SR 1404/1402 (29th Ave NE/ 24th St NE)

NC 127 (N Center St) to SR 1453 (Springs Rd NE)

Catawba County

STIP Project No. U-2307B

WBS No. 34791.1.9

Traffic Forecast Report

Prepared For:
North Carolina Department of Transportation

Prepared By:
Patriot Transportation Engineering, PLLC

July 2018

TRAFFIC FORECAST COVER LETTER

July 23, 2018

MEMORANDUM TO: Theresa Ellerby, CPM
NCDOT Project Management Unit

FROM: Peter Trencansky, PE, PTOE, AICP
Patriot Transportation Engineering, PLLC

SUBJECT: Traffic Forecast for U-2307B
Catawba County
SR 1404/1402 (29th Avenue NE/24th Street NE) Improvements

Please find attached the 2018 and 2040 traffic forecast for STIP Project U-2307B in Catawba County. The proposed project would widen SR 1404/1402 (29th Avenue NE/24th Street NE) to a four-lane divided roadway. This forecast was requested for use in the project development activities associated with the project, including the environmental documentation and Preliminary Roadway Design.

This is the first forecast for this project. The project is located within the boundaries of the Greater Hickory Metropolitan Planning Organization (GHMPO). The following three scenarios are provided in this forecast:

- 2018 Base Year (Existing Conditions)
- 2040 Future Year No-Build
- 2040 Future Year Build (4-Lane Divided)

Michael Poe (NCDOT Division 12 Division Project Development Engineer), Byron Engle (NCDOT Division 12 Division Traffic Engineer), Michael Watson (NCDOT Division 12 District 3 Assistant District Engineer), Pamela Cook (NCDOT Transportation Planning Branch), Brian Horton (Greater Hickory MPO Transportation Planning Manager), and John Marshall (City of Hickory Transportation Planning Manager) were consulted during the development of this forecast.

Fiscal Constraint

The project is located within the GHMPO boundaries; therefore, the travel demand model and traffic forecast is fiscally constrained to match the assumptions of the 2014 Long Range Transportation Plan (LRTP), which is the latest available long-range plan as of the preparation of this forecast.

The *2040 Greater Hickory Urban Area Long Range Transportation Plan* (2040 LRTP) (adopted January 2014) includes the proposed project in the Regionally Significant Projects list for Catawba County and describes it as follows:

- McDonald Parkway NE - The combination of this recommended major thoroughfare and the proposed NC127 & US 321 Connector and Grace Chapel Road will provide a valuable loop system that serves the northern and western sectors of the City of Hickory. McDonald Parkway NE comprises 29th Avenue NE and 29th Avenue Drive NE from NC 127 to Springs Road NE. The City of Hickory prefers a 4-lane divided boulevard cross-section.

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Travel Demand Model

The Greater Hickory Travel Demand Model (provided by NCDOT on 03/20/2018) was utilized as a tool in the development of the forecast.

Forecast Methodology

The 2018 Base Year No-Build traffic volumes and design factors were developed based upon current counts and historic AADT trend projections. The 2040 future year no-build traffic volumes generally included the development of compound annual growth rates between two model years, while the 2040 future year build volumes generally included the development of diversion rates between like model years with different scenarios. The compound annual growth rates or diversion rates were then applied to the AADT volumes from another scenario to develop initial volumes for each scenario. Engineering judgment adjustments were applied as needed in finalizing the volumes in order to develop a balanced forecast.

Interpolation/Extrapolation

To estimate AADT volumes between 2018 and 2040, straight line interpolation between the 2018 and the 2040 scenarios is acceptable. AADT volumes may be extrapolated for up to two years immediately following 2040. If it is determined that any of these assumptions have become inconsistent with the project and surrounding area activity, please request updated projections at this location.

This forecast has been reviewed and approved by the NCDOT Transportation Planning Branch on July 23, 2018.

cc: (Final distribution for your records via e-mail as PDF attachments):
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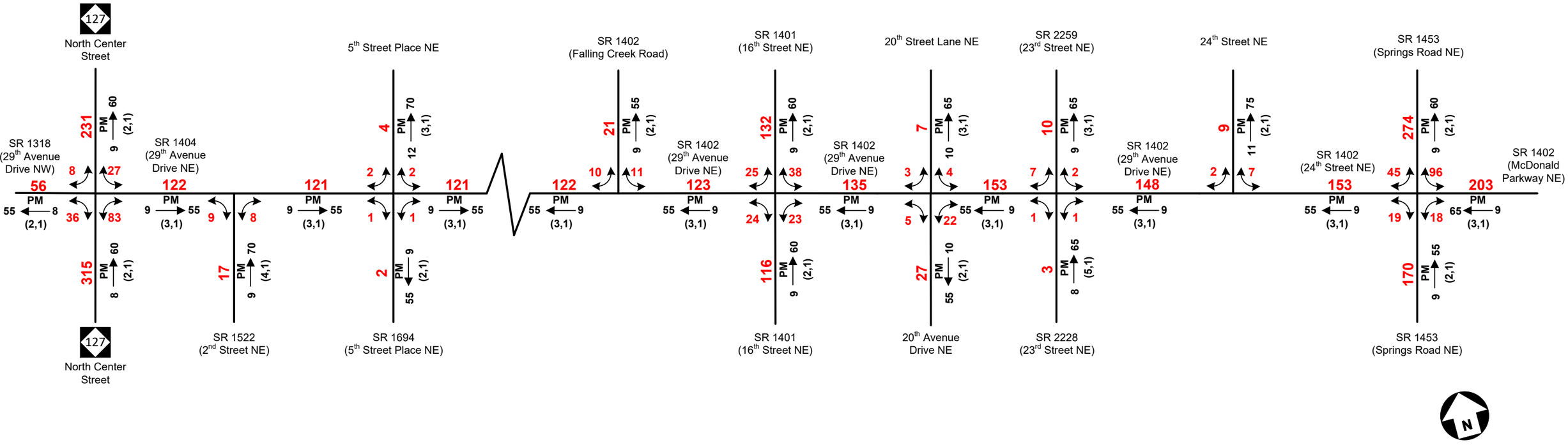


2018 AVERAGE ANNUAL DAILY TRAFFIC

NO-BUILD SCENARIO

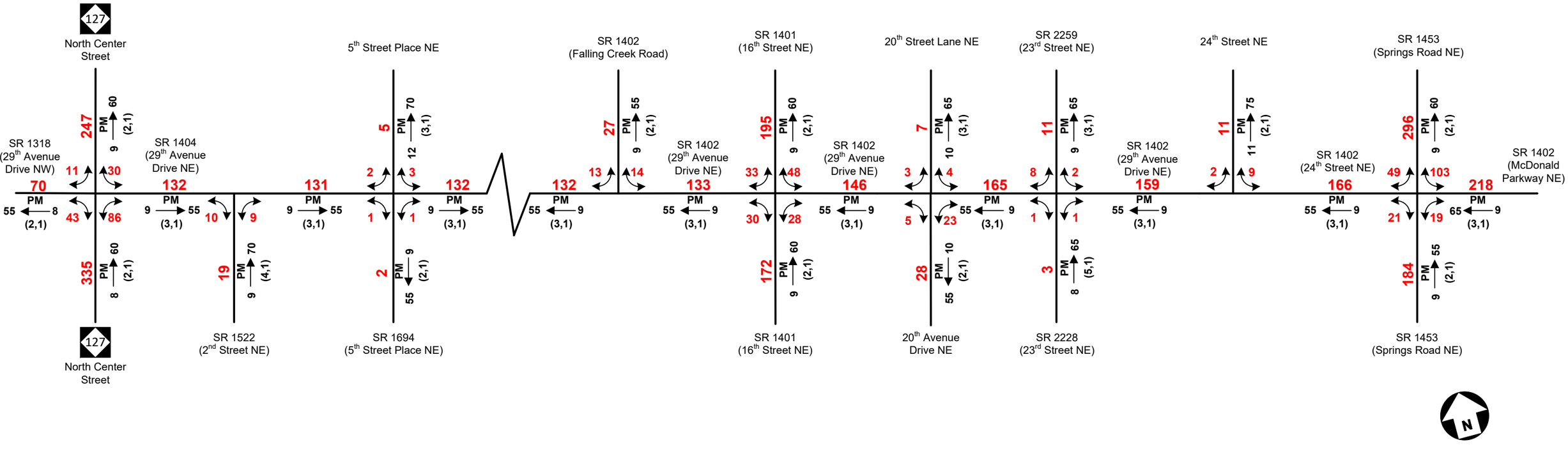
SHEET 1 OF 1

L E G E N D

K PM (d, t) D

###	No. of Vehicles Per Day (VPD) in 100s	K	Design Hour Factor (%)
1-	Less than 50 VPD	PM	PM Peak Period
X	Movement Prohibited	D	Peak Hour Directional Split
		→	Indicates Direction of D
		(d, t)	Duals, TT-STs (%)

TIP: U-2307B	**WBS:** 34791.1.9
COUNTY: Catawba	**DIVISION:** 12
DATE: 07-23-2018	
PREPARED BY: Patriot Transportation Engineering, PLLC	
LOCATION: SR 1404/SR 1402 (29th Avenue NE/24th Street NE) from NC 127 (N Center Street) to SR 1453 (Springs Road)	
PROJECT: Widen SR 1404/SR 1402 (29th Avenue NE/24th Street NE)	



2040 AVERAGE ANNUAL DAILY TRAFFIC

NO-BUILD SCENARIO

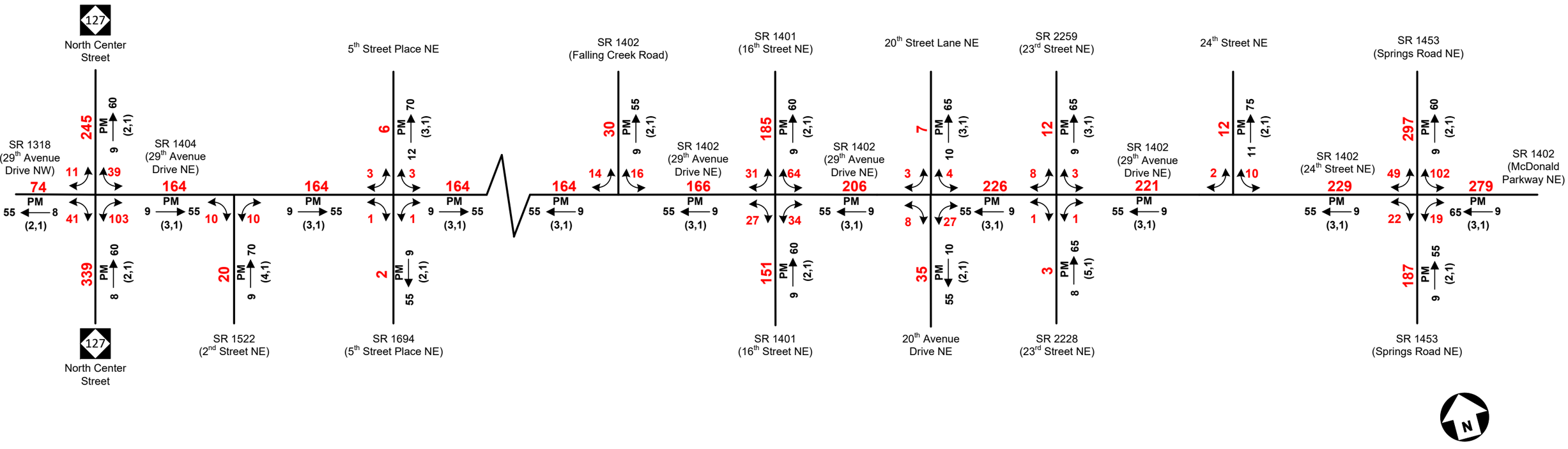
SHEET 1 OF 1

L E G E N D

K PM (d, t) D

###	No. of Vehicles Per Day (VPD) in 100s	K	Design Hour Factor (%)
1-	Less than 50 VPD	PM	PM Peak Period
X	Movement Prohibited	D	Peak Hour Directional Split
		→	Indicates Direction of D
		(d, t)	Duals, TT-STs (%)

TIP: U-2307B	**WBS:** 34791.1.9
COUNTY: Catawba	**DIVISION:** 12
DATE: 07-23-2018	
PREPARED BY: Patriot Transportation Engineering, PLLC	
LOCATION: SR 1404/SR 1402 (29th Avenue NE/24th Street NE) from NC 127 (N Center Street) to SR 1453 (Springs Road)	
PROJECT: Widen SR 1404/SR 1402 (29th Avenue NE/24th Street NE)	



2040 AVERAGE ANNUAL DAILY TRAFFIC

BUILD SCENARIO (4-Lane Divided)

SHEET 1 OF 1

L E G E N D

K PM (d, t) D

###	No. of Vehicles Per Day (VPD) in 100s	K	Design Hour Factor (%)
1-	Less than 50 VPD	PM	PM Peak Period
X	Movement Prohibited	D	Peak Hour Directional Split
		→	Indicates Direction of D
		(d, t)	Duals, TT-STs (%)

TIP: U-2307B	**WBS:** 34791.1.9
COUNTY: Catawba	**DIVISION:** 12
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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1. PROJECT BACKGROUND

Patriot Transportation Engineering, PLLC (Patriot) has been contracted by the North Carolina Department of Transportation (NCDOT) to develop base and future year traffic forecasts for NCDOT State Transportation Improvement Program (STIP) Project U-2307B (29th Avenue NE/24th Street NE) widening in Catawba County.

1.1 PROJECT REQUEST INFORMATION

The traffic forecast for this project was requested by NCDOT Division 12 in support of project development activities, including environmental documentation and Preliminary Design for the project. The scope of work for the traffic forecast was finalized in March 2018.

For the purposes of the environmental document, it was decided through project scoping with NCDOT that Base Year scenarios would use 2018 and Future Year scenarios would use 2040. The 2018 Base Year traffic forecast includes the No-Build scenario. The 2040 Future Year traffic forecast includes No-Build and Build scenarios for one alternative, the widening of the roadway to a four-lane divided facility.

1.2 FORECAST HISTORY

This is the first request for a traffic forecast at this location.

1.3 PROJECT DESCRIPTION

NCDOT proposes to widen SR 1404/SR 1402 (29th Avenue NE/24th Street NE) to a four-lane divided facility, from NC 127 (N Center Street) to SR 1453 (Springs Road NE), a distance of approximately 3.2 miles, in Catawba County.

1.4 AREA INFORMATION

Catawba County has an estimated population of 154,800 citizens based on 2010 census data and a projected 2018 population of 157,400 according to the North Carolina Office of State Budget and Management (NCOSBM). The county covers approximately 413 square miles and consists of several cities and towns including: Claremont, Conover, Hickory, Newton, Brookford, Catawba, Long View, and Maiden. Newton is the county seat of Catawba County.

The project area is in Hickory in the northern part of Catawba County, north of I-40 and south of Lake Hickory.

The project location map for the U-2307B forecast is shown on Figure 1-1.

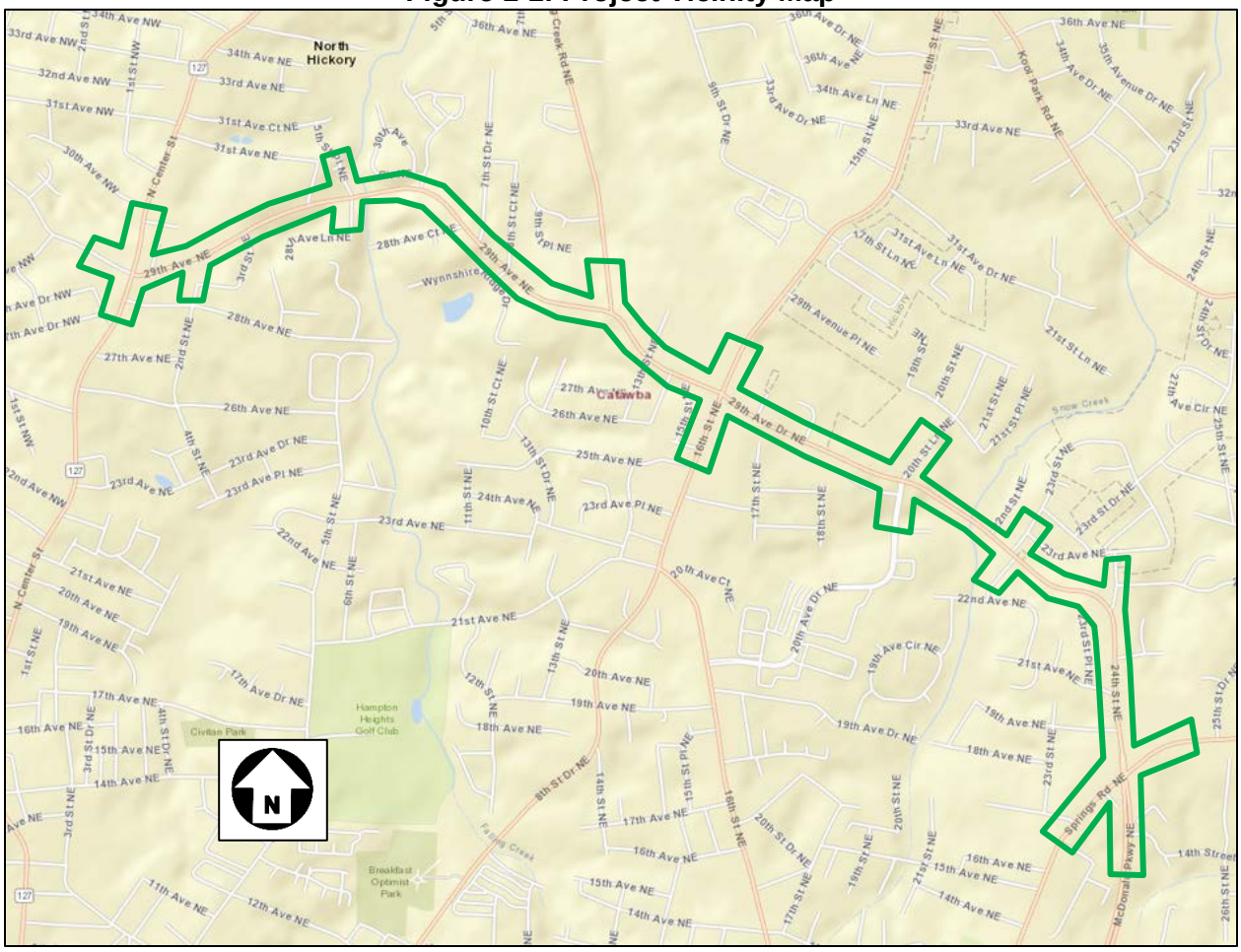
1.5 ROUTE INFORMATION

The following roadways within the study area are classified by the Federal Highway Administration (FHWA):

The **29th Avenue NE/24th Street NE (SR 1404/1402)** corridor is classified as an *Other Principal Arterial* and runs from NC 127 (N Center Street) in the west to Springs Road NE/12th Avenue NE (SR 1439/SR 1453) in the east. The roadway alignment continues southeast of Springs Road NE/12th Avenue NE as McDonald Parkway NE (also as an Other Principal Arterial). 29th Avenue NE and 24th Street NE are two-lane, undivided roadways along the length of the study area. Access to the corridor is provided by intersecting local streets and direct-access driveways from residences and businesses. The land use along 29th Avenue NE/24th Street NE is primarily residential with some commercial uses at the primary intersections. There are also several multi-unit senior living facilities. The speed limit along the corridor varies from 35 mph on the east and west commercial areas to 45 mph in the central portion of the corridor.

NC 127 (N Center Street) is a four-lane *Other Principal Arterial* divided by a center two-way left-turn lane (TWLTL). NC 127 is a major north-south radial roadway serving the Hickory area (connecting Hickory to Alexander County within the study area). The speed limit in the study area is 35 mph south of 29th Avenue NE and 45 mph north of 29th Avenue NE.

Figure 1-1: Project Vicinity Map



McDonald Parkway (SR 1402) is a four-lane *Other Principal Arterial* with a median. McDonald Parkway NE connects directly to I-40 via an interchange. The speed limit in the study area is 45 mph.

16th Street NE (SR 1401) is designated as a *Minor Arterial*. The speed limit along 16th Street NE is 45 mph.

Springs Road NE/12th Avenue NE (SR 1439/SR 1453) is designated as a *Minor Arterial* in the study area. The speed limit along Springs Road NE/12th Avenue NE is 45 mph.

All other roadways included in the project forecast are classified as *Local Roads*.

1.6 FUTURE AREA ROADWAY IMPROVEMENTS – FISCAL CONSTRAINT

The project is located within the Greater Hickory MPO (GHMPO) boundaries; therefore, the travel demand model and traffic forecast is fiscally constrained to match the assumptions of the 2014 Long Range Transportation Plan (LRTP), which is the latest available long-range plan as of the preparation of this forecast.

The *2040 Greater Hickory Urban Area Long Range Transportation Plan* (2040 LRTP) (adopted January 2014) includes the following projects in the area which are described as follows:

- NC 127 widening, from Cloninger Mill Rd NE (SR 1400) to Richey Rd (SR 1156) – (STIP ID R-3630A)
- Cloninger Mill Rd NE-Kool Park Rd (SR 1400) widening – GHMPO LRTP
- 16th ST NE, widening and extension – GHMPO LRTP
- North Crosstown Loop – GHMPO LRTP

2. SOURCES OF INFORMATION AND DATA

The following sections describe the various information and data sources used in the development of the traffic forecast.

2.1 RELATED FORECASTS

Past traffic forecasts in the vicinity of the proposed project can potentially be utilized as a tool when preparing the traffic forecast. However, no past forecasts in the vicinity of the project were identified.

2.2 HISTORIC AADT

Existing traffic count data for study area roadways from 1997 to 2016 was provided by the NCDOT Traffic Survey Group (TSG). Data sources included:

- NCDOT TSG Average Annual Daily Traffic (AADT) history from 1997 to 2016

The locations of the historic traffic data counts are shown in Figure 2-1 . The complete 20-year AADT history for each location is found in Appendix A.

2.3 FIELD DATA COLLECTION

New project-specific counts were taken in February 2018 through the NCDOT TSG on-call contract and included nine 13-hour turning movement counts and two 48-hour classification counts. The traffic count locations are listed in Table 2-1 and are displayed in Figure 2-1.

The traffic count locations fall under the following TSG ATR classification:

- ATR Group 1 (The most dominant group in the State. Mostly rural in nature and is predominantly used for count locations on nonurban primary routes and all rural and most urban secondary roads).

The classification counts were converted to 24-Hour volumes by dividing the 48-Hour counts by two and then applying the correct seasonal adjustment factors. The turning movement counts (TMCs) were converted to 24-Hour volumes by utilizing the NCDOT Traffic Survey Partial Weekday Count Expansion Factors (November 2015). The count expansion factors were also compared to the count data from the 48-hour volume, speed, classification count and determined to be adequate.

Figure 2-1: Traffic Volume Data Locations

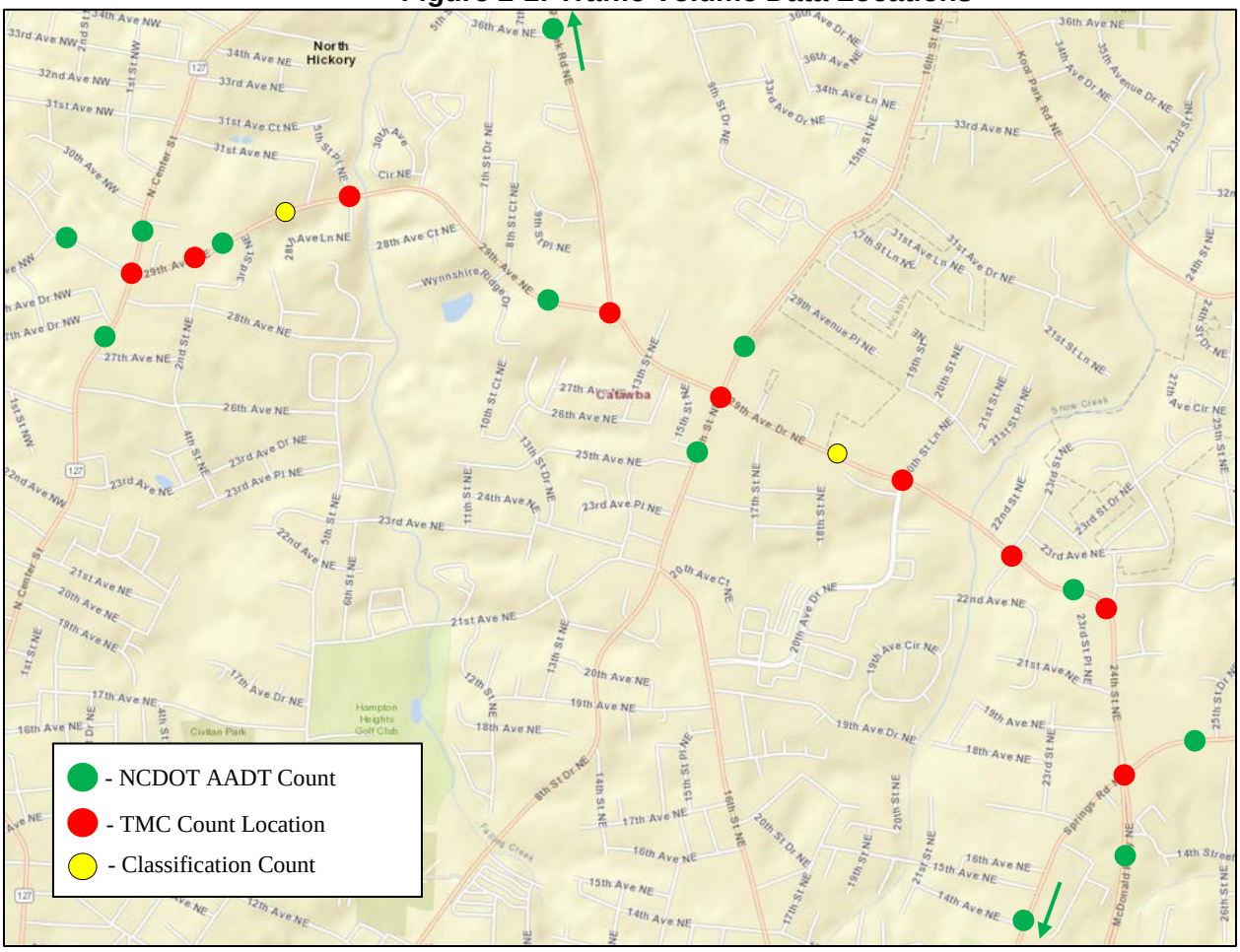


Table 2-1: Collected Traffic Count Locations

Location	Count Type	Date(s)	County	ATR Group	Seasonal Adjustment Factor
SR 1404 (29th Ave NE)/SR 1318 (29th Ave Dr NW) at NC 127 (N Center St)	13-hour TMC	4/12/18	Catawba	1	0.95
SR 1404 (29th Ave NE) at SR 1522 (2nd Street NE)	13-hour TMC	4/12/18	Catawba	1	0.95
SR 1404 (29th Ave NE) at 5th Street Place NE	13-hour TMC	4/12/18	Catawba	1	0.95
SR 1404 (29th Ave NE) at SR 1402 (Falling Creek Road)	13-hour TMC	4/12/18	Catawba	1	0.95
SR 1402 (29th Ave NE) at SR 1401 (16th St NE)	13-hour TMC	4/12/18	Catawba	1	0.95
SR 1402 (29th Ave NE) at 20th Avenue Drive NE	13-hour TMC	4/12/18	Catawba	1	0.95
SR 1402 (29th Ave NE) at SR 2228/2259 (23rd Street NE)	13-hour TMC	4/12/18	Catawba	1	0.95
SR 1402 (29th Ave NE) at 24th Street NE	13-hour TMC	4/12/18	Catawba	1	0.95
SR 1402 (McDonald Parkway NE) at SR 1453 (Springs Road NE)/SR 1439 (12th Ave NE)	13-hour TMC	4/12/18	Catawba	1	0.95
SR 1404 (29th Ave NE) west of 5th St Pl NE	48-hour VSC	4/10/18-4/12/18	Catawba	1	0.99/0.97
SR 1402 (29th Ave NE) west of 20th Avenue Drive NE	48-hour VSC	4/10/18-4/12/18	Catawba	1	0.99/0.97

Note: TMC = turning movement count; VSC = volumes, speed, classification count

2.4 FIELD INVESTIGATION

An orientation field trip was taken as part of the traffic forecast initiation process. The field trip was taken on May 30, 2018. The following observations were noted:

- The land use along 29th Avenue NE and 24th Street NE is a mix of suburban residential, commercial, and some high-density residential. The residences are primarily located on small lots that have direct access to the study roadway. The commercial areas are primarily clustered around three intersections at: Springs Road NE/12th Avenue NE, 16th Street NE, and NC 127. There are at least three senior assisted/independent living facilities. There are also church uses, one of which, Tabernacle Baptist Church, has a school attached to it. Several of the commercial properties at the NC 127 intersection appear to be newly built.

- The PM peak direction of the 29th Avenue NE/24th Street NE corridor appeared to be mainly in the westbound direction.

- The PM peak direction of Springs Road NE/12th Street NE appeared to be mainly in the northbound direction.

- The PM peak direction of NC 127 appeared to be mainly in the northbound direction.

- The PM peak time appeared to be around 5:00. There were no observed periods of sustained queuing along the study corridor, however, there tended to be traffic back-ups at the signalized intersections, especially for those intersections that lack left-turn bays.

- Where the small waterway, named Falling Creek, crosses 29th Avenue NE, there is a significant grade change. The roadway drops down in elevation rapidly from 2nd Street NE to 5th Street Place NE, and then climbs rapidly on the other side of Falling Creek to 7th Street Drive NE.

2.5 INFORMATION FROM LOCAL PLANNERS

Questionnaires were sent to, completed by or discussed with the following individuals to assist in understanding the project and traffic forecast study area:

- *Michael Poe, NCDOT Division 12 – Division Project Development Engineer
- Thad Duncan, NCDOT Division 12 – Division Project Manager
- *Byron Engle, NCDOT Division 12 – Division Traffic Engineer
- *Michael Watson, NCDOT Division 12 – District 3, Assistant District Engineer
- *Pamela Cook, NCDOT Transportation Planning Branch
- *Brian Horton, Greater Hickory MPO Transportation Planning Manager
- *John Marshall, City of Hickory Transportation Planning Manager
- Jacky Eubanks, Catawba County Planning Director

Individuals who provided a response are denoted with an *. Detailed information from the questionnaires is included in Appendix B.

2.6 OTHER SOURCES

Data sources used that are not listed in Sections 2.1 through 2.5 include:

North Carolina Department of Transportation. *State Transportation Improvement Program.* June 2018. Available: https://connect.ncdot.gov/projects/planning/STIPDocuments1/NCDOT%20Current%20STIP.pdf

Greater Hickory Metropolitan Planning Organization. Greater Hickory Metropolitan Transportation Organization 2040 Long Range Transportation Plan. Adopted January 22, 2014. Available: http://www.wpcog.org/2040-long-range-plan/

NCDOT Functional Classification Maps. Available: http://ncdot.maps.arcgis.com/home/webmap/viewer.html?layers=029a9a9fe26e43d687d30cd3c08b1792

3. BASE YEAR 2018 NO-BUILD TRAFFIC FORECAST

3.1 METHODOLOGY

A review of previous traffic forecasts, field-collected traffic counts, area AADT history, and engineering judgment serve as the basis for the 2018 Base Year No-Build traffic forecast. After careful review for reasonableness checks, the 48-Hour classification counts and 13-Hour TMCs were first converted to AADT volumes by using the appropriate NCDOT TSG seasonal adjustment factors based on the month and day of the week the counts were collected.

A variation of the NCDOT Traffic Forecast Utility (TFU) spreadsheet was also a major tool used in the determination of the traffic forecast volumes. The NCDOT TFU spreadsheet includes the calculation of a validation score that considers the approach volumes and design factors for each intersection. The score is utilized as a tool in selecting the appropriate volumes and factors with a score that is less than 2.0 being valid. All scores for the 2018 Base Year forecast were less than 1.2 (and only one was greater than 1.0). Ultimately, the approach volumes and factors were selected based on engineering judgment such that the AADTs and turning movements can be converted to peak hour volumes.

The data from the field-collected traffic counts were incorporated into the spreadsheet to replicate volumes as closely as possible for each intersection in the traffic forecast. The traffic forecast volumes in the 2018 Base-Year traffic forecast mimic the observed patterns as closely as possible. Once the traffic forecast volumes were determined, they were compared to historic AADT trends and interpolated model volumes for reasonableness. Table C1 found in Appendix C provides a comparison of historic AADT trends, field collected data, interpolated model volumes, and the selected traffic forecast volumes for all locations within the study area.

3.2 DESIGN FACTORS

Design factors are a very important aspect of traffic forecasting. The truck percentages, peak hour factor (or K-Factor), and directional distribution are all used along with forecasted traffic volumes when designing a roadway. The methodology and chosen values for each of the factors are described below.

3.2.1 TRUCK PERCENTAGES

Truck Percentages were determined using the 48-Hour mainline classification count data and the 13-Hour TMC data. Overall truck percentages were then separated into the two NCDOT standard classifications: Duals (single-unit trucks with at least one dual-tire axle) and TTSTs (multi-unit trucks with single or twin trailers). Attempts were made to maintain consistent truck percentages along a roadway facility unless circumstances warranted a change. Data used to determine the truck percentages and the chosen values are found in Table C2 in Appendix C. A discussion of the truck percentages for the project is also included as follows:

- Truck percentages from the turning movement counts were mostly consistent along 29th Avenue NE/24th Street NE, with 1 to 2 percent duals and 1 percent TTSTs. The truck percentages from the mainline counts showed 4 to 7 percent duals and 1 percent TTSTs. The forecast utilizes 3 percent duals (which takes into consideration both the TMC and mainline data) and 1 percent TTSTs on 29th Avenue NE/24th Street NE.

- Y-lines – Most of the truck percentages collected for the Y-lines showed truck percentages that were similar to 29th Avenue NE/24th Street NE. The overall percentages ranged from 1 to 5 percent. The forecast utilizes truck percentages that are consistent with the count percentages as much as possible.

3.2.2 DIRECTIONAL DISTRIBUTION

The directional distribution (D) provides information on the direction of traffic flow in the peak period and is a percentage (rounded to the nearest 5 percent) based on the percent of traffic traveling in each direction along the

roadway. In addition to the directional distribution percentage, the direction of the peak travel during the PM peak period is selected and included on the forecast figures. For the forecast study area, D was in the 50% to 57% range for 29th Avenue NE/24th Street NE. The D values for the y-lines varied greatly by location and land use. The D values were measured from as low as 50% (5th Street Extended NE south of 29th Avenue NE) to as high as 74% (24th Street NE north of 29th Avenue NE). Table C3 in Appendix C provides the D value information used for this traffic forecast. A discussion of the D values for the project is also included as follows:

- 29th Avenue NE/24th Street NE (SR 1404/1402) – the directional distribution along 29th Avenue NE/24th Street NE ranged from 50 to 57 percent. The peak direction for travel was primarily in the eastbound direction from NC 127 to east of 5th Street Place NE, and the peak direction was primarily in the westbound direction from 12th Avenue NE/Springs Road NE to west of Falling Creek Road. It was determined that a directional distribution of 55 percent would be the most appropriate distribution with the PM peak direction in the eastbound direction from NC 127 to east of 5th Street Place NE and in the westbound direction from 12th Avenue NE/Springs Road NE to west of Falling Creek Road. The differing PM peak directions reflect the character of the roadway, which serves largely residential areas and is located between two arterials.

- Y-lines along study area – the directional distributions for Y-lines along the study area ranged from 50 to 74 percent. Wherever possible the selected directional distributions were in line with the turning movement count percentages.

3.2.3 PEAK HOUR FACTOR

The peak hour factor (K) is the percentage of AADT that occurs during the peak time period of the day. The K-factor is meant to approximate what percentage of daily traffic would be present during the 30th highest peak hour of a given year, which is commonly referred to as K30. To determine the K-value for the classification counts the highest hourly volume was divided by the daily average of the 48-Hour counts. For turning movement counts the K-factor was developed by dividing the peak hour of the count by the daily volume. For the forecast study area, the K-factors ranged from 7% to 13%. The K-factor information used for this forecast is found in Table C4 in Appendix C. A discussion of the K values for the project is also included as follows:

- 29th Avenue NE/24th Street NE (SR 1404/1402) – the peak hour factors for 29th Avenue NE/24th Street NE were eight or nine percent. A peak hour factor of nine percent was selected for 29th Avenue NE/24th Street NE.

- Y-lines along the corridor – the peak hour factors for Y-lines along the corridor ranged from seven to thirteen percent and the selected peak hour factors were largely in line with the turning movement count percentages.

3.3 TRAFFIC FORECAST VOLUMES

Based on the methodology described in Section 3.1, traffic forecasts for the 2018 Base Year No-Build Scenario were calculated. Adjusted counts were compared to trend line analyses and the extrapolation of data to 2018 during the process. Utilizing a variation of the NCDOT Traffic Forecast Utility spreadsheet, bidirectional turning movements were also forecasted at intersections to replicate observed daily turning movement volumes as closely as possible. Comparisons of trend line analyses, volume extrapolation, observed counts, and selected forecast volumes are shown in Table C1 in Appendix C. A discussion of the traffic forecast volumes is included as follows:

- The traffic forecast includes a break line at one location on 29th Avenue NE (SR 1404). The break occurs between 5th Street Place NE and Falling Creek Road where it was determined that the PM peak direction changed between the intersections.

4. BASE YEAR 2018 BUILD TRAFFIC FORECAST

During the scoping process for this forecast, it was determined that a base year 2018 build traffic forecast would not be prepared. The proposed project would not include new connections that would result in any substantial diversion of the existing traffic volumes and there are not any readily accessible parallel routes along the existing corridor. Additionally, the existing facility is currently under capacity and it is not likely that existing trips are diverting from the existing roadway due to congestion. Therefore, no diversion of traffic is anticipated and a Build forecast would not result in volumes that are substantially different than those included in the No-Build estimate. For analysis purposes, the 2018 Base Year No-Build volumes can be used as a proxy for 2018 Base Year Build volumes.

5. MODEL DATA

The study area for the forecast is included the Greater Hickory MPO Travel Demand Model. The Greater Hickory MPO Travel Demand Model (provided by NCDOT on 03/20/2018) was utilized as a tool in the development of the forecast. The study area is located in the central area of the model and has limited connectivity, with the model including only the major links (NC 127 and Springs Road NE/12 Avenue NE) and one other roadway (16th Street NE).

The Greater Hickory MPO Model was developed in TransCAD (version 5.0 Build 2110) and was calibrated based on a base year of 2011, and has models for a future year of 2040.

Table C5 can be found in Appendix C and displays the model performance for the 2011 model against 2011 AADTs, the 2040 model volumes, and an extrapolated volume for 2018 based on the 2011 and 2040 model output. A discussion of the model performance for the project study area corridors is included as follows:

- 29th Avenue NE/24th Street NE (SR 1404/1402) – the 2011 model volumes on the study roadway (within the study limits) were consistently lower than the corresponding AADT. The AADT on the west end of the corridor were higher than the model volumes by about 3,000 to 4,000 vehicles per day (vpd), a difference of 60% to 72%. The AADT on the east end of the corridor was higher by about 1,100 vpd, a difference of about 10%. The 2018 interpolated model volumes varied from the extrapolated AADT counts in a similar pattern, although the differences are greater because the model reported a low amount of growth (leading to a small interpolated value).
- McDonald Parkway NE (SR 1402) – the 2011 model volumes for McDonald Parkway NE (just east of the study corridor) were lower than the corresponding AADT by about 2,800 vpd. The 2018 interpolated model volumes were closer to the extrapolated AADT count, lower by about 400 vpd.
- NC 127 (N Center Street) – the 2011 model volume on NC 127 (south of 29th Avenue NE) is lower than the corresponding AADT by approximately 12,200 vpd, a difference of 65%. The 2018 interpolated model volumes varied from the extrapolated AADT count in greater magnitude.
- 16th Street NE (SR 1401) – the 2011 model volumes for 16th Street NE corresponded well with the AATD counts, with the model within 1,000 vpd and 10%. The 2018 interpolated model volumes varied from the extrapolated AADT counts in a similar way.
- Springs Road NE/12th Avenue NE (SR 1453/SR 1439) – the 2011 model volumes for Springs Road NE/12th Avenue NE were higher than the corresponding AADT (by 1,800 to 4,200 vpd). The 2018 interpolated model volumes varied from the extrapolated AADT counts in a similar way but with a greater magnitude.

6. FUTURE YEAR 2040 NO-BUILD TRAFFIC FORECAST

6.1 ASSUMPTIONS

A Future Year of 2040 was chosen for the U-2307B traffic volume examination as it is the latest year available in the Greater Hickory MPO Travel Demand Model and to correspond with the horizon year of the 2014 LRTP. All 2040 fiscally-constrained projects, with the exception of U-2307B, listed in the *2040 Greater Hickory Urban Area Long Range Transportation Plan* (2040 LRTP) were included in the 2040 No-Build alternative model run.

The modeling aspects for the 2040 No-Build scenario include utilizing the Greater Hickory MPO Travel Demand Model fiscally constrained model. The first step was to review the model and determine if the changes included in the fiscally constrained MTP have been properly included in the model. Based on this review, only one revision was made to the 2040 future model, which was to include the planned I-40 widening (STIP ID I-5991) from US 321 to Fairgrove Church Road SE.

6.2 METHODOLOGY

The Greater Hickory MPO Travel Demand Model was utilized as a tool in the development of the 2040 Future Year No-Build traffic volumes.

2040 Future Year No-Build model runs were completed without the proposed project in place. The Compound Annual Growth Rate (CAGR) for each traffic volume location was calculated using the following equation:

((2040 Model Value/2011 Model Value) ^1/29) -1

Additionally, the raw model volumes were compared to determine the total change in model volume between 2011 and 2040. The CAGR rates and total volume changes were reviewed and adjusted during this phase using engineering judgment where needed. The selected CAGR rates were then determined and applied to the 2018 No-Build traffic volumes and extrapolated to determine the 2040 traffic volumes.

6.3 DESIGN FACTORS

The 2040 model network was reviewed to see if any of the corridors experienced changes in the percent of traffic occurring in the peak hour, direction of peak travel, or directional split. Based on a review of the model data it was determined that all of the 2018 Base Year factors were still adequate and that none of the design factors would change from those included in the 2018 Base Year forecast.

6.4 TRAFFIC FORECAST VOLUMES

Based on the methodology described in Section 6.2, traffic volumes for the 2040 Future Year No-Build Scenario were calculated. Table C6 in Appendix C shows the comparisons of historic growth rates, model output, CAGRs, and selected volumes. Some of the volumes were modified slightly to allow for the development of a balanced network.

A brief summary of the key observations and considerations from the development of the 2040 No-Build volumes are as follows:

- The model CAGRs for 29th Avenue NE/24th Street NE (SR 1404/1402) averaged -0.34%. The negative growth on the corridor reflects the effects of several projects planned nearby which would increase roadway capacity, particularly the widening of 16th Street NE. Because the network connectivity of the model in this area is relatively poor, almost all of the vehicle loading onto 29th Avenue NE/24th Street NE comes from centroid connectors. Therefore, some of the negative growth in the 2040 No-Build scenario that are seen due to

improvements on radial routes in the area that are drawing more volume directly from centroid connectors. In reality, drivers' routes are more fixed so that their shortest paths are still likely to make use of 29th Avenue NE/24th Street NE, even with added capacity nearby. Therefore, the growth rate chosen for the forecast was a positive one, at roughly 0.35%. This rate matches the only positive CAGR from the model, and reflects engineering judgment and input from local experts.

- The Y-lines had growth rates from 0.3% to 1.8% selected based on overall growth in the area. Where the model predicted a negative growth rate, a small positive one was chosen for the forecast due to the reasons specified above.

7. FUTURE YEAR 2040 BUILD TRAFFIC FORECAST

7.1 ASSUMPTIONS

The 2040 Build traffic forecast contains all of the assumptions found in the 2040 No-Build traffic volume network discussed in Section 6.1. The U-2307B project was coded into the model by modifying the model to include the widening of SR 1404/1402 (29th Avenue NE/24th Street NE) to a 4-lane road with a median separation.

7.2 METHODOLOGY

The Greater Hickory MPO Travel Demand Model and engineering judgment were heavily relied upon in the calculation of the 2040 Future Year Build traffic volumes. Once the travel demand model was run to include U-2307B, model volumes were extracted for each location included in the evaluation. Model volumes from the 2040 No-Build and Build Model runs were compared in order to calculate a diversion percentage between the two scenarios. The model diversion rates were then reviewed along with input from local planners, historic growth rates and engineering judgment to determine the proposed diversion rates for the forecast. These diversion percentages were then applied to the 2040 No-Build traffic volumes in order to develop 2040 Build Traffic volumes.

7.3 DESIGN FACTORS

The 2040 model network was reviewed to see if any of the corridors experienced changes in the percent of traffic occurring in the peak hour, direction of peak travel, or directional split. The selection of design factors for the 2040 Build scenario was similar to the evaluations discussed in the previous scenarios, with the selected values being the same as those selected for the 2040 No-Build scenario discussed in Section 6.3.

7.4 TRAFFIC FORECAST VOLUMES

Based on the methodology described in Section 7.2, traffic volumes for the 2040 Future Year Build Forecast Scenario were calculated. Table C7 in Appendix C show the comparisons of model output, diversion percentages, volume deltas, and selected volumes.

A brief summary of the key observations and considerations from the development of the 2040 Build volumes are as follows:

- The 2040 Build volumes from the model showed diversion rates on 29th Avenue NE/24th Street NE (SR 1404/1402) from 27% to 86% due to the increased capacity from the four-lane widening and median separation. The model was not well validated in this area with some portions of the corridor being 72 percent lower in the model compared with the AADT data. Because the model is already much lower than the actual volumes, you end up with relatively high diversion percentages that actually produce volume changes that are comparably low. Therefore, the chosen diversion rates along the study roadway were all either in line with the model diversion rates or (as in most locations) considerably less than the model diversion rates. However, the chosen diversion rates produced a diversion in absolute volume that was either similar to the model-predicted changes or greater than the model-predicted changes. So, even when diversion rates were chosen that were less than those predicted by the model, the absolute change in volume was at least as great and, in most locations, more. This balanced approach was determined to be the most reasonable approach and was utilized along the subject corridor.

- 16th Street NE was the only location within the study area that the model predicted a large decrease in volume with the project in place. The additional capacity on 29th Avenue NE/24th Street NE served to provide a competitive travel path to vehicles on 16th Street NE, even with its own widening. The selected diversion rates were very similar to the model diversion rates.

- The Y-lines had selected diversion rates that were similar to those predicted by the model (except in those cases where the closest model analog to a study roadway was a centroid connector).

APPENDIX A:

HISTORIC AADT COUNT DATA

Table A1: NCDOT Historic AADT

Location	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
SR 1318 W OF NC 127		4,300		3,900		3,800		3,700		*4,200*
SR 1404 E OF NC 127		10,000		10,000		8,300		11,000		12,000
SR 1404 W OF FALLING CREEK RD		10,000		10,000		8,900		12,000		*13,000*
SR 1402 W OF SR 1650		14,000		14,000		12,000		14,000		
SR 1005 (MCDONALD PKWY) S OF 18TH AVE NE		18,000		19,000		17,000		19,000		16,000
NC 127 N OF SR 1404		22,000		22,000				21,000		
NC 127 N of 27TH AVE NE		32,000		31,000		31,000		32,000		32,000
FALLING CREEK RD S of 37TH AVE NE		2,700		2,400		*1,300*		2,500		2,700
SR 1401 N OF SR 1402		12,000		12,000		11,000				
SR 1401 S OF SR 1404		11,000		11,000		11,000		12,000		13,000
SR 1453 (PETERS CHURCH RD) E OF SR 1402 29TH AVE DR NE		26,000		*31,000*		25,000		26,000		25,000
SR 1453 N OF SR 1441		15,000		15,000		14,000		15,000		16,000

Location	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
SR 1318 W OF NC 127		2,900		3,200		2,700		2,400		2,500
SR 1404 E OF NC 127		11,000		9,800		9,100		7,400		*6,800*
SR 1404 W OF FALLING CREEK RD		10,000		9,800		9,300		7,300		*7,600*
SR 1402 W OF SR 1650		8,700		8,300		7,800		7,900		*7,700*
SR 1005 (MCDONALD PKWY) S OF 18TH AVE NE										
NC 127 N OF SR 1404										
NC 127 N of 27TH AVE NE		*38,000*		32,000		30,000		28,000		*30,000*
FALLING CREEK RD S of 37TH AVE NE		2,700		2,400		2,200		1,900		*1,800*
SR 1401 N OF SR 1402										
SR 1401 S OF SR 1404		15,000		14,000		14,000		13,000		*10,000*
SR 1453 (PETERS CHURCH RD) E OF SR 1402 29TH AVE DR NE		24,000		23,000		23,000		21,000		*25,000*
SR 1453 N OF SR 1441		25,000		24,000		24,000		25,000		*22,000*

Note: *Red Italics* denote numbers removed from data set due to being greater than two standard deviations away from the trend line data.

APPENDIX B:

PROJECT CORRESPONDENCE

Lee Klieman

From: contact us admin <noreply@ncdot.gov>
Sent: Tuesday, April 03, 2018 12:49 PM
To: Lee Klieman
Subject: A response to your comment has been posted.

A Subject Matter Expert associated with the 'Traffic Analysis' Unit has responded to the comment you posted.
Please do not respond to this email directly.
Instead, click on the following link to view the response.
https://apps.ncdot.gov/ContactUS/Home/CommentDetails?TrackingNum=U9XRBJARQV&Email=lee@pt-engineering.net

Comment History

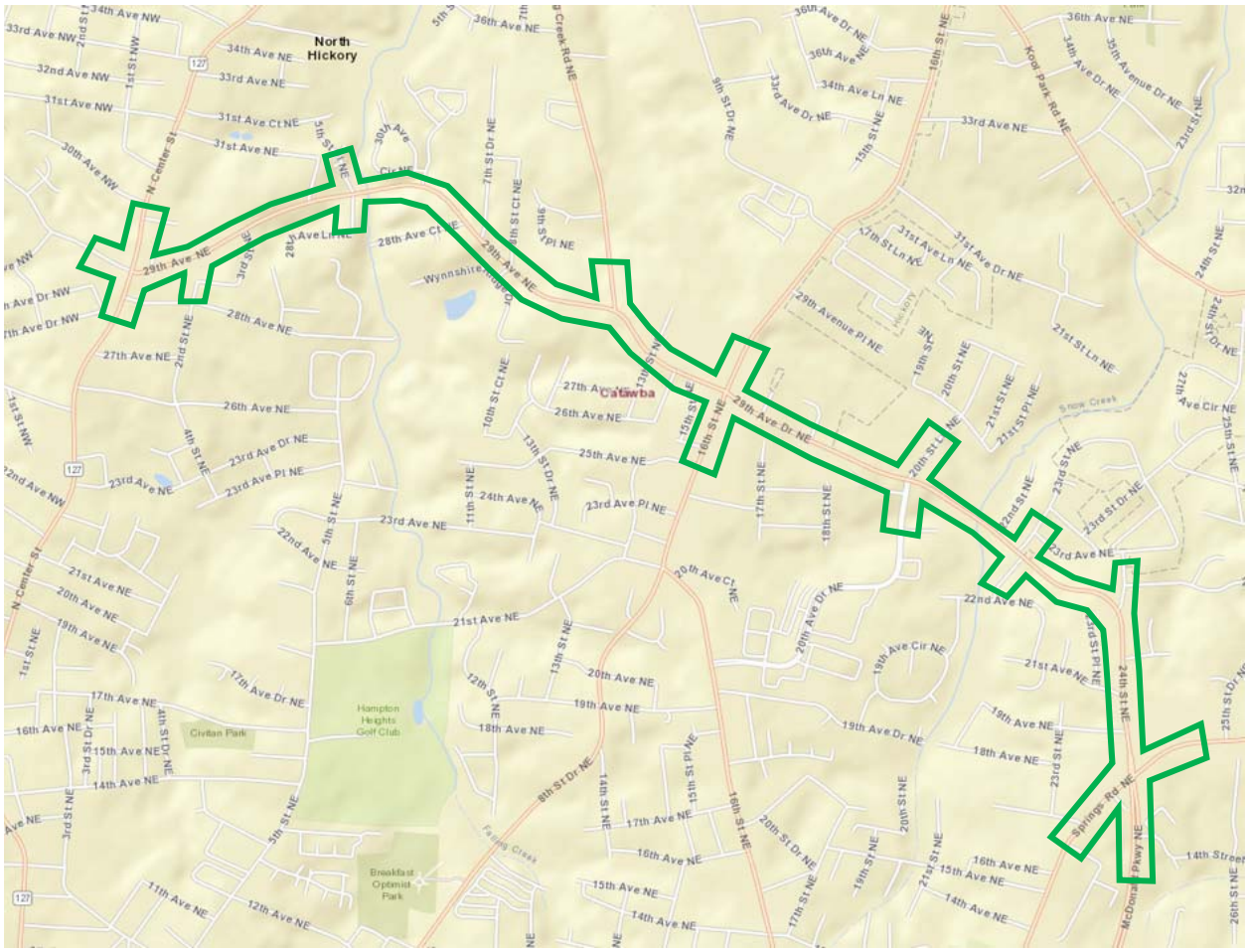
Tracking Number: U9XRBJARQV
Unit Name: Traffic Analysis
Name/Phone: Lee Klieman / (919)336-9342

Sent By: Lee Klieman
Date/Time: 4/3/2018 12:04:55 PM
Comment:
Hello, I am requesting information on what ATR groups to use at several locations for the purpose of factoring counts. Attached is a file listing the 11 AADT stations and their locations that I am requesting ATR groups for. Thank you, Lee Klieman

Sent By: jlviera
Date/Time: 4/3/2018 12:48:38 PM
Comment:
Good afternoon, Your request has been assigned #0765 as a tracking number. If you have any further questions regarding this particular request, please reference this number in your message. I have reviewed the list of coverage stations that you requested ATR Group numbers for and found that you can use ATR Group 1 for all of the stations listed. If you have any additional questions, please don't hesitate to ask. Sincerely, Jamie Viera

Study Area Questionnaire Sent to Local Planners

Patriot Transportation Engineering is currently in the process of developing a traffic forecast for NCDOT STIP Project No. U-2307B, which would widen SR 1404/1402 (29th Avenue NE/24th Street NE) to a 4-lane road with a median separation in Catawba County. The forecast includes base year (2018) and future year (2040) forecasts. The forecast study area is shown in the following figure:



We have reviewed the 2040 Greater Hickory Urban Area Long Range Transportation Plan and are seeking input from local planners and engineers who are familiar with the area. We have identified you as a local representative. I have listed a few questions below that will help us in the development in the traffic forecast. We would greatly appreciate your time in answering these questions. You may answer the questions in text format below and return them to me at: lee@pt-engineering.net.

If you would rather discuss the questions over the phone, I will be following up with a phone call early next week. Thank you in advance for your time and please let me know if you have any questions.

1) Current and historical traffic trends indicate that the traffic growth over the last 20 years along the study corridor has increased overall, although traffic levels have appeared to plateau around the year 2007 and from there either remained relatively stable or decreased from the 2007 levels. Thus, the 20-year growth rates across the study roadway range from 1.5% to 4.3% per year, while the 10-year growth rates range from -2.4% to 0.7% per year. The growth rates on roads connecting to the study corridor generally show a similar growth pattern, with 20-year growth rates (around 1.0%) higher than the 10-year growth rates (around 0%). The only exception in the study area to this general growth pattern is on 12th Ave NE south of 24th

Study Area Questionnaire Sent to Local Planners

St/McDonald Parkway – at this location traffic has been steadily decreasing over the years so that the 20-year growth rate is -3.5% per year and the 10-year growth rate is -0.7% per year.

a. Do you agree with the growth patterns described?

b. What growth patterns have you noticed?

c. Would you expect the growth rate to change substantially in the next 20 years?

d. Do you expect the growth rate to increase in the future? If so, by what percent per year?

2) The traffic forecast will include developing volumes for the average traffic situation. Aside from school being in session and the heavy shopping activity around the Christmas holiday, are there any noticeable seasonal differences in traffic?

3) According to the North Carolina Office of State Budget and Management (OSBM) the population of Catawba County was approximately 156,400 in 2016 and is projected to grow by 0.28% per year to around 166,400 in 2037. The population projections for Catawba County that are contained within the LRTP are slightly higher, showing a projected population of 178,100 in the year 2040 with a growth rate of around 0.48% per year. The LRTP shows a growth rate for the entire Greater Hickory MPO region of 0.34% to the year 2040.

a. Do you think that the 0.28% to 0.48% population growth rate is reasonable for the project study area or do you think it will be higher or lower?

b. Do you know of any other population projections for this area that may be helpful as we review the growth in the area?

4) The Hickory Travel Demand Model data shows that between 2010 and 2040 29th Ave/24th Ave has a growth rate of roughly 1.0% per year. The model shows approximate growth rates of 0.1% per year on NC 127 and on Springs Rd NE. (It should be noted that a number of capacity-affecting projects are planned for the area (see next question) which can lead to traffic diversion within the roadway network.)

a. Do you think that these traffic growth rates are reasonable for the project study area or do you think they will be higher or lower?

5) The Greater Hickory MPO (GHMPO) 2040 Long Range Transportation Plan includes the following projects in the vicinity of the forecast.

- NC 127 widening, from Cloninger Mill Rd (SR 1400) to Richey Rd (SR 1156) – (STIP ID R-3630A)
- Cloninger Mill Rd-Kool Park Rd (SR 1400) widening – GHMPO LRTP
- 16th ST NE, widening and extension – GHMPO LRTP
- North Crosstown Loop – GHMPO LRTP

a. What affect, if any, do you believe these projects will have on the traffic volumes in the study area?

b. Do you know of any reasonably foreseeable transportation projects that are not identified above that may affect traffic volumes in the traffic forecast study area?

6) Are you aware of any previous traffic forecasts that were performed in or near the study area?

Study Area Questionnaire Sent to Local Planners

7) A preliminary review of data on municipal and county websites did not find any current development information in the vicinity of the study area (Bridgewater, Crescent & Key Harbor, and The Village at Sherrills Ford appear to be a considerable distance from the study area). Do you know of any ongoing or planned developments in the vicinity of the traffic forecast area that may affect our traffic forecast and if so, could you provide information on those developments (type, accessibility, size, timeframe, etc)?

8) Do you have any additional comments that would be helpful in our development of the traffic forecast?

9) This questionnaire is being sent to the following individuals:

    i. Michael Poe, Division 12, Division Project Development Engineer (mlpoe@ncdot.gov)
    ii. Thad Duncan, Division 12, Division Project Manager (tfduncan@ncdot.gov)
    iii. Byron Engle, Division 12, Division Traffic Engineer (bengle@ncdot.gov)
    iv. Michael Watson, Division 12, District 3 Assistant District Engineer (mwatson@ncdot.gov)
    v. Daniel Sellers, NCDOT Transportation Planning Division (dcsellers1@ncdot.gov)
    vi. Brian Horton, Greater Hickory MPO, Transportation Planning Manager (brian.horton@wpcog.org)
    vii. John Marshall, City of Hickory, Transportation Planning Manager (jmarshall@hickorync.gov)
    viii. Jacky Eubanks, Catawba County, Planning Director (jeubanks@catawbacountync.gov)

    a. Are there any other individuals whom you think we should contact to discuss this forecast?

Comments completed by Brian Horton via email – 05/24/2018

1) Current and historical traffic trends indicate that the traffic growth over the last 20 years along the study corridor has increased overall, although traffic levels have appeared to plateau around the year 2007 and from there either remained relatively stable or decreased from the 2007 levels. Thus, the 20-year growth rates across the study roadway range from 1.5% to 4.3% per year, while the 10-year growth rates range from -2.4% to 0.7% per year. The growth rates on roads connecting to the study corridor generally show a similar growth pattern, with 20-year growth rates (around 1.0%) higher than the 10-year growth rates (around 0%). The only exception in the study area to this general growth pattern is on 12th Ave NE south of 24th St/McDonald Parkway – at this location traffic has been steadily decreasing over the years so that the 20-year growth rate is -3.5% per year and the 10-year growth rate is -0.7% per year.

    a. Do you agree with the growth patterns described? *Agree with the data. The 10-year number is slower due to the recession. However, the more recent economic recovery has likely led to some increase in traffic since 2015 (latest data available), with the exception of 12th Ave south of McDonald Parkway.*

    b. What growth patterns have you noticed? *The count on 12th Ave south of McDonald Parkway has decreased due to the completion of McDonald Parkway over a decade ago. Traffic along Springs Road heading toward Hickory now turns left onto McDonald Parkway to head to the retail area in Hickory along the US 70 corridor.*

    c. Would you expect the growth rate to change substantially in the next 20 years? *Seems reasonable over the next 20 years.*

    d. Do you expect the growth rate to increase in the future? If so, by what percent per year? *1.5% to 4.3% per year seems reasonable over the next twenty years, unless the existing capacity was maxed out prior to new construction (if corridor were to remain two lanes over next 20 years)*

2) The traffic forecast will include developing volumes for the average traffic situation. Aside from school being in session and the heavy shopping activity around the Christmas holiday, are there any noticeable seasonal differences in traffic? *Traffic would tend to be less in the summer due to vacations and no school. Otherwise, no differences.*

3) According to the North Carolina Office of State Budget and Management (OSBM) the population of Catawba County was approximately 156,400 in 2016 and is projected to grow by 0.28% per year to around 166,400 in 2037. The population projections for Catawba County that are contained within the LRTP are slightly higher, showing a projected population of 178,100 in the year 2040 with a growth rate of around 0.48% per year. The LRTP shows a growth rate for the entire Greater Hickory MPO region of 0.34% to the year 2040.
    a. Do you think that the 0.28% to 0.48% population growth rate is reasonable for the project study area or do you think it will be higher or lower? *The growth rate is reasonable, particularly is any apartment complexes were to be built in the corridor over the next 20 years.*

    b. Do you know of any other population projections for this area that may be helpful as we review the growth in the area? *Yes, GHMPO can provide the 2015 and*

Comments completed by Brian Horton via email – 05/24/2018

2045 population estimates for TAZs that touch the corridor. Just let us know how we may assist with any corridor-defined analysis.

4) The Hickory Travel Demand Model data shows that between 2010 and 2040 29th Ave/24th Ave has a growth rate of roughly 1.0% per year. The model shows approximate growth rates of 0.1% per year on NC 127 and on Springs Rd NE. (It should be noted that a number of capacity-affecting projects are planned for the area (see next question) which can lead to traffic diversion within the roadway network.)

   a. Do you think that these traffic growth rates are reasonable for the project study area or do you think they will be higher or lower? *This is a question better answered by NCDOT.*

5) The Greater Hickory MPO (GHMPO) 2040 Long Range Transportation Plan includes the following projects in the vicinity of the forecast.
   - NC 127 widening, from Cloninger Mill Rd (SR 1400) to Richey Rd (SR 1156) – (STIP ID R-3630A)
   - Cloninger Mill Rd-Kool Park Rd (SR 1400) widening – GHMPO LRTP
   - 16th ST NE, widening and extension – GHMPO LRTP
   - North Crosstown Loop – GHMPO LRTP

   a. What affect, if any, do you believe these projects will have on the traffic volumes in the study area? *GHMPO has worked with NCDOT since the 2040 LRTP on the Draft 2045 MTP and its corresponding model network and volumes. Let us know if you'd like these newer MTP project assumptions.*

   b. Do you know of any reasonably foreseeable transportation projects that are not identified above that may affect traffic volumes in the traffic forecast study area? *5-lane to 4-lane-divided conversions of NC 127 and Springs Rd NE at either end of the project corridor are perhaps the most influential, but there may be others regionally in the newer MTP model.*

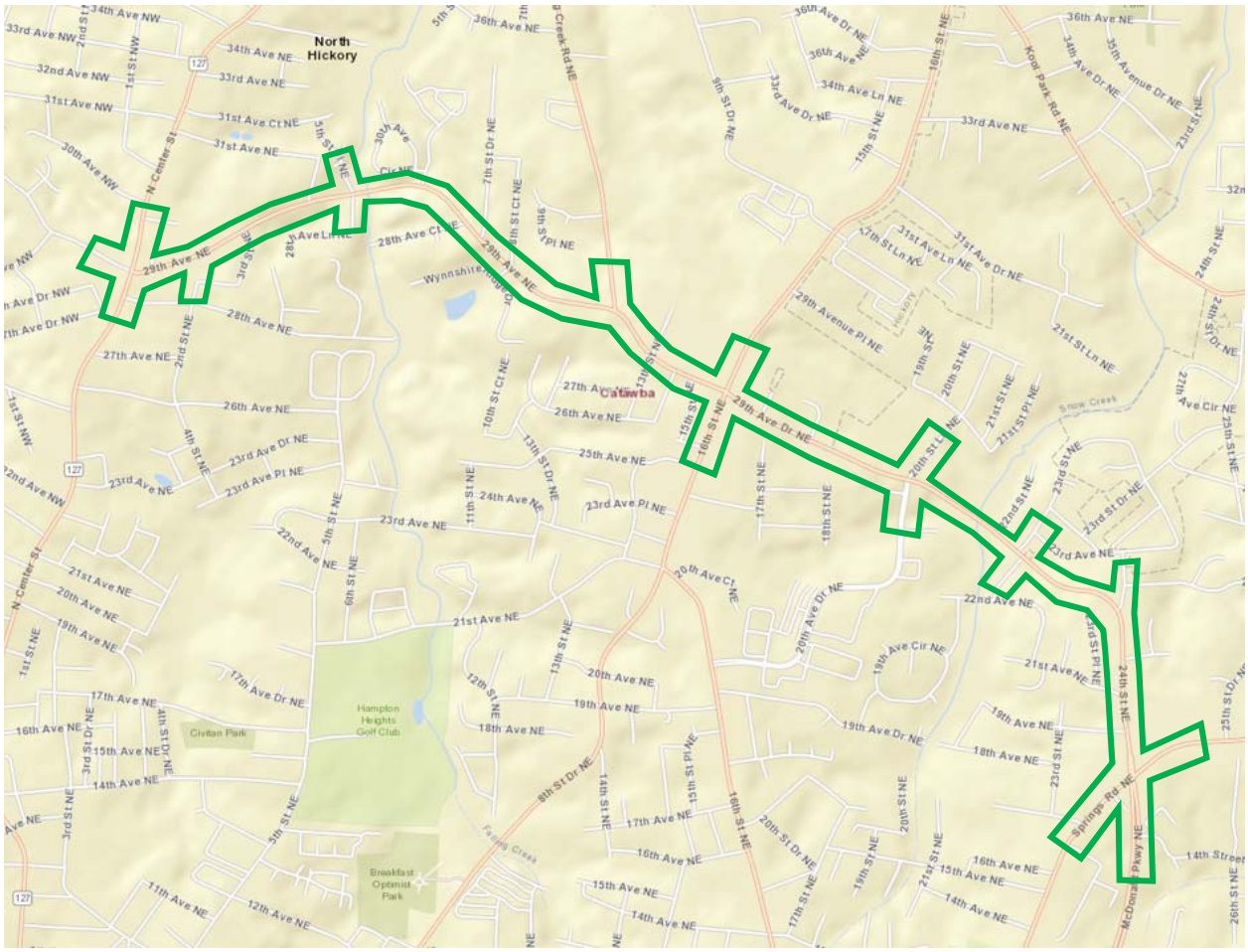
6) Are you aware of any previous traffic forecasts that were performed in or near the study area? *The travel effects of the recession may have lessened or delayed some of the projected growth of these older forecasts. Would advise using newer, post-recovery forecasts instead.*

7) A preliminary review of data on municipal and county websites did not find any current development information in the vicinity of the study area (Bridgewater, Crescent & Key Harbor, and The Village at Sherrills Ford appear to be a considerable distance from the study area). Do you know of any ongoing or planned developments in the vicinity of the traffic forecast area that may affect our traffic forecast and if so, could you provide information on those developments (type, accessibility, size, timeframe, etc)? *This is a question to be better answered by the City of Hickory Planning Department.*

8) Do you have any additional comments that would be helpful in our development of the traffic forecast? *Look forward to any coordination and assistance we can provide.*

Comments completed by Michael Poe via email – 06/05/2018

Patriot Transportation Engineering is currently in the process of developing a traffic forecast for NCDOT STIP Project No. U-2307B, which would widen SR 1404/1402 (29th Avenue NE/24th Street NE) to a 4-lane road with a median separation in Catawba County. The forecast includes base year (2018) and future year (2040) forecasts. The forecast study area is shown in the following figure:



We have reviewed the 2040 Greater Hickory Urban Area Long Range Transportation Plan and are seeking input from local planners and engineers who are familiar with the area. We have identified you as a local representative. I have listed a few questions below that will help us in the development in the traffic forecast. We would greatly appreciate your time in answering these questions. You may answer the questions in text format below and return them to me at: lee@pt-engineering.net.

If you would rather discuss the questions over the phone, I will be following up with a phone call early next week. Thank you in advance for your time and please let me know if you have any questions.

1) Current and historical traffic trends indicate that the traffic growth over the last 20 years along the study corridor has increased overall, although traffic levels have appeared to plateau around the year 2007 and from there either remained relatively stable or decreased from the 2007 levels. Thus, the 20-year growth rates across the study roadway range from 1.5% to 4.3% per year, while the 10-year growth rates range from -2.4% to 0.7% per year. The growth rates on roads connecting to the study corridor generally show a similar growth pattern, with 20-year growth rates (around 1.0%) higher than the 10-year growth rates (around 0%). The only exception in the study area to this general growth pattern is on 12th Ave NE south of 24th

Comments completed by Michael Poe via email – 06/05/2018

St/McDonald Parkway – at this location traffic has been steadily decreasing over the years so that the 20-year growth rate is -3.5% per year and the 10-year growth rate is -0.7% per year.

a. Do you agree with the growth patterns described? Yes

b. What growth patterns have you noticed? Like you said, for much of the Hickory area, traffic volumes seem to have plateaued in the mid-2000s and have been fairly stable since that time.

c. Would you expect the growth rate to change substantially in the next 20 years? I do not anticipate a substantial change in growth rate but I do believe the area will experience upward growth during this time.

d. Do you expect the growth rate to increase in the future? If so, by what percent per year? Yes, but I do not have a good feel on a percentage to recommend. If I had to provide a number I would assume 0.5% per year.

2) The traffic forecast will include developing volumes for the average traffic situation. Aside from school being in session and the heavy shopping activity around the Christmas holiday, are there any noticeable seasonal differences in traffic? No, not to my knowledge.

3) According to the North Carolina Office of State Budget and Management (OSBM) the population of Catawba County was approximately 156,400 in 2016 and is projected to grow by 0.28% per year to around 166,400 in 2037. The population projections for Catawba County that are contained within the LRTP are slightly higher, showing a projected population of 178,100 in the year 2040 with a growth rate of around 0.48% per year. The LRTP shows a growth rate for the entire Greater Hickory MPO region of 0.34% to the year 2040.

a. Do you think that the 0.28% to 0.48% population growth rate is reasonable for the project study area or do you think it will be higher or lower? Yes

b. Do you know of any other population projections for this area that may be helpful as we review the growth in the area?

4) The Hickory Travel Demand Model data shows that between 2010 and 2040 29th Ave/24th Ave has a growth rate of roughly 1.0% per year. The model shows approximate growth rates of 0.1% per year on NC 127 and on Springs Rd NE. (It should be noted that a number of capacity-affecting projects are planned for the area (see next question) which can lead to traffic diversion within the roadway network.)

a. Do you think that these traffic growth rates are reasonable for the project study area or do you think they will be higher or lower? Yes, they are probably reasonable.

5) The Greater Hickory MPO (GHMPO) 2040 Long Range Transportation Plan includes the following projects in the vicinity of the forecast.

- NC 127 widening, from Cloninger Mill Rd (SR 1400) to Richey Rd (SR 1156) – (STIP ID R-3630A)
- Cloninger Mill Rd-Kool Park Rd (SR 1400) widening – GHMPO LRTP
- 16th ST NE, widening and extension – GHMPO LRTP
- North Crosstown Loop – GHMPO LRTP

a. What affect, if any, do you believe these projects will have on the traffic volumes in the study area? I don't anticipate these projects having much impacts on traffic volumes.

Comments completed by Michael Poe via email – 06/05/2018

b. Do you know of any reasonably foreseeable transportation projects that are not identified above that may affect traffic volumes in the traffic forecast study area? No

6) Are you aware of any previous traffic forecasts that were performed in or near the study area? No

7) A preliminary review of data on municipal and county websites did not find any current development information in the vicinity of the study area (Bridgewater, Crescent & Key Harbor, and The Village at Sherrills Ford appear to be a considerable distance from the study area). Do you know of any ongoing or planned developments in the vicinity of the traffic forecast area that may affect our traffic forecast and if so, could you provide information on those developments (type, accessibility, size, timeframe, etc)? I'm not aware of any considerable developments planned in the vicinity of the project study area. This area is fairly well-developed. There has been an upturn recently in commercial redevelopment at both ends of the project along NC 127 and Springs Road. I would anticipate these trends to continue.

8) Do you have any additional comments that would be helpful in our development of the traffic forecast? While I don't know that they will have an impact from a volume perspective, there are access management projects proposed on both NC 127 and Springs Road in the project study area that have been submitted for project prioritization in P5.0 for the 2020-2029 STIP and Division 12 anticipates both of them to be funded at this point in time.

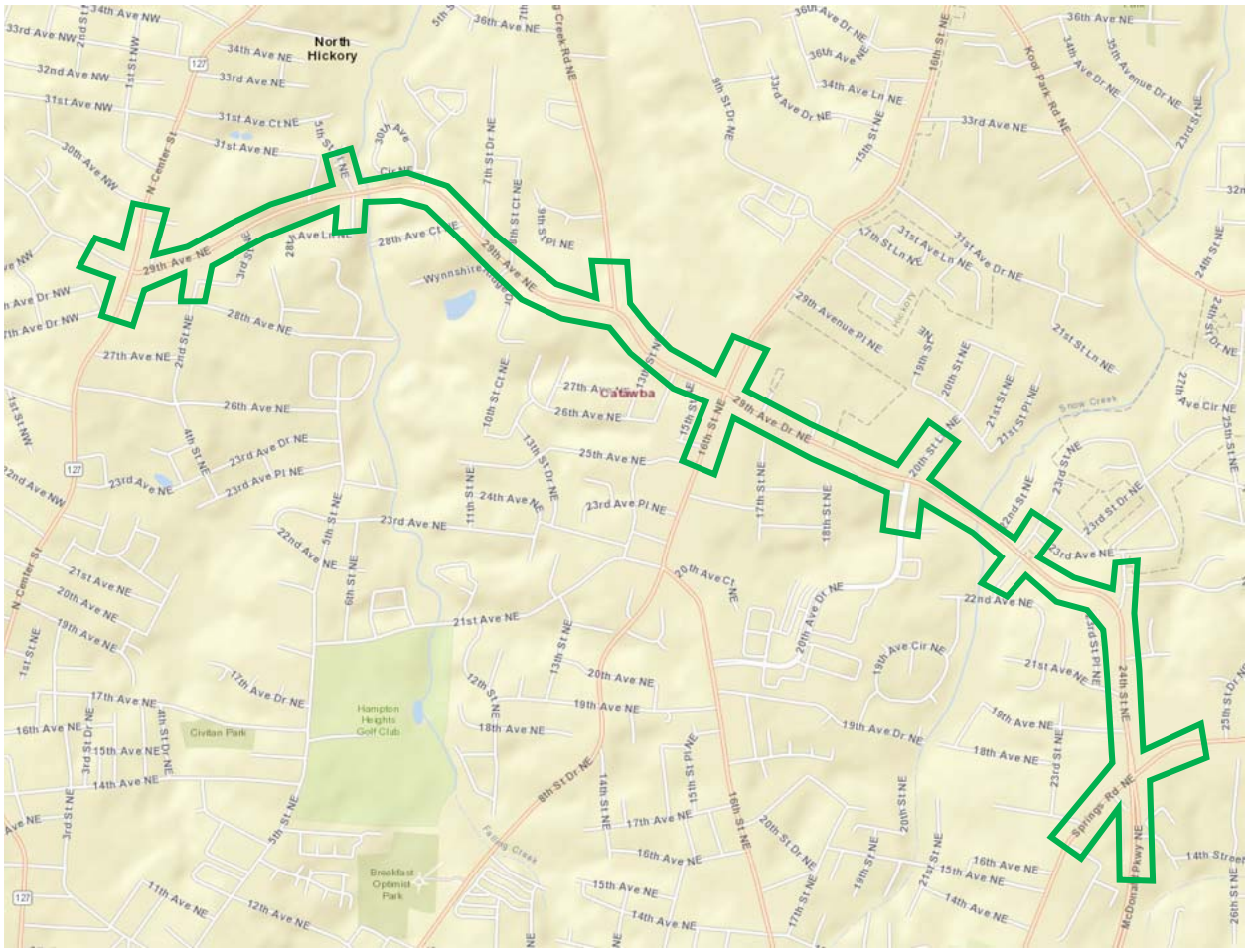
9) This questionnaire is being sent to the following individuals:

i. Michael Poe, Division 12, Division Project Development Engineer (mlpoe@ncdot.gov)
ii. Thad Duncan, Division 12, Division Project Manager (tfduncan@ncdot.gov)
iii. Byron Engle, Division 12, Division Traffic Engineer (bengle@ncdot.gov)
iv. Michael Watson, Division 12, District 3 Assistant District Engineer (mwatson@ncdot.gov)
v. Daniel Sellers, NCDOT Transportation Planning Division (dcsellers1@ncdot.gov)
vi. Brian Horton, Greater Hickory MPO, Transportation Planning Manager (brian.horton@wpcog.org)
vii. John Marshall, City of Hickory, Transportation Planning Manager (jmarshall@hickorync.gov)
viii. Jacky Eubanks, Catawba County, Planning Director (jeubanks@catawbacountync.gov)

a. Are there any other individuals whom you think we should contact to discuss this forecast?

Comments completed by Pamela Cook via email – 05/29/2018

Patriot Transportation Engineering is currently in the process of developing a traffic forecast for NCDOT STIP Project No. U-2307B, which would widen SR 1404/1402 (29th Avenue NE/24th Street NE) to a 4-lane road with a median separation in Catawba County. The forecast includes base year (2018) and future year (2040) forecasts. The forecast study area is shown in the following figure:



We have reviewed the 2040 Greater Hickory Urban Area Long Range Transportation Plan and are seeking input from local planners and engineers who are familiar with the area. We have identified you as a local representative. I have listed a few questions below that will help us in the development in the traffic forecast. We would greatly appreciate your time in answering these questions. You may answer the questions in text format below and return them to me at: lee@pt-engineering.net.

If you would rather discuss the questions over the phone, I will be following up with a phone call early next week. Thank you in advance for your time and please let me know if you have any questions.

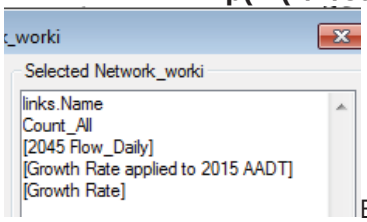
1) Current and historical traffic trends indicate that the traffic growth over the last 20 years along the study corridor has increased overall, although traffic levels have appeared to plateau around the year 2007 and from there either remained relatively stable or decreased from the 2007 levels. Thus, the 20-year growth rates across the study roadway range from 1.5% to 4.3% per year, while the 10-year growth rates range from -2.4% to 0.7% per year. The growth rates on roads connecting to the study corridor generally show a similar growth pattern, with 20-year growth rates (around 1.0%) higher than the 10-year growth rates (around 0%). The only exception in the study area to this general growth pattern is on 12th Ave NE south of 24th

Comments completed by Pamela Cook via email – 05/29/2018

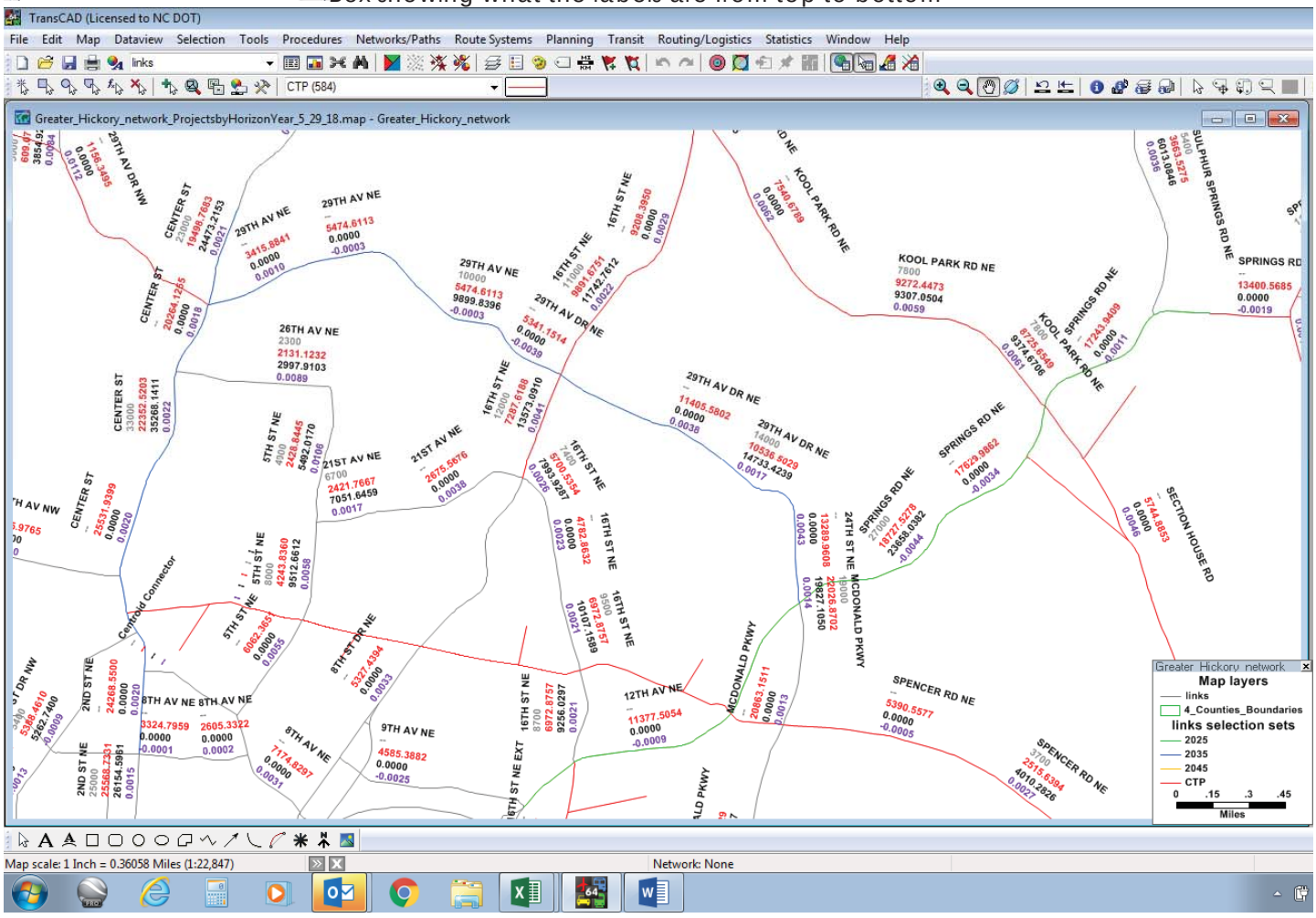
St/McDonald Parkway – at this location traffic has been steadily decreasing over the years so that the 20-year growth rate is -3.5% per year and the 10-year growth rate is -0.7% per year.

a. Do you agree with the growth patterns described?
Overall. There is a new travel demand model developed for the 2018 MTP getting ready to go out for public input on the draft MTP. It shows an increase along 29th Ave NE and 24th St NE. 12th Ave Drive NE does show a continued decrease at McDonald Parkway.

b. What growth patterns have you noticed? I have put the Draft 2045 MTP model output below. **The Growth Rate is between the 2015 model load and 2045 model load: Exp(Ln(F/P/30)-1**



Box showing what the labels are from top to bottom



c. Would you expect the growth rate to change substantially in the next 20 years?

d. Do you expect the growth rate to increase in the future? If so, by what percent per year? That corridor will have a lot of growth on both ends (i.e. NC 127 are and US 70 area) so traffic may increase more along it than some other roads. But the model used what the MPO projected to be 2045 SE data for 2045 runs.

Comments completed by Pamela Cook via email – 05/29/2018

2) The traffic forecast will include developing volumes for the average traffic situation. Aside from school being in session and the heavy shopping activity around the Christmas holiday, are there any noticeable seasonal differences in traffic? Local MPO and city staff would have best answer for here.

3) According to the North Carolina Office of State Budget and Management (OSBM) the population of Catawba County was approximately 156,400 in 2016 and is projected to grow by 0.28% per year to around 166,400 in 2037. The population projections for Catawba County that are contained within the LRTP are slightly higher, showing a projected population of 178,100 in the year 2040 with a growth rate of around 0.48% per year. The LRTP shows a growth rate for the entire Greater Hickory MPO region of 0.34% to the year 2040.
   a. Do you think that the 0.28% to 0.48% population growth rate is reasonable for the project study area or do you think it will be higher or lower? Check it against the draft MTP the MPO is getting ready to release (ask MPO staff for it). I don't have a copy, or I would send it to you.

   b. Do you know of any other population projections for this area that may be helpful as we review the growth in the area? Check it against the draft MTP the MPO is getting ready to release (ask MPO staff for it). I don't have a copy, or I would send it to you.

4) The Hickory Travel Demand Model data shows that between 2010 and 2040 29th Ave/24th Ave has a growth rate of roughly 1.0% per year. The model shows approximate growth rates of 0.1% per year on NC 127 and on Springs Rd NE. (It should be noted that a number of capacity-affecting projects are planned for the area (see next question) which can lead to traffic diversion within the roadway network.)
   a. Do you think that these traffic growth rates are reasonable for the project study area or do you think they will be higher or lower? I have provided with question 1 the new model that goes with the draft MTP coming out tomorrow afternoon. Let me know if you have any questions.

5) The Greater Hickory MPO (GHMPO) 2040 Long Range Transportation Plan includes the following projects in the vicinity of the forecast.
   - NC 127 widening, from Cloninger Mill Rd (SR 1400) to Richey Rd (SR 1156) – (STIP ID R-3630A) – Minimal impact
   - Cloninger Mill Rd-Kool Park Rd (SR 1400) widening – GHMPO LRTP – Has been moved to post 2045 in draft MTP so will not impact this project at this time.
   - 16th ST NE, widening and extension – GHMPO LRTP Has been moved to post 2045 in draft MTP so will not impact this project at this time.
   - North Crosstown Loop – GHMPO LRTP Has been moved to post 2045 in draft MTP so will not impact this project at this time.

   a. What affect, if any, do you believe these projects will have on the traffic volumes in the study area?
      Three of the above projects have moved to CTP – Post 2045 year in the draft MTP being considered now.
   b. Do you know of any reasonably foreseeable transportation projects that are not identified above that may affect traffic volumes in the traffic forecast study area?

   There is a project in 2025 horizon year of draft MTP that may increase traffic along 29th Ave NE some: Springs Rd NE/12th Ave NE (SR 1453) – convert from 5-lane to 4-lane divided from 9th Ave NE to Charlotte St (SR 1504.

6) Are you aware of any previous traffic forecasts that were performed in or near the study area?

Comments completed by Pamela Cook via email – 05/29/2018

R-3603A – NC 127 and Cloninger Mill Rd NE is in progress by RS&H

7) A preliminary review of data on municipal and county websites did not find any current development information in the vicinity of the study area (Bridgewater, Crescent & Key Harbor, and The Village at Sherrills Ford appear to be a considerable distance from the study area). Do you know of any ongoing or planned developments in the vicinity of the traffic forecast area that may affect our traffic forecast and if so, could you provide information on those developments (type, accessibility, size, timeframe, etc)? Leave for local staff

8) Do you have any additional comments that would be helpful in our development of the traffic forecast? No

9) This questionnaire is being sent to the following individuals:

   i. Michael Poe, Division 12, Division Project Development Engineer (mlpoe@ncdot.gov)
   ii. Thad Duncan, Division 12, Division Project Manager (tfduncan@ncdot.gov)
   iii. Byron Engle, Division 12, Division Traffic Engineer (bengle@ncdot.gov)
   iv. Michael Watson, Division 12, District 3 Assistant District Engineer (mwatson@ncdot.gov)
   v. Pam Cook, NCDOT Transportation Planning Division (dcsellers1@ncdot.gov)
   vi. Brian Horton, Greater Hickory MPO, Transportation Planning Manager (brian.horton@wpcog.org)
   vii. John Marshall, City of Hickory, Transportation Planning Manager (jmarshall@hickorync.gov)
   viii. Jacky Eubanks, Catawba County, Planning Director (jeubanks@catawbacountync.gov)

   a. Are there any other individuals whom you think we should contact to discuss this forecast?

Lee Klieman

From: Watson, Michael R <mwatson@ncdot.gov>
Sent: Thursday, June 07, 2018 9:58 AM
To: Lee Klieman
Cc: Jordan, Travis R
Subject: RE: [External] NCDOT STIP U-2307B Traffic Forecast Questionnaire

Lee,

The District office does not have any specific input related to the growth rates & population questions. For question 7, we have been contacted about potential development of 2 parcels in the vicinity in the recent past. Neither have proceeded past preliminary questions, but I can give you the parcel ID's for your information. Parcel ID 371418427283 was interested in building a church, Parcel ID 372313036307 along existing McDonald Parkway has inquired about direct access for the 4.8 acre parcel (currently is C/A with no break, but there is a northbound left turn installed already at 24th St NE) for residential and/or commercial development.

Thanks,

Michael Watson
Assistant District Supervisor
Division 12, District 3
NCDOT

704 748 2400 office
mwatson@ncdot.gov

1031 East Gaston Street
Lincolnton, NC 28092

From: Lee Klieman [mailto:Lee@pt-engineering.net]
Sent: Tuesday, May 22, 2018 5:28 PM
To: Poe, Michael L; Duncan, Thad F; Engle, Byron K; Watson, Michael R; Sellers, Daniel C; brian.horton@wpcog.org; jmarshall@hickorync.gov; jeubanks@catawbacountync.gov
Cc: Peter Trencansky
Subject: [External] NCDOT STIP U-2307B Traffic Forecast Questionnaire

My name is Lee Klieman and my firm, Patriot Transportation Engineering, is in the process of preparing a traffic forecast for NCDOT STIP Project No. U-2307B, which would widen 29th Avenue NE/24th Street NE (SR 1404/1402) to a 4-lane road with a median separation in Catawba County. During the development of the forecast we utilize numerous resources, one of which is to gain a better understanding of the study area through discussing the project with local planners and engineers. I have attached a brief questionnaire that will help us gain a better understanding of the study area as we prepare the forecast. Besides local knowledge (represented by responses to the questionnaire), several other data sources will be consulted in shaping the forecast, so that engineering judgment will sometimes be necessary in determining the traffic forecast submitted to NCDOT.

If you would please review the attached questionnaire, we would greatly appreciate your time in answering these questions. You may answer the questions in text format in the attached file (or simply within an email) and return them to me at: lee@pt-engineering.net. If you would rather discuss the questions over the phone, I will be following up with a phone call next week. Thank you in advance for your time and please let me know if you have any questions.

Lee Klieman, P.E., PTOE

_____

Patriot Transportation Engineering, PLLC

Mailing Address	Physical Address
PO Box 31452	3008 Anderson Drive
Raleigh, NC 27622	Suite 220
	Raleigh, NC 27609

lee@pt-engineering.net
Office: 919.336.9342

Record of Phone Conversation with Byron Engle

06/04/18

Byron Engle – by phone call

The widening of 29th Street/24th Street could bring more traffic to the area. There shouldn't be an expectation for traffic to keep going down or remaining steady (as in the past).

A traffic growth rate of 1% - 2% seems reasonable (around 1% would be good).

No unusual seasonal traffic activity.

The population growth rates presented seem reasonable.

A 1% growth rate (as stated before) seems reasonable, unless the City of Hickory knows more details.

When other roadway projects are completed, it's possible that traffic could increase on 29th depending on when the projects are built, especially the North Crosstown Loop (depending on where it ends up).

No knowledge of any road projects in the vicinity not already mentioned. But US 321 is being widened up towards Lenoir.

No knowledge of any major developments that are approved. The latest was probably the Walmart Neighborhood Market, which has already been completed.

Record of Phone Conversation with John Marshall

06/05/18

John Marshall – by phone call

The traffic growth patterns based on historic traffic counts sounds pretty accurate. It bottomed out around 2007/2008. Traffic counts around Hickory have begun creeping back up.

There are no unusual seasonal differences.

The population projections seem reasonable. They could be higher but something would have to push it.

The model results sound reasonable.

The NC 127 widening could have an impact on 29th. What people do now is come down 127 and then use 29th to cut over to McDonald Pkwy to get to I-40. The other roadway projects are far enough out that they're past 2040, so they should not have any immediate impact on 29th/24th.

Knows of no other traffic forecasts in the area.

Doesn't know of any major developments in the area, but there are some outparcels in commercial areas that remain undeveloped. There is one outparcel by the Walmart Neighborhood Market. There are three outparcels in the Lowe's Foods shopping center at 29th and 16th. There are some other outparcels near the Publix supermarket by NC 127. There could be some small residential developments, but not anything large.

APPENDIX C:

TRAFFIC FORECAST TABLES

Table C1: 2018 Base Year No-Build Traffic Volumes

Forecast Location	NCDOT Historic Count Data							AADT Exptrapolated to 2018 (1)	Project Specific Count Data[2]		2018 No-Build Traffic Forecast
	2010	2011	2012	2013	2014	2015	2016		TMC	Mainline	
SR 1318 (29th Ave Dr NW) - West of NC 127 (N Center St)		3,800		3,900		4,300		4,600	5,900 (3)		**5,600**
SR 1404 (29th Ave NE) - NC 127 (N Center St) to SR 1522 (2nd Street NE)									12,600 (3) 12,000 (3)		**12,200**
SR 1404 (29th Ave NE) - SR 1522 (2nd Street NE) to 5th Street Place NE/SR 1694 (5th Street Extended NE)		8,300		10,000		10,000		11,600	11,900 (3) 12,300 (3)	11,900 (4)	**12,100**
SR 1404 (29th Ave NE) - East of 5th Street Place NE/SR 1694 (5th Street Extended NE)									12,300 (3)		**12,100**
SR 1404 (29th Ave NE) - West of SR 1402 (Falling Creek Road)		8,900		10,000		10,000		11,000	12,200 (3)		**12,200**
SR 1404 (29th Ave NE) - SR 1402 (Falling Creek Road) to SR 1401 (16th St NE)									12,000 (3) 12,400 (3)		**12,300**
SR 1404 (29th Ave NE) - SR 1401 (16th St NE) to 20th Avenue Drive NE									13,500 (3) 13,600 (3)	13,100 (4)	**13,500**
SR 1404 (29th Ave NE) - 20th Avenue Drive NE to SR 2259 (23rd Street NE)/SR 2228 (23rd Street NE)									15,300 (3) 15,300 (3)		**15,300**
SR 1404 (29th Ave NE) - SR 2259 (23rd Street NE)/SR 2228 (23rd Street NE) to 24th Street NE		12,000		14,000		14,000		15,800	14,800 (3) 14,800 (3)		**14,800**
SR 1404 (29th Ave NE) - 24th Street NE to SR 1453 (Springs Road NE)									15,300 (3) 14,300 (3)		**15,300**
SR 1402 (McDonald Parkway NE) - East of SR 1453 (Springs Road NE)		17,000		19,000		18,000		19,300	20,300 (3)		**20,300**
NC 127 (N Center St) - North of SR 1404 (29th Ave NE)/SR 1318 (29th Ave Dr NW)				22,000		22,000		22,000	23,100 (3)		**23,100**
NC 127 (N Center St) - South of SR 1404 (29th Ave NE)/SR 1318 (29th Ave Dr NW)		31,000		31,000		32,000		32,600	31,300 (3)		**31,500**

Notes:

(1) Data extrapolated to 2018 based on linear regression of 2006-2016 data

(2) All Project Specific Counts were converted to AADT based on the NCDOT Traffic Survey Unit ATR Seasonal Factors as described in Section 2.3

(3) 2018 13-hour Turning Movement Count - factored to 24-hour volumes and adjusted to AADT.

(4) 2018 Project Specific Mainline Count - Adjusted to AADT.

Table C1: 2018 Base Year No-Build Traffic Volumes

Forecast Location	NCDOT Historic Count Data							AADT Exptrapolated to 2040 - Future Year Build - (1)	Project Specific Count Data[2]		2018 No-Build Traffic Forecast
	2010	2011	2012	2013	2014	2015	2016		TMC	Mainline	
SR 1522 (2nd Street NE) - South of SR 1404 (29th Ave NE)									1,800 (3)		**1,700**
5th Street Place NE - North of SR 1404 (29th Ave NE)									400 (3)		**400**
SR 1694 (5th Street Extended NE) - South of SR 1404 (29th Ave NE)									200 (3)		**200**
SR 1402 (Falling Creek Road) - North of SR 1404 (29th Ave NE)		1,300		2,400		2,700		3,900	2,100 (3)		**2,100**
SR 1401 (16th St NE) - North of SR 1404 (29th Ave NE)		11,000		12,000		12,000		12,900	13,200 (3)		**13,200**
SR 1401 (16th St NE) - South of SR 1404 (29th Ave NE)		11,000		11,000		11,000		11,000	11,600 (3)		**11,600**
20th Avenue Drive NE - North of SR 1404 (29th Ave NE)									700 (3)		**700**
20th Avenue Drive NE - South of SR 1404 (29th Ave NE)									2,700 (3)		**2,700**
SR 2259 (23rd Street NE) - North of SR 1404 (29th Ave NE)									900 (3)		**1,000**
SR 2228 (23rd Street NE) - South of SR 1404 (29th Ave NE)									300 (3)		**300**
24th Street NE - North of SR 1404 (29th Ave NE)									1,000 (3)		**900**
SR 1453 (Springs Road NE) - North of SR 1402 (McDonald Parkway NE)/24th St NE		25,000		31,000		26,000		28,600	27,600 (3)		**27,400**
SR 1453 (Springs Road NE) - South of SR 1402 (McDonald Parkway NE)/24th St NE		14,000		15,000		15,000		15,900	17,000 (3)		**17,000**

Notes:

(1) Data extrapolated to 2018 based on linear regression of 2006-2016 data

(2) All Project Specific Counts were converted to AADT based on the NCDOT Traffic Survey Unit ATR Seasonal Factors as described in Section 2.3

(3) 2018 13-hour Turning Movement Count - factored to 24-hour volumes and adjusted to AADT.

(4) 2018 Project Specific Mainline Count - Adjusted to AADT.

Table C2: 2018 Base Year No-Build Design Data – Truck Percentages

Forecast Location	Project Specific Count Data		Selected 2018 BY NB Value
	TMC	Mainline	
SR 1318 (29th Ave Dr NW) - West of NC 127 (N Center St)	2 , 1 (1)		**2 , 1**
SR 1404 (29th Ave NE) - NC 127 (N Center St) to SR 1522 (2nd Street NE)	2 , 1 (1) 2 , 1 (1)		**3 , 1**
SR 1404 (29th Ave NE) - SR 1522 (2nd Street NE) to 5th Street Place NE/SR 1694 (5th Street Extended NE)	2 , 1 (1) 2 , 1 (1)	(4 , 1) (2)	**3 , 1**
SR 1404 (29th Ave NE) - East of 5th Street Place NE/SR 1694 (5th Street Extended NE)	2 , 1 (1)		**3 , 1**
SR 1404 (29th Ave NE) - West of SR 1402 (Falling Creek Road)	2 , 1 (1)		**3 , 1**
SR 1404 (29th Ave NE) - SR 1402 (Falling Creek Road) to SR 1401 (16th St NE)	2 , 1 (1) 2 , 1 (1)		**3 , 1**
SR 1404 (29th Ave NE) - SR 1401 (16th St NE) to 20th Avenue Drive NE	2 , 1 (1) 1 , 1 (1)	(7 , 1) (2)	**3 , 1**
SR 1404 (29th Ave NE) - 20th Avenue Drive NE to SR 2259 (23rd Street NE)/SR 2228 (23rd Street NE)	1 , 1 (1) 1 , 1 (1)		**3 , 1**
SR 1404 (29th Ave NE) - SR 2259 (23rd Street NE)/SR 2228 (23rd Street NE) to 24th Street NE	1 , 1 (1) 2 , 1 (1)		**3 , 1**
SR 1404 (29th Ave NE) - 24th Street NE to SR 1453 (Springs Road NE)	2 , 1 (1) 2 , 1 (1)		**3 , 1**
SR 1402 (McDonald Parkway NE) - East of SR 1453 (Springs Road NE)	2 , 1 (1)		**3 , 1**
NC 127 (N Center St) - North of SR 1404 (29th Ave NE)/SR 1318 (29th Ave Dr NW)	2 , 1 (1)		**2 , 1**
NC 127 (N Center St) - South of SR 1404 (29th Ave NE)/SR 1318 (29th Ave Dr NW)	2 , 1 (1)		**2 , 1**
SR 1522 (2nd Street NE) - South of SR 1404 (29th Ave NE)	4 , 1 (1)		**4 , 1**
5th Street Place NE - North of SR 1404 (29th Ave NE)	3 , 0 (1)		**3 , 1**
SR 1694 (5th Street Extended NE) - South of SR 1404 (29th Ave NE)	2 , 0 (1)		**2 , 1**
SR 1402 (Falling Creek Road) - North of SR 1404 (29th Ave NE)	2 , 1 (1)		**2 , 1**
SR 1401 (16th St NE) - North of SR 1404 (29th Ave NE)	2 , 1 (1)		**2 , 1**

Notes:

(1) 2018 13-hour Turning Movement Count

(2) 2018 Volume, Speed, Class Mainline Count

Table C2: 2018 Base Year No-Build Design Data – Truck Percentages

Forecast Location	Project Specific Count Data				Selected 2018 BY NB Value
	TMC		Mainline		
SR 1401 (16th St NE) - South of SR 1404 (29th Ave NE)	2 , 1	(1)			**2 , 1**
20th Avenue Drive NE - North of SR 1404 (29th Ave NE)	3 , 0	(1)			**3 , 1**
20th Avenue Drive NE - South of SR 1404 (29th Ave NE)	2 , 1	(1)			**2 , 1**
SR 2259 (23rd Street NE) - North of SR 1404 (29th Ave NE)	3 , 0	(1)			**3 , 1**
SR 2228 (23rd Street NE) - South of SR 1404 (29th Ave NE)	5 , 0	(1)			**5 , 1**
24th Street NE - North of SR 1404 (29th Ave NE)	1 , 0	(1)			**2 , 1**
SR 1453 (Springs Road NE) - North of SR 1402 (McDonald Parkway NE)/24th St NE	2 , 1	(1)			**2 , 1**
SR 1453 (Springs Road NE) - South of SR 1402 (McDonald Parkway NE)/24th St NE	2 , 1	(1)			**2 , 1**

Notes:

(1) 2018 13-hour Turning Movement Count

(2) 2018 Volume, Speed, Class Mainline Count

Table C3: 2018 Base Year No-Build Design Data – Directional Distribution

Forecast Location	Project Specific Count Data		Selected 2018 BY NB Value
	TMC	Mainline	
SR 1318 (29th Ave Dr NW) - West of NC 127 (N Center St)	55 WB (1)		**55 WB**
SR 1404 (29th Ave NE) - NC 127 (N Center St) to SR 1522 (2nd Street NE)	51 EB (1) 50 WB (1)		**55 EB**
SR 1404 (29th Ave NE) - SR 1522 (2nd Street NE) to 5th Street Place NE/SR 1694 (5th Street Extended NE)	52 EB (1) 52 EB (1)	55 EB (2)	**55 EB**
SR 1404 (29th Ave NE) - East of 5th Street Place NE/SR 1694 (5th Street Extended NE)	51 EB (1)		**55 EB**
SR 1404 (29th Ave NE) - West of SR 1402 (Falling Creek Road)	51 WB (1)		**55 WB**
SR 1404 (29th Ave NE) - SR 1402 (Falling Creek Road) to SR 1401 (16th St NE)	53 WB (1) 54 WB (1)		**55 WB**
SR 1404 (29th Ave NE) - SR 1401 (16th St NE) to 20th Avenue Drive NE	52 WB (1) 53 WB (1)	55 WB (2)	**55 WB**
SR 1404 (29th Ave NE) - 20th Avenue Drive NE to SR 2259 (23rd Street NE)/SR 2228 (23rd Street NE)	55 WB (1) 55 WB (1)		**55 WB**
SR 1404 (29th Ave NE) - SR 2259 (23rd Street NE)/SR 2228 (23rd Street NE) to 24th Street NE	55 WB (1) 56 WB (1)		**55 WB**
SR 1404 (29th Ave NE) - 24th Street NE to SR 1453 (Springs Road NE)	57 WB (1) 52 WB (1)		**55 WB**
SR 1402 (McDonald Parkway NE) - East of SR 1453 (Springs Road NE)	64 WB (1)		**65 WB**
NC 127 (N Center St) - North of SR 1404 (29th Ave NE)/SR 1318 (29th Ave Dr NW)	61 NB (1)		**60 NB**
NC 127 (N Center St) - South of SR 1404 (29th Ave NE)/SR 1318 (29th Ave Dr NW)	60 NB (1)		**60 NB**
SR 1522 (2nd Street NE) - South of SR 1404 (29th Ave NE)	68 NB (1)		**70 NB**
5th Street Place NE - North of SR 1404 (29th Ave NE)	69 NB (1)		**70 NB**
SR 1694 (5th Street Extended NE) - South of SR 1404 (29th Ave NE)	50 SB (1)		**55 SB**
SR 1402 (Falling Creek Road) - North of SR 1404 (29th Ave NE)	57 NB (1)		**55 NB**

Notes:

(1) 2018 13-hour Turning Movement Count

(2) 2018 Volume, Speed, Class Mainline Count

Forecast Location	Project Specific Count Data	Selected 2018

Table C3: 2018 Base Year No-Build Design Data – Directional Distribution

Forecast Location	TMC	Mainline	BY NB Value
SR 1401 (16th St NE) - North of SR 1404 (29th Ave NE)	59 NB (1)		**60 NB**
SR 1401 (16th St NE) - South of SR 1404 (29th Ave NE)	62 NB (1)		**60 NB**
20th Avenue Drive NE - North of SR 1404 (29th Ave NE)	64 NB (1)		**65 NB**
20th Avenue Drive NE - South of SR 1404 (29th Ave NE)	56 SB (1)		**55 SB**
SR 2259 (23rd Street NE) - North of SR 1404 (29th Ave NE)	65 NB (1)		**65 NB**
SR 2228 (23rd Street NE) - South of SR 1404 (29th Ave NE)	65 NB (1)		**65 NB**
24th Street NE - North of SR 1404 (29th Ave NE)	74 NB (1)		**75 NB**
SR 1453 (Springs Road NE) - North of SR 1402 (McDonald Parkway NE)/24th St NE	60 NB (1)		**60 NB**
SR 1453 (Springs Road NE) - South of SR 1402 (McDonald Parkway NE)/24th St NE	51 NB (1)		**55 NB**

Notes:

(1) 2018 13-hour Turning Movement Count

(2) 2018 Volume, Speed, Class Mainline Count

Table C4: 2018 Base Year No-Build Design Data – Peak Hour Factor

Forecast Location	Project Specific Count Data		Selected 2018 BY NB Value
	TMC	Mainline	
SR 1318 (29th Ave Dr NW) - West of NC 127 (N Center St)	8 (1)		**8**
SR 1404 (29th Ave NE) - NC 127 (N Center St) to SR 1522 (2nd Street NE)	8 (1) 9 (1)		**9**
SR 1404 (29th Ave NE) - SR 1522 (2nd Street NE) to 5th Street Place NE/SR 1694 (5th Street Extended NE)	9 (1) 9 (1)	9 (2)	**9**
SR 1404 (29th Ave NE) - East of 5th Street Place NE/SR 1694 (5th Street Extended NE)	9 (1)		**9**
SR 1404 (29th Ave NE) - West of SR 1402 (Falling Creek Road)	9 (1)		**9**
SR 1404 (29th Ave NE) - SR 1402 (Falling Creek Road) to SR 1401 (16th St NE)	9 (1) 9 (1)		**9**
SR 1404 (29th Ave NE) - SR 1401 (16th St NE) to 20th Avenue Drive NE	8 (1) 8 (1)	8 (2)	**9**
SR 1404 (29th Ave NE) - 20th Avenue Drive NE to SR 2259 (23rd Street NE)/SR 2228 (23rd Street NE)	9 (1) 9 (1)		**9**
SR 1404 (29th Ave NE) - SR 2259 (23rd Street NE)/SR 2228 (23rd Street NE) to 24th Street NE	9 (1) 9 (1)		**9**
SR 1404 (29th Ave NE) - 24th Street NE to SR 1453 (Springs Road NE)	9 (1) 9 (1)		**9**
SR 1402 (McDonald Parkway NE) - East of SR 1453 (Springs Road NE)	9 (1)		**9**
NC 127 (N Center St) - North of SR 1404 (29th Ave NE)/SR 1318 (29th Ave Dr NW)	9 (1)		**9**
NC 127 (N Center St) - South of SR 1404 (29th Ave NE)/SR 1318 (29th Ave Dr NW)	8 (1)		**8**
SR 1522 (2nd Street NE) - South of SR 1404 (29th Ave NE)	9 (1)		**9**
5th Street Place NE - North of SR 1404 (29th Ave NE)	13 (1)		**12**
SR 1694 (5th Street Extended NE) - South of SR 1404 (29th Ave NE)	9 (1)		**9**
SR 1402 (Falling Creek Road) - North of SR 1404 (29th Ave NE)	9 (1)		**9**
SR 1401 (16th St NE) - North of SR 1404 (29th Ave NE)	9 (1)		**9**

Notes:

(1) 2018 13-hour Turning Movement Count

(2) 2018 Volume, Speed, Class Mainline Count

	Project Specific Count Data	

Table C4: 2018 Base Year No-Build Design Data – Peak Hour Factor

Forecast Location	Project Specific Count Data				Selected 2018 BY NB Value
	TMC		Mainline		
SR 1401 (16th St NE) - South of SR 1404 (29th Ave NE)	9	(1)			**9**
20th Avenue Drive NE - North of SR 1404 (29th Ave NE)	10	(1)			**10**
20th Avenue Drive NE - South of SR 1404 (29th Ave NE)	10	(1)			**10**
SR 2259 (23rd Street NE) - North of SR 1404 (29th Ave NE)	9	(1)			**9**
SR 2228 (23rd Street NE) - South of SR 1404 (29th Ave NE)	7	(1)			**8**
24th Street NE - North of SR 1404 (29th Ave NE)	11	(1)			**11**
SR 1453 (Springs Road NE) - North of SR 1402 (McDonald Parkway NE)/24th St NE	9	(1)			**9**
SR 1453 (Springs Road NE) - South of SR 1402 (McDonald Parkway NE)/24th St NE	9	(1)			**9**

Notes:

(1) 2018 13-hour Turning Movement Count

(2) 2018 Volume, Speed, Class Mainline Count

Table C5: Model Validation

Forecast Location	Model 2011		2018 No-Build		FY No-Build Volumes	
	Model Volume	AADT	Interpolated Model [1]	Forecast Volume	2040 Model	2040 Forecast
SR 1318 (29th Ave Dr NW) - West of NC 127 (N Center St)	3,269	3,800	3,600	5,600	4,483	7,000
SR 1404 (29th Ave NE) - NC 127 (N Center St) to SR 1522 (2nd Street NE)	3,406		3,500	12,200	3,766	13,200
SR 1404 (29th Ave NE) - SR 1522 (2nd Street NE) to 5th Street Place NE/SR 1694 (5th Street Extended NE)	5,168	8,300	5,100	12,100	4,743	13,100
SR 1404 (29th Ave NE) - East of 5th Street Place NE/SR 1694 (5th Street Extended NE)	5,168		5,100	12,100	4,743	13,200
SR 1404 (29th Ave NE) - West of SR 1402 (Falling Creek Road)	5,168	8,900	5,100	12,200	4,743	13,200
SR 1404 (29th Ave NE) - SR 1402 (Falling Creek Road) to SR 1401 (16th St NE)	9,049		8,900	12,300	8,503	13,300
SR 1404 (29th Ave NE) - SR 1401 (16th St NE) to 20th Avenue Drive NE	10,804		10,200	13,500	8,268	14,600
SR 1404 (29th Ave NE) - East of 20th Avenue Drive NE	11,053		10,300	15,300	8,017	16,500
SR 1404 (29th Ave NE) - West of SR 2259 (23rd Street NE)/SR 2228 (23rd Street NE)	11,036		10,700	15,300	9,797	16,500
SR 1404 (29th Ave NE) - SR 2259 (23rd Street NE)/SR 2228 (23rd Street NE) to 24th Street NE	10,911	12,000	10,500	14,800	9,060	15,900
SR 1404 (29th Ave NE) - East of 24th Street NE	13,088		12,900	15,300	12,231	16,600
24th St NE - West of SR 1453 (Springs Road NE)	13,715		14,100	15,300	15,197	16,600
SR 1402 (McDonald Parkway NE) - East of SR 1453 (Springs Road NE)	19,767	17,000	19,700	20,300	19,431	21,800
NC 127 (N Center St) - North of SR 1404 (29th Ave NE)/SR 1318 (29th Ave Dr NW)	15,219		15,000	23,100	14,226	24,700
NC 127 (N Center St) - South of SR 1404 (29th Ave NE)/SR 1318 (29th Ave Dr NW)	18,749	31,000	18,900	31,500	19,205	33,500
SR 1522 (2nd Street NE) - South of SR 1404 (29th Ave NE)	*1,763*		*1,600*	1,700	*977*	1,900
SR 1402 (Falling Creek Road) - North of SR 1404 (29th Ave NE)	*5,137*	1,300	*5,700*	2,100	*7,349*	2,700
SR 1401 (16th St NE) - North of SR 1404 (29th Ave NE)	10,291	11,000	12,000	13,200	17,404	19,500
SR 1401 (16th St NE) - South of SR 1404 (29th Ave NE)	10,042	11,000	11,600	11,600	16,703	17,200
20th Avenue Drive NE - South of SR 1404 (29th Ave NE)	*2,693*		*2,600*	2,700	*2,169*	2,800
24th Street NE - North of SR 1404 (29th Ave NE)	*3,851*		*4,100*	900	*5,004*	1,100
SR 1453 (Springs Road NE) - North of SR 1402 (McDonald Parkway NE)/24th St NE	20,771	25,000	20,500	27,400	19,759	29,600

Notes: (1) Interpolated volume between 2011 and 2040 model data

Traffic values shown in *grey italics* are taken from representative centroid connectors

SR 1453 (Springs Road NE) - South of SR 1402 (McDonald Parkway NE)/24th St NE	12,228	14,000	12,500	17,000	13,396	18,400

Table C5: Model Validation

Forecast Location	Model 2011		2018 No-Build		FY No-Build Volumes	
	Model Volume	AADT	Interpolated Model (1)	Forecast Volume	2040 Model	2040 Forecast

Notes: (1) Interpolated volume between 2011 and 2040 model data

Traffic values shown in *grey italics* are taken from representative centroid connectors

Table C6: 2040 No-Build Traffic Volumes

Forecast Location	Forecast 2018 Base Year NB	Historic Growth Rate		Model Growth Rate [1]	Chosen Growth Rate [1]	Model Volume Delta [2]	Chosen Volume Delta [2]	Future Year No-Build Volumes	
	AADT	2007-2016	1997-2016	2011-2040	2018-2040	2011-2040	2018-2040	2040 Model	2040 Forecast
SR 1318 (29th Ave Dr NW) - West of NC 127 (N Center St)	5,600	2.45%	3.30%	1.09%	1.02%	1,214	1,400	4,483	**7,000**
SR 1404 (29th Ave NE) - NC 127 (N Center St) to SR 1522 (2nd Street NE)	12,200			0.35%	0.36%	360	1,000	3,766	**13,200**
SR 1404 (29th Ave NE) - SR 1522 (2nd Street NE) to 5th Street Place NE/SR 1694 (5th Street Extended NE)	12,100	-2.41%	1.53%	-0.30%	0.36%	-425	1,000	4,743	**13,100**
SR 1404 (29th Ave NE) - East of 5th Street Place NE/SR 1694 (5th Street Extended NE)	12,100			-0.30%	0.40%	-425	1,100	4,743	**13,200**
SR 1404 (29th Ave NE) - West of SR 1402 (Falling Creek Road)	12,200	-2.37%	1.45%	-0.30%	0.36%	-425	1,000	4,743	**13,200**
SR 1404 (29th Ave NE) - SR 1402 (Falling Creek Road) to SR 1401 (16th St NE)	12,300			-0.21%	0.36%	-546	1,000	8,503	**13,300**
SR 1404 (29th Ave NE) - SR 1401 (16th St NE) to 20th Avenue Drive NE	13,500			-0.92%	0.36%	-2,536	1,100	8,268	**14,600**
SR 1404 (29th Ave NE) - 20th Avenue Drive NE to SR 2259 (23rd Street NE)/SR 2228 (23rd Street NE)	15,300			-1.10% -0.41%	0.34%	-3,036 -1,239	1,200	8,017 9,797	**16,500**
SR 1404 (29th Ave NE) - SR 2259 (23rd Street NE)/SR 2228 (23rd Street NE) to 24th Street NE	14,800	0.74%	4.30%	-0.64%	0.33%	-1,851	1,100	9,060	**15,900**
SR 1404 (29th Ave NE) - 24th Street NE to SR 1453 (Springs Road NE)	15,300			-0.23% 0.35%	0.37%	-857 1,482	1,300	12,231 15,197	**16,600**
SR 1402 (McDonald Parkway NE) - East of SR 1453 (Springs Road NE)	20,300	1.13%	1.13%	-0.06%	0.32%	-336	1,500	19,431	**21,800**
NC 127 (N Center St) - North of SR 1404 (29th Ave NE)/SR 1318 (29th Ave Dr NW)	23,100	0.83%	0.83%	-0.23%	0.30%	-993	1,600	14,226	**24,700**
NC 127 (N Center St) - South of SR 1404 (29th Ave NE)/SR 1318 (29th Ave Dr NW)	31,500	-0.16%	0.45%	0.08%	0.28%	456	2,000	19,205	**33,500**
SR 1522 (2nd Street NE) - South of SR 1404 (29th Ave NE)	1,700			-2.01%	0.51% [3]	-786	200 [3]	977	**1,900**

Notes:

(1) Growth rate shown is the Compound Annual Growth Rate (CAGR).

(2) Volume Delta is the raw change in volume between either the model volumes or the forecast volumes

(3) Growth rate and model volumes shown are for a centroid connector that was determined to be representative of the change in volume for the subject roadway

5th Street Place NE - North of SR 1404 (29th Ave NE)	400				1.02%		100		**500**

Table C6: 2040 No-Build Traffic Volumes

Forecast Location	Forecast 2018 Base Year NB	Historic Growth Rate		Model Growth Rate [1]	Chosen Growth Rate [1]	Model Volume Delta [2]	Chosen Volume Delta [2]	Future Year No-Build Volumes	
	AADT	2007-2016	1997-2016	2011-2040	2018-2040	2011-2040	2018-2040	2040 Model	2040 Forecast
SR 1694 (5th Street Extended NE) - South of SR 1404 (29th Ave NE)	200				0.00%		0		**200**
SR 1402 (Falling Creek Road) - North of SR 1404 (29th Ave NE)	2,100	-0.19%	1.79%	1.24%	1.15% (3)	2,212	600 (3)	7,349	**2,700**
SR 1401 (16th St NE) - North of SR 1404 (29th Ave NE)	13,200	2.17%	2.17%	1.83%	1.79%	7,113	6,300	17,404	**19,500**
SR 1401 (16th St NE) - South of SR 1404 (29th Ave NE)	11,600	-2.14%	-1.71%	1.77%	1.81%	6,661	5,600	16,703	**17,200**
20th Avenue Drive NE - North of SR 1404 (29th Ave NE)	700				0.00%		0		**700**
20th Avenue Drive NE - South of SR 1404 (29th Ave NE)	2,700			-0.74%	0.17% (3)	-524	100 (3)	2,169	**2,800**
SR 2259 (23rd Street NE) - North of SR 1404 (29th Ave NE)	1,000				0.43%		100		**1,100**
SR 2228 (23rd Street NE) - South of SR 1404 (29th Ave NE)	300				0.00%		0		**300**
24th Street NE - North of SR 1404 (29th Ave NE)	900			0.91%	0.92% (3)	1,153	200 (3)	5,004	**1,100**
SR 1453 (Springs Road NE) - North of SR 1402 (McDonald Parkway NE)/24th St NE	27,400	0.34%	0.77%	-0.17%	0.35%	-1,012	2,200	19,759	**29,600**
SR 1453 (Springs Road NE) - South of SR 1402 (McDonald Parkway NE)/24th St NE	17,000	-0.66%	-3.46%	0.32%	0.36%	1,168	1,400	13,396	**18,400**

Notes:

(1) Growth rate shown is the Compound Annual Growth Rate (CAGR).

(2) Volume Delta is the raw change in volume between either the model volumes or the forecast volumes

(3) Growth rate and model volumes shown are for a centroid connector that was determined to be representative of the change in volume for the subject roadway

Table C7: 2040 Build Traffic Volumes

Forecast Location	2040 Model Volumes, Daily		Model Diversion Percent	Chosen Diversion Percent	Model Volume Delta	Chosen Volume Delta	2040 Forecast Volumes	
	No-Build	Build					No-Build	Build
SR 1318 (29th Ave Dr NW) - West of NC 127 (N Center St)	4,483	4,563	1.78%	5.71%	80	400	7,000	**7,400**
SR 1404 (29th Ave NE) - NC 127 (N Center St) to SR 1522 (2nd Street NE)	3,766	4,798	27.40%	24.24%	1,032	3,200	13,200	**16,400**
SR 1404 (29th Ave NE) - SR 1522 (2nd Street NE) to 5th Street Place NE/SR 1694 (5th Street Extended NE)	4,743	6,951	46.55%	25.19%	2,208	3,300	13,100	**16,400**
SR 1404 (29th Ave NE) - East of 5th Street Place NE/SR 1694 (5th Street Extended NE)	4,743	6,951	46.55%	24.24%	2,208	3,200	13,200	**16,400**
SR 1404 (29th Ave NE) - West of SR 1402 (Falling Creek Road)	4,743	6,951	46.55%	24.24%	2,208	3,200	13,200	**16,400**
SR 1404 (29th Ave NE) - SR 1402 (Falling Creek Road) to SR 1401 (16th St NE)	8,503	10,736	26.26%	24.81%	2,233	3,300	13,300	**16,600**
SR 1404 (29th Ave NE) - SR 1401 (16th St NE) to 20th Avenue Drive NE	8,268	14,327	73.28%	41.10%	6,059	6,000	14,600	**20,600**
SR 1404 (29th Ave NE) - 20th Avenue Drive NE to SR 2259 (23rd Street NE)/SR 2228 (23rd Street NE)	8,017 9,797	14,873 15,481	85.52% 58.02%	36.97%	6,856 5,684	6,100	16,500	**22,600**
SR 1404 (29th Ave NE) - SR 2259 (23rd Street NE)/SR 2228 (23rd Street NE) to 24th Street NE	9,060	14,624	61.41%	38.99%	5,564	6,200	15,900	**22,100**
SR 1404 (29th Ave NE) - 24th Street NE to SR 1453 (Springs Road NE)	12,231 15,197	18,054 20,901	47.61% 37.53%	37.95%	5,823 5,704	6,300	16,600	**22,900**
SR 1402 (McDonald Parkway NE) - East of SR 1453 (Springs Road NE)	19,431	24,637	26.79%	27.98%	5,206	6,100	21,800	**27,900**
NC 127 (N Center St) - North of SR 1404 (29th Ave NE)/SR 1318 (29th Ave Dr NW)	14,226	14,107	-0.84%	-0.81%	-119	-200	24,700	**24,500**
NC 127 (N Center St) - South of SR 1404 (29th Ave NE)/SR 1318 (29th Ave Dr NW)	19,205	19,484	1.45%	1.19%	279	400	33,500	**33,900**
SR 1522 (2nd Street NE) - South of SR 1404 (29th Ave NE)	977	2,153	120.37%	5.26% (1)	1,176	100 (1)	1,900	**2,000**
5th Street Place NE - North of SR 1404 (29th Ave NE)				20.00%		100	500	**600**
SR 1694 (5th Street Extended NE) - South of SR 1404 (29th Ave NE)				0.00%		0	200	**200**
SR 1402 (Falling Creek Road) - North of SR 1404 (29th Ave NE)	7,349	7,553	2.78%	11.11% (1)	204	300 (1)	2,700	**3,000**
SR 1401 (16th St NE) - North of SR 1404 (29th Ave NE)	17,404	16,329	-6.18%	-5.13%	-1,075	-1,000	19,500	**18,500**

Notes:

Table C7: 2040 Build Traffic Volumes

Forecast Location	2040 Model Volumes, Daily		Model Diversion Percent	Chosen Diversion Percent	Model Volume Delta	Chosen Volume Delta	2040 Forecast Volumes	
	No-Build	Build					No-Build	Build
(1) Diversion rate and model volumes shown are for a centroid connector that was determined to be representative of the change in volume for the subject roadway								
SR 1401 (16th St NE) - South of SR 1404 (29th Ave NE)	16,703	14,613	-12.51%	-12.21%	-2,090	-2,100	17,200	**15,100**
20th Avenue Drive NE - North of SR 1404 (29th Ave NE)				0.00%		0	700	**700**
20th Avenue Drive NE - South of SR 1404 (29th Ave NE)	2,169	2,962	36.56%	25.00% (1)	793	700 (1)	2,800	**3,500**
SR 2259 (23rd Street NE) - North of SR 1404 (29th Ave NE)				9.09%		100	1,100	**1,200**
SR 2228 (23rd Street NE) - South of SR 1404 (29th Ave NE)				0.00%		0	300	**300**
24th Street NE - North of SR 1404 (29th Ave NE)	5,004	5,059	1.10%	9.09% (1)	55	100 (1)	1,100	**1,200**
SR 1453 (Springs Road NE) - North of SR 1402 (McDonald Parkway NE)/24th St NE	19,759	19,714	-0.23%	0.34%	-45	100	29,600	**29,700**
SR 1453 (Springs Road NE) - South of SR 1402 (McDonald Parkway NE)/24th St NE	13,396	13,582	1.39%	1.63%	186	300	18,400	**18,700**

Notes:

(1) Diversion rate and model volumes shown are for a centroid connector that was determined to be representative of the change in volume for the subject roadway

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