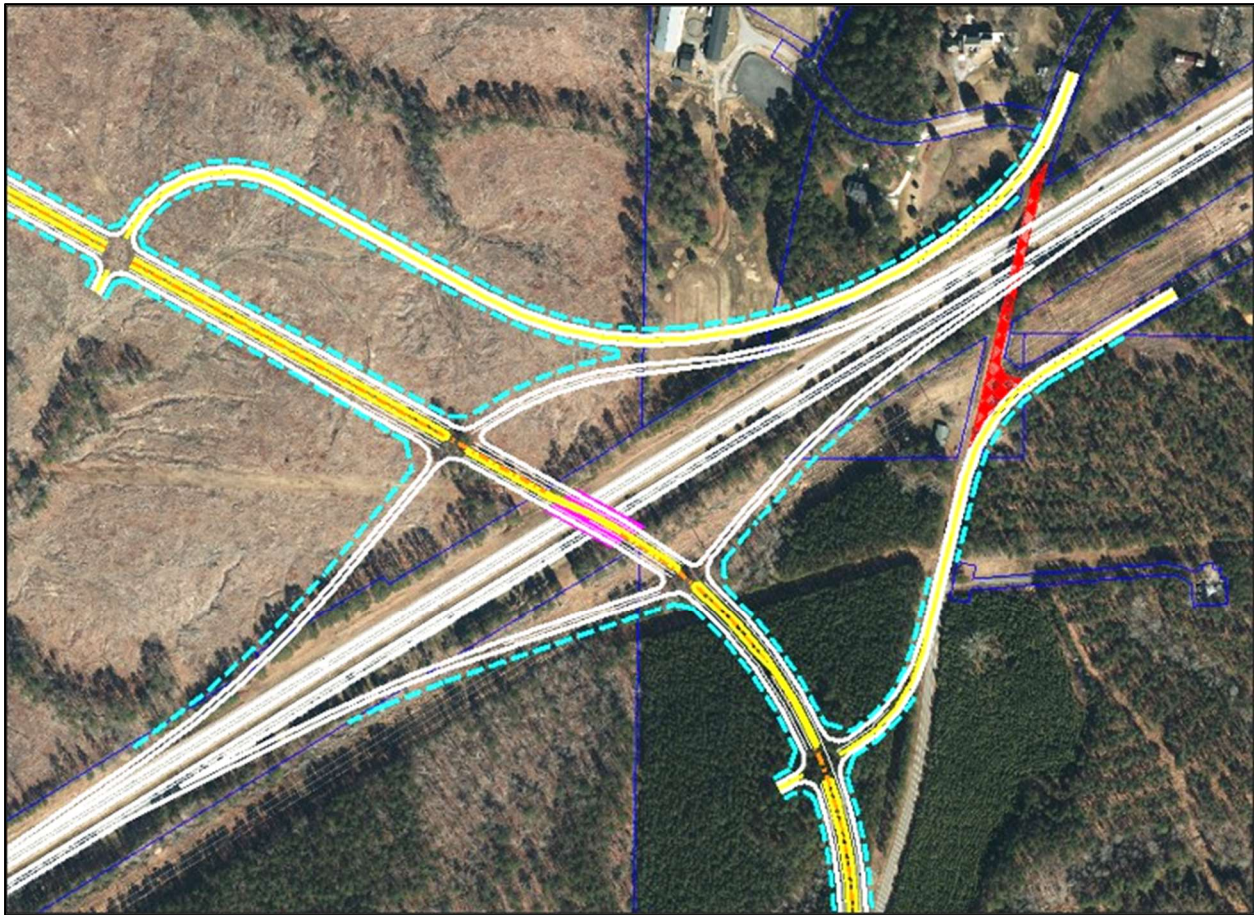


Figure 19. Interchange Alternative 4

4.3.5 Interchange Alternative 5

Interchange Alternative 5: Tight Diamond located further southwest – Consists of a six-lane roadway typical section divided by a median. The location of interchange Alternative 5 was shifted further south (approximately 800 feet) to avoid ramp conflicts with the Friendship Road bridge and accommodate the new access to the Amgen Facility. This interchange configuration accommodates four through lanes and two left-turn lanes to access US 1. Single-lane on ramps will include dedicated right-turn lanes. Double-lane off ramps will allow for dedicated left and right turn lanes. Intersections at the interchange will not be signalized. The tight diamond interchange, bridge cross-section, and roadway configuration are shown in Figure 20.

Roadway and bridge improvements adjacent to interchange Alternative 5 will include the realignment and widening of Friendship Road to a four-lane median divided thoroughfare, a signalized intersection, a new access to the Amgen Facility (north side of the property), and a new two-lane undivided roadway tie back to existing Friendship Road south of Woods Creek Road.



Figure 20. Interchange Alternative 5

Benefits of interchange Alternative 5 include the least right of way acquisition or need for corridor preservation relative to the other interchange alternatives and provides bridge over US 1 that is not on skew. Interchange Alternative 5 concerns include the requirement for a wider bridge to accommodate both through lanes and full left turn lanes and anticipated conflicts with streams and necessity for stormwater drainage at Little White Oak Creek.

4.3.6 Interchange Alternative 6

Interchange Alternative 6: Tight Diamond with roundabout intersection at Old Friendship Road – Consists of a six-lane roadway typical section divided by a median. The location of interchange Alternative 5 was shifted further south (approximately 800 feet) to avoid ramp conflicts with the Friendship Road bridge and accommodate the new access to the Amgen Facility. This interchange configuration accommodates four through lanes and two left-turn lanes to access US 1. Single-lane on ramps will include dedicated right-turn lanes. Double-lane off ramps will allow for dedicated left and right turn lanes. Intersections at the interchange will not be signalized. On and off ramps on the south side of the interchange (Holly Springs side) were further tightened to minimize encroachment into the Duke Energy utility easement. The tight diamond interchange, bridge cross-section, and roadway configuration are shown in Figure 21.



Figure 21. Interchange Alternative 6

Roadway and bridge improvements adjacent to interchange Alternative 6 will include the realignment and widening of Friendship Road to a four-lane median divided thoroughfare, and a signalized intersection at Friendship Road.

Benefits of interchange Alternative 6 include the least right of way acquisition and/or corridor preservation relative to the other interchange alternatives, provides bridge over US 1 that is not on skew, and allows for optimum intersection spacing to Friendship Road and the Amgen facility driveway. Interchange Alternative 6 concerns include the requirement for a wider bridge to accommodate both through lanes and full left turn lanes and anticipated conflicts with streams and necessity for stormwater drainage at Little White Oak Creek.

4.4 Proposed Roadway Alignment Options

The towns of Apex and Holly Springs indicate the need for a new Friendship Road alignment in coordination with the proposed US 1 interchange. The New Location Road at the proposed US 1 interchange in Holly Springs, and the Richardson Road New Location (new location of Friendship Road) from the new US 1 Interchange to Old US 1 Hwy in Apex are included in their respective CTPs. The overall proposed roadway network improvements, pedestrian and bicycle improvements, roadway functional classifications and designs, land use planning context, proposed community development, identified and anticipated right-of-way constraints, and anticipated traffic volumes were evaluated in determining the appropriate roadway alignment and cross-section for the new Friendship Road in Holly Springs and Apex.

4.4.1 New Friendship Road in Holly Springs

Within the Town of Holly Springs, The New Location Road from Friendship Road to the proposed US 1 Interchange and the Friendship Road widening from the proposed US 1 Interchange to US 1 Highway are included in the Vision Holly Springs 2018 Update within the Business and Industrial land use west of Friendship Road and the Innovation Village land use near the Friendship Road and Holly Springs New Hill Road intersection.

The New Location Road from Friendship Road to the proposed US 1 Interchange is a considered long-term project. The Friendship Road Widening from the proposed US 1 Interchange to US 1 Highway, the northern part of the New Hill Holleman Road Widening, the western part of the Holly Springs New Hill Road Widening, the Woodfield Dead End Road Extension, and the Woods Creek Road Widening are proposed mid-term projects.

According to the Holly Springs CTP, the New Location Road and the Friendship Road Widening are considered thoroughfares that are limited by adjacent land uses, designed for relatively lower traffic volumes and speeds than major thoroughfares, and offer local and regional mobility. The proposed implementation plan for the New Location Road and the Friendship Road Widening is a four-lane median divided thoroughfare with sidewalks/bike lanes (wide outside lane) on both sides of the roadway.

4.4.1.1 Friendship Road

The Holly Springs CTP indicates a four-lane median divided thoroughfare for the widening of Friendship Road from Holly Springs New Hill Road to the new location of Friendship Road at the proposed US 1 interchange. The need for a four-lane median divided thoroughfare was confirmed through evaluations that included a comparison of existing traffic volumes and future traffic forecast without the proposed US 1 interchange, and future traffic forecast with the proposed US 1 interchange. This proposed improvement includes 10-foot inside lanes, 14-foot outside lanes (to accommodate bicycles), a 17.5-foot raised median, and five-foot sidewalks on both sides of the roadway consistent with the Holly Springs CTP implementation plan. The minimum right of way requirement is 118 feet. The four-lane median divided thoroughfare cross-section T-4B is shown in Figure 22.



Figure 22. T-4B Four-Lane Thoroughfare Cross-Section

The Amgen facility northern and southern driveways are currently under construction. These driveways directly access Friendship Road. The proposed Friendship Road widening will accommodate the Amgen facility driveways, the future Woodfield Dead End Road Extension, and future developments at Friendship Innovation Park.

4.4.1.2 The New Location of Friendship Road

The Holly Springs CTP indicates a four-lane median divided thoroughfare for the New Location Road from Friendship Road to the proposed US 1 interchange. The need for a four-lane median divided thoroughfare was confirmed through evaluations that included a comparison of existing traffic volumes and future traffic forecast without the proposed US 1 interchange, and future traffic forecast with the proposed US 1 interchange. This proposed improvement includes four 10-foot through lanes, a 17.5-foot raised median, a five-foot sidewalk and a five-foot side path consistent with the Holly Springs CTP implementation plan. The minimum right of way requirement is 118 feet. The four-lane median divided thoroughfare cross-section T-4A is shown in Figure 23.



Figure 23. T-4A Four-Lane Thoroughfare Cross-Section

The Friendship Road realignment will avoid the Amgen facility and driveways and will accommodate future developments at Friendship Road Innovation Park.

Intersections for the Friendship Road realignment are proposed corresponding to each interchange alternatives presented in Section 4.3. Intersections would connect the Friendship Road realignment (four-lane median divided thoroughfare) to existing Friendship Road and Woods Creek Road. Intersection options include a two-lane roundabout, a three-way unsignalized (stop condition) intersection, and a three-way signalized intersection.

4.4.2 New Friendship Road in Apex

Within the Town of Apex, the new US 1 Interchange and Richardson Road New Location (new location of Friendship Road) from the New US 1 Interchange to Old US 1 Hwy are included in the Advance Apex 2045 Plan Suburban context area. The suburban context area is heavily reliant on vehicle travel and dependable roadway networks due to relatively higher traffic volumes. Roadway design priorities include optimum roadway capacity, median dividers on major roadways, and sidewalks and separation for pedestrians and bicyclists. The new location of Friendship Road from the proposed US 1 interchange to Old US 1 Hwy is anticipated to be a three-lane roadway including a side path. The full capacity typical section would likely be a four-lane median divided roadway (similar to the proposed Richardson Road New Location from Old US 1 Hwy to Humie Olive Road). Proposed roadway cross-sections may include a three-lane undivided thoroughfare with a center turn lane, a four-lane median divided thoroughfare accommodating a 110-foot right of way, or the Apex Peakway (four-lane median divided thoroughfare) accommodating a 100-foot right of way.

The Apex CTP indicates a three-lane roadway including a side path for the Richardson Road New Location (new Friendship Road) from the new US 1 interchange to Old US 1 Hwy. This proposed improvement includes 11-foot through lanes, a 12-foot center turn lane, and five-foot sidewalks or side paths on both sides of the roadway consistent with the Apex CTP implementation plan. The minimum right of way requirement is 80 feet. The three-lane undivided thoroughfare cross-section is shown in Figure 24.

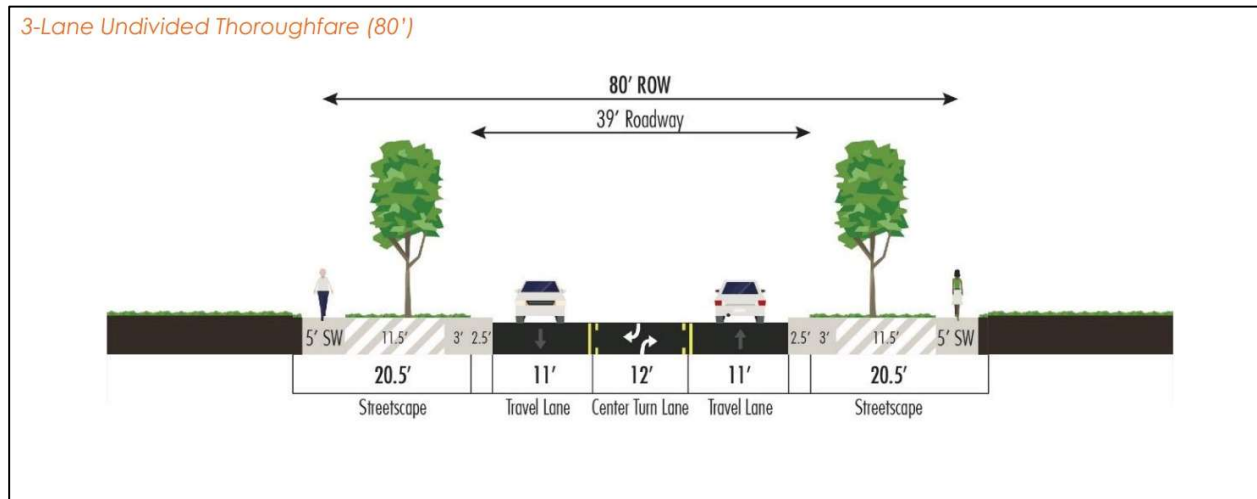


Figure 24. Three-Lane Undivided Thoroughfare Cross-Section

The need for a four-lane median divided roadway was confirmed through evaluations that included a comparison of existing traffic volumes and future traffic forecast without the proposed US 1 interchange, and future traffic forecast with the proposed US 1 interchange. A four-lane median divided roadway is included in the Apex CTP, but currently is not proposed for this roadway segment. Should the Apex CTP be updated and call for a four-lane median divided roadway for this segment, available cross-sections include a four-lane divided thoroughfare with and the Apex Peakway.

The four-lane divided thoroughfare includes 11-foot lanes, a 23-foot raised median, five-foot sidewalks or side paths on both sides, with a 110-foot right of way. The Apex Peakway includes 11-foot inside lanes, 13-foot outside lanes, an 18-foot raised median, a five-foot sidewalk, a 10-foot side path, with a 100-foot right of way. The four-lane divided thoroughfare and the Apex Peakway cross-sections are shown in Figure 25.

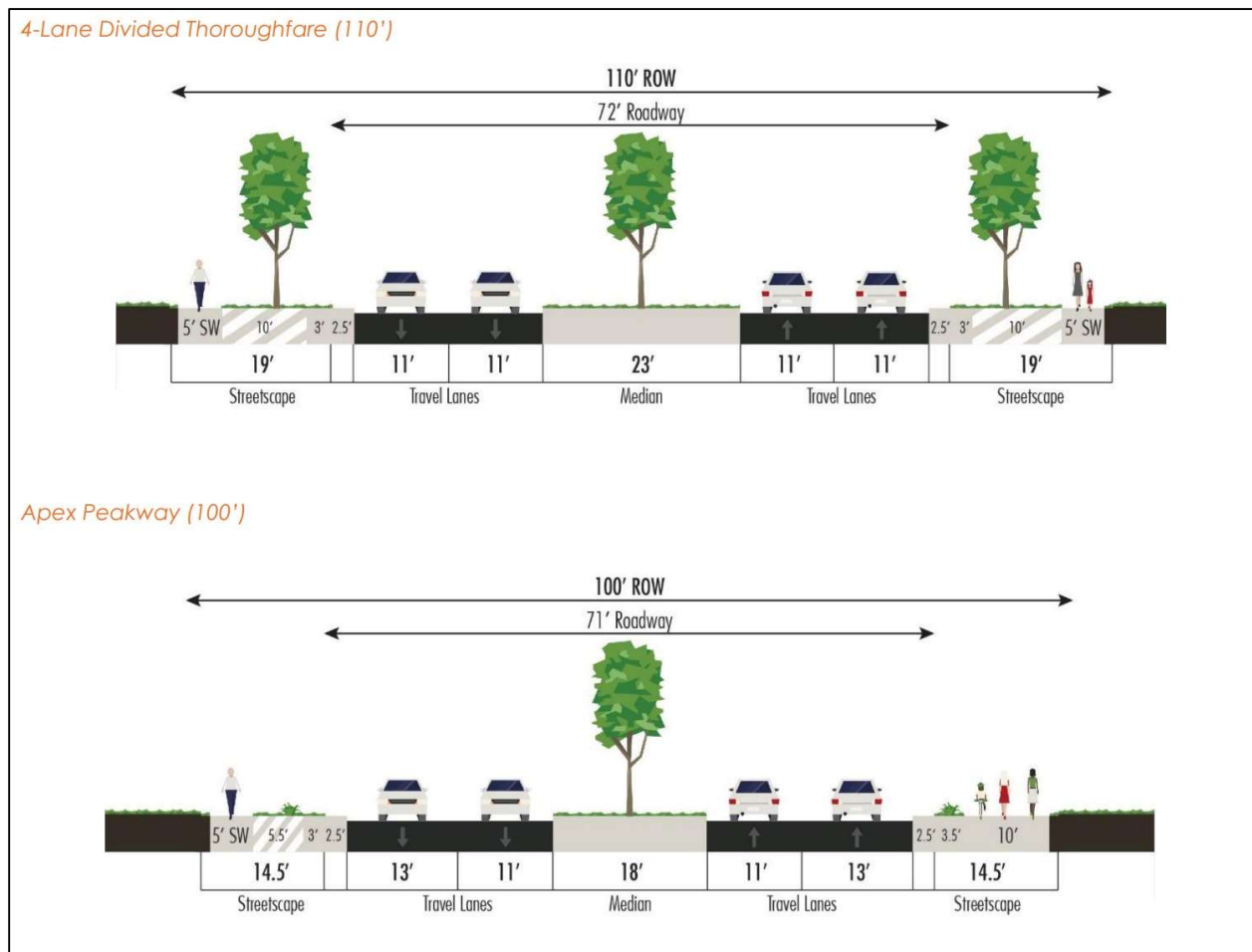


Figure 25. Four-Lane Divided Thoroughfare and Apex Peakway Cross-Sections

The proposed Friendship Road interchange at US 1 and Richardson Road New Location (new location of Friendship Road in Apex) optimized alignment and right of way would still encroach on streams and possible wetlands at Little White Oak Creek. Stream crossings may require drainage culverts or bridge culverts and stormwater permits. Wetland encroachment may require environmental permits.

5 INTERSECTION OPERATIONAL AND SAFETY ANALYSIS

Traffic capacity and operational analyses utilized Synchro 10 software analyses for conventional intersections and Sidra software analyses for roundabouts including the No-Build, MTP, and MTP+ scenarios. Intersection operations and safety performance were evaluated for the six interchange alternatives using the Intersection Control Evaluation (ICE). Synchro10 and Sidra files are available through CAMPO's project SharePoint site.

5.1 Traffic Operations Analysis

Conventional and roundabout intersection level of service (LOS) were calculated for year 2050 scenarios. The analysis shows the MTP and MTP+ scenarios would provide an acceptable level of traffic operations, resulting in LOS D or better, for the AM and PM peak hour. The No-Build scenario results in three intersections along New Hill-Holleman Road that would operate at LOS E or F. These three intersections would have reduced traffic volumes and operate at LOS D or better if traffic flow is diverted to the proposed Friendship Road interchange at US 1. Table 2 provides a summary of intersection year 2050 LOS including analysis of the No-Build and six Friendship Road interchange alternatives.

The proposed intersection of the new location of Friendship Road in Apex (Richardson Road New Location/Richardson Road New Location from Old US 1 Hwy to Humie Olive Road) and Old US 1 Hwy was evaluated as an at-grade and a grade-separated signalized intersection for the MTP and MTP+ scenarios. A summary of intersection year 2050 LOS AM and PM peak hour LOS is provided in Table 3.

Table 2. Intersection Level of Service for Scenario Year 2050 Interchange Alternatives

Intersection Level of Service (LOS) Scenario Year 2050		No-Build Scenario	MTP Scenario					MTP+ Scenario				
Intersection	Time	No Build	Alt. 1	Alt. 2	Alt. 4	Alt. 5	Alt. 6	Alt. 1	Alt. 2	Alt. 4	Alt. 5	Alt. 6
US 1 SB Ramps / Friendship Rd	AM	-	C	A	B	C	C	C	B	C	C	C
	PM	-	C	A	C	C	C	C	C	C	C	C
US 1 NB Ramps / Friendship Rd	AM	-	C	A	C	C	C	B	C	C	B	B
	PM	-	B	A	B	B	B	B	B	B	B	B
New Friendship at Old Friendship Rd / Woods Creek Rd	AM	-	B	B	B	B	A	B	B	B	B	A
	PM	-	B	B	B	B	A	B	B	B	B	A
Friendship Rd at Holly Springs-New Hill Rd	AM	B	B	B	B	B	B	C	C	C	C	C
	PM	B	B	B	B	B	B	B	B	B	B	B
Old US 1 at New Friendship Rd	AM	-	C	C	C	C	C	D	D	D	D	D
	PM	-	C	C	C	C	C	D	D	D	D	D
US 1 SB Ramps / New Hill Holleman Rd	AM	D	C	C	C	C	C	C	C	C	C	C
	PM	E	D	D	C	D	D	D	D	D	D	D
US 1 NB Ramps and New Hill Holleman Rd	AM	D	D	D	C	D	D	D	D	D	D	D
	PM	E	B	B	A	B	B	C	C	C	C	C
New Hill Holleman Rd and Friendship Rd	AM	F	D	D	D	D	D	D	D	D	D	D
	PM	E	C	C	C	C	C	B	B	B	B	B

Table 3. Intersection Level of Service for the Old US 1 Hwy Intersection

Scenario Year: 2050	Peak Period	MTP Scenario	MTP+ Scenario	MTP+ Scenario
		Signalized T-Intersection	Signalized Intersection	Signalized Quadrant Intersection
Old US 1 Hwy and New Friendship Rd / Richardson Rd	AM	C	D	C / C
	PM	C	D	C / C

5.2 Intersection Control Evaluation

ICE is a safety evaluation tool that helps identify optimum and safe intersections measure of effectiveness (MOE) by incorporating a comprehensive comparison and analysis of diverse projects. ICE compares multiple concepts against several factors including future interchange/intersection operations, safety performance, environmental constraints, and planning level costs.

ICE compared traffic operations, safety, and planning level costs to rank the six interchange alternatives including the MTP+ scenario. Table 4 shows ICE comparison and ranking of the interchange alternatives.

Table 4. ICE Comparison and Ranking for Interchange Alternatives

Measure of Effectiveness	Alt. 1	Alt. 2	Alt. 4	Alt. 5	Alt. 6
AM LOS:	C / C	B / C	C / C	C / C	C / C
PM LOS:	B / B	C / B	C / B	B / B	B / B
CMF¹:	1.02	0.76	1.0	1.02	1.02
Cost²:	\$3,900,000	\$3,200,000	\$3,000,000	\$3,900,000	\$3,900,000
Rank:	2	1	3	2	2

¹ Determined from FHWA Crash Modification Factor (CMF) Clearinghouse

² Additional costs compared to standard diamond interchange, does not include utility impacts

6 RECOMMENDATIONS

6.1 Stakeholder Input

The Friendship Road Hot Spot Interchange Study engaged and solicited responses from local stakeholders and state transportation agencies. Scope of work, traffic model for the roadway network, interchange locations, interchange alternatives, safety, and planning level costs were presented to the following stakeholders through the course of three stakeholder meetings:

- CAMPO
- Town of Holly Springs
- Town of Apex
- Wake County
- NCDOT
- North Carolina Turnpike Authority (NCTA)

PowerPoint presentations, meeting minutes, and stakeholder responses associated with stakeholder meetings held on April 18, 2022 (Meeting 1), May 25, 2022 (Meeting 2), and June 22, 2022 (Meeting 3) are included in Appendix B. Stakeholder responses for a request to rank viable interchange alternatives after Meeting 2, and responses for a request to coordinate interchange alternatives 5 and 6 with Amgen property owners after Meeting 3 are included in Appendix B.

6.2 Evaluation Matrix

The five viable interchange alternatives were evaluated for the following factors and potential impacts:

- Stakeholder input
- Traffic analysis
- Safety analysis
- Existing and proposed developments
- The Friendship Road bridge
- General environmental features
- Environmental easements
- Utility easements
- Right of way acquisition
- Planning costs

An evaluation and ranking matrix for the five viable interchange alternatives are shown in Table 5 and Table 6 respectively. These matrices are intended to aid preliminary decisions on location of the interchange and recommended interchange alternatives only. Interchange alternatives 1, 2, and 4 avoids environmental conflicts. Interchange alternatives 5 and 6 avoids the Friendship

Road bridge replacement and environmental easements. Interchange Alternative 6 has the least utility easement conflict and development conflict when compared to Interchange Alternative 5. Interchange alternatives 2 and 4 typically ranks higher than the rest in terms of traffic, safety, and planning costs. Interchange alternatives 1 and 6 ranks higher on stakeholder preference.

Table 5. Evaluation Matrix

Potential Impacts	Alt. 1	Alt. 2	Alt. 4	Alt. 5	Alt. 6
Developments	None	None	None	Moderate	Minimal
Friendship Road Bridge	Moderate	Moderate	Significant	None	None
Environmental Features	None	None	None	Moderate	Moderate
Environmental Easements	Moderate	Moderate	Moderate	None	None
Utility Easements	Moderate	Moderate	Moderate	Moderate	Minimal
Right of Way	Moderate	Moderate	Moderate	Minimal	Minimal

Table 6. Ranking Matrix

Ranking Criteria	Alt. 1	Alt. 2	Alt. 4	Alt. 5	Alt. 6
Level of Service (1 best LOS)	3	1	2	4	3
Crash Modification Factor (1 safest)	3	1	2	4	3
Planning Cost (1 lowest cost)	3	2	1	4	3
Stakeholder Preference (1 most preferred)	2	4	5	3	1

6.3 Recommended Interchange Location

CAMPO, the Town of Holly Springs, and the Town of Apex agree on two interchange locations:

- For Interchange Alternative 1, the interchange would be located approximately 1.5 miles from the New Hill Holleman Road interchange and similarly 1.5 miles from the NC 540 interchange, thereby avoiding Little White Oak Creek. This interchange location would also avoid encroachment on the Amgen Facility with the construction of the Friendship Road realignment. This interchange location would result in a skewed bridge and the replacement of the Friendship Road bridge to fit northbound and southbound ramps associated with the proposed interchange.
- For Interchange Alternative 6, the interchange would be located approximately 800 feet southwest of the Interchange Alternative 1 location to avoid the Friendship Road bridge replacement or removal. This interchange location would allow for a bridge that is not on skew. This interchange location would result in the Friendship Road realignment

requiring a new Amgen facility access at the north side of the property, minimal encroachment into the northern side of the Amgen facility property, and potential conflict with Little White Oak Creek tributaries.

6.4 Recommended Interchange Alternatives

CAMPO, the Town of Holly Springs, and the Town of Apex agree on the following recommended interchange alternatives:

- Alternative 1 Tight Diamond (includes the replacement of Friendship Road bridge)
- Alternative 6 Tight Diamond with a New Access to the Amgen Facility and New Intersection at Friendship Road

Interchange Alternative 1 Tight Diamond consists of a six-lane roadway typical section divided by a median. This interchange configuration accommodates four through lanes and two left-turn lanes to access US 1. Single-lane on ramps will include dedicated right-turn lanes. Double-lane off ramps will allow for dedicated left and right turn lanes. Intersections at the interchange will not be signalized.

Interchange Alternative 6 Tight Diamond with a New Access to the Amgen Facility and New Intersection at Friendship Road consists of a six-lane roadway typical section divided by a median. The location of interchange Alternative 5 was shifted further south (approximately 800 feet) to avoid ramp conflicts with the Friendship Road bridge and accommodate the new access to the Amgen Facility. This interchange configuration accommodates four through lanes and two left-turn lanes to access US 1. Single-lane on ramps will include dedicated right-turn lanes. Double-lane off ramps will allow for dedicated left and right turn lanes. Intersections at the interchange will not be signalized. On and off ramps on the south side of the interchange (Holly Springs side) were further tightened to minimize encroachment into the Duke Energy utility easement.

6.4.1 TransModeler Results

The study simulated future traffic conditions with and without the Friendship Road interchange at US 1 using TransModeler. The TransModeler analysis was developed for interchange alternatives 1 and 6. With the new interchange, build condition interchange alternatives 1 and 6 show acceptable operations through design year 2050. The No-Build condition showed considerable congestion at the New Hill/Holleman interchange that was alleviated by the inclusion of the Friendship Road interchange. TransModeler files and videos are available through CAMPO's project SharePoint site.

7 CONCLUSION AND NEXT STEPS

The Friendship Road Hot Spot Interchange Study concludes with recommendations for interchange location and selection of interchange alternatives 1 and 6 as the preferred interchange options. The next steps include recommendation of potential funding sources for the proposed improvements, assignment of transportation jurisdictional responsibilities, initial development of transportation policies, and opportunities to preserve transportation right of way.

7.1 Funding Opportunities

Available funding opportunities include the Strategic Transportation Investments (STI) funding, federal discretionary grants, and transportation bonds.

The proposed improvement may qualify for division project STI funding. However, this funding is competitive and limited.

The Friendship Road interchange and new roadway alignment may qualify for the following federal discretionary grants:

- **RAISE grant** – The new Rebuilding American Infrastructure with Sustainability and Equity (RAISE) is an existing grant previously known as Better Utilizing Investments to Leverage Development (BUILD) and Transportation Investment Generating Economy Recovery (TIGER) discretionary grants. RAISE investments include highway projects focusing on significant regional or local impact to safety, quality of life, environmental sustainability, mobility and community connectivity, economic competitiveness, collaboration, and technical innovation.
- **MPDG** – The US Department of Transportation recently combined the National Infrastructure Project Assistance program (or MEGA), the Infrastructure of Rebuilding America program (or INFRA), and the Rural Surface Transportation Grant program (or RURAL) programs into the Multimodal Projects Discretionary Grant (MPDG) to increase the stream of projects under the Bipartisan Infrastructure Law. MPDG funds complex projects including highways for both urban and rural areas. Funding goals include the creation of good paying jobs, economic growth, reduction of emissions, safety improvements, a sustainable and resilient transportation network, improvements to critical freight movements, the elimination of supply chain bottlenecks, and expansion of transportation options to agricultural areas and other underserved communities.

Federal discretionary grants typically require project cost-benefit analyses and a 20 percent local match.

Lastly, transportation bonds such as a bond referendum would allow municipalities to raise transportation funds through the sale of bonds. Bonds supplements municipal budgets making capital projects more affordable. A referendum would allow the issuance of general obligation funds for specific projects such as the Friendship Road interchange and new roadway alignments. However, developing specific projects for transportation bonds can be a significant and time-constrained process dependent on municipal election schedules.

7.2 Jurisdictional Responsibilities

At the project limits, US 1 is the jurisdictional boundary between the Town of Holly Springs and the Town of Apex. Thoroughfare cross-sections and required right of ways differ between the two municipalities. The Holly Springs CTP indicates a four-lane median divided thoroughfare for the New Location Road from Friendship Road to the proposed US 1 interchange. This includes four 10-foot through lanes, a 17.5-foot raised median, and a five-foot sidewalk and a five-foot side path.

The Apex CTP indicates a three-lane roadway including a side path for the Richardson Road New Location (new Friendship Road) from the new US 1 interchange to Old US 1 Hwy. This includes 11-foot through lanes, a 12-foot center turn lane, and five-foot sidewalks or side paths on both sides of the roadway.

Each municipality would be responsible for maintaining segments of the new Friendship Road and right of way and may share responsibility in maintaining the proposed cross-section of the new Friendship Road interchange bridge (either interchange alternatives 1 or 6).

7.3 Access Management and Right of Way Preservation

Intersections (in Holly Springs or Apex) associated with Interchange Alternative 1 and the new access to the Amgen facility included in Interchange Alternative 6 would be located approximately 1,000 feet or more from the proposed Friendship Road interchange at US 1 to meet minimum access management and intersection justification requirements. Right of way preservation would depend on each established processes for the towns of Holly Spring and Apex, respectively.

7.3.1 Town of Holly Springs

Intersections and the new access to the Amgen facility included in interchange alternatives 5 (should Interchange Alternative 5 be reconsidered as the preferred alternative) should be located approximately 1,000 feet or more from the proposed Friendship Road interchange at US 1 to meet minimum access management and intersection justification requirements.

The four-lane median divided roadway would require a minimum right of way of 118 feet. This proposed right of way would moderately impact the Amgen facility property with the selection of Interchange Alternative 1 and would minimally impact the property with Interchange Alternative 6 as the preferred option. Preservation of this extent of right of way is anticipated for private properties adjacent to the proposed interchange, the Amgen facility property, and Friendship Innovation Park properties. Right of way preservation should also consider potential conflicts with streams on the Amgen facility and Friendship Innovation Park properties, and the Duke Energy utility easement adjacent to US 1.

After right of way preservation, the next step in Holly Spring's project development (consistent with their CTP's Implementation Plan) would be a planning study, preliminary engineering, and environmental review to identify specific solutions.

7.3.2 Town of Apex

Intersections, median breaks, and accesses to the proposed realignment of Boscoe Road, the proposed realignment of Friendship Road included in Interchange Alternative 4 (should this alternative be reconsidered as the preferred alternative), and properties along Richardson Road New Location would be located approximately 1,000 feet or more from the proposed Friendship Road interchange at US 1 to meet minimum access management and intersection justification requirements.

The three-lane roadway would require a minimum right of way of 80 feet. This proposed right of way would impact private properties in Apex with the selection of either interchange alternatives 1 or 6. Preservation of this extent of right of way is anticipated for private properties adjacent to the proposed interchange, along Boscoe Road, and near Old US 1 Hwy. Right of way preservation should also consider potential conflicts with streams and environmental easements in the area.

APPENDIX A: TECHNICAL MEMORANDUMS

Tech Memo 1

Tech Memo 2

Tech Memo 3

APPENDIX B: PRESENTATIONS / MINUTES

Meeting 1 Presentation/Minutes

Meeting 2 Presentation/Minutes

Meeting 3 Presentation/Minutes

Stakeholder Responses