US 64 Improvements

West of SR 1308 (Laura Duncan Road) to US 1

Wake County

STIP Project No. U-5301

WBS No. 47018.1.1

Traffic Forecast Report

Prepared For:

North Carolina Department of Transportation

Prepared By:

Patriot Transportation Engineering, PLLC

January 2017

TRAFFIC FORECAST COVER LETTER

January 24, 2017

MEMORANDUM TO: John Conforti, PE
NCDOT Project Development

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

SUBJECT: Traffic Forecast for U-5301
Wake County
US 64 from SR 1308 (Laura Duncan Road) to US 1

Please find attached the 2016 and 2040 traffic forecast for STIP Project Number U-5301 in Wake County. The proposed project (Alternative 1) will improve US 64 from Laura Duncan Road (SR 1308) to US 1 to include interchanges at Laura Duncan Road (SR 1308) and Lake Pine Drive (SR 1521) and a 6-lane superstreet from east of Lake Pine Drive to US 1. Alternative 2 includes the same configuration as Alternative 1; however, the corridor from Laura Duncan Road to US 1is upgraded to an expressway that maintains the existing access points. This forecast was requested for use in the project development activities associated with the project, including the NEPA documentation and Preliminary Roadway Design. This forecast was requested by John Conforti, of NCDOT Project Development, on November 3, 2016.

This is the first forecast for this project in its current form; however, a forecast was developed in September 2008 for the US 64 Corridor Study Phase IIA. The project is located within the boundaries of the Capital Area Metropolitan Planning Organization (CAMPO). The following three scenarios are provided in this forecast:

- 2016 Base Year No-Build
- 2040 Future Year No-Build
- 2040 Future Year Build (Alternative 1 and Alternative 2)

Chris Lukasina (Capital Area MPO – Executive Director), Alex Rickard (Capital Area MPO – Deputy Director), Tyler Bray (Town of Cary – Transportation Planning Engineer), Juliet Andes (Town of Cary – Facilities Planning Manager), Will Hartye (Town of Cary – Planner II), Russell Dalton (Town of Apex – Transportation Engineer), Shannon Cox (Town of Apex – Senior Transportation Planner), Brendie Vega (Town of Apex – Principal Planner), and Brian Wert (NCDOT State Traffic Forecast Engineer) were consulted during the development of this forecast.

Fiscal Constraint

The project is located within the CAMPO boundaries; therefore, the travel demand model and traffic forecast is fiscally constrained to match the assumptions of the corresponding Metropolitan Transportation Plan (MTP).

The *Capital Area Metropolitan Planning Organization 2040 Metropolitan Transportation Plan* (2040 MTP) includes several projects that overlap the study location with both an interim and a long-term solution for

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US 64 within the limits of the subject forecast. The subject project that is currently funded (Alternative 1) is an interim solution and an additional long term solution for the corridor (widening it to six lanes and upgrading it to an expressway from US 1 to NC 540) is also included in the fiscally constrained 2040 MTP. The interim project is included as MTP Projects A380, F15a1 and F15a2 and has a horizon year of 2030. The ultimate project is included as MTP Project F15a and has a horizon year of 2040. Based on a conversation with the NCDOT State Traffic Forecast Engineer on August 22, 2016 and CAMPO on November 4, 2016 it was decided that, due to the overlapping nature of the projects, the full ultimate project (six-lane expressway for the entire extent from US 1 to NC 540) would not be included in the forecast for the 2040 scenario. Therefore, only the interim solution (Alternative 1) and the additional upgrade of corridor from Laura Duncan Road to US 1 to an expressway (Alternative 2) are included in this forecast. The MTP describes the interim solution projects as follows:

- MTP Project A380 – US 64 (superstreet), from US 1 to Laura Duncan Road – Construct superstreet (2030)
- MTP Project F15a1 – US 64/Laura Duncan Interchange (New) – New interchange (2030)
- MTP Project F15a2 – US 64/Lake Pine Interchange (New) – New interchange (2030)

The following projects that may affect the proposed project are assumed to be constructed prior to 2040:

- MTP Project A410 – Lake Pine Drive/Old Raleigh Road, from Cary Parkway to Apex Peakway – Widen from 2 to 4 lanes (2040)
- MTP Project F110 – US 1, from US 64 to I-540 – Widen from 4 lanes to 6 lanes (2040)
- MTP Project F5 – NC 540 Tri-Ex (Phase IV), from NC 55 Bypass to US 401 (South) – New freeway location (2020)
- MTP Project A187b – Apex Peakway (East) from Laura Duncan Road to NC 55 – New Location 4-lane median divided roadway (2040)
- MTP Project A166 – Center St/1010, from US 1 to Apex Peakway – Widen from 2 to 4 lanes (2030)
- MTP Project A28b – Davis Drive, from US 64 to Farm Pond Road – Widen from 2 to 4 lanes (2040)

Travel Demand Model

The Triangle Regional Model v5 build version 416 (provided by ITRE on 09/22/2016 as authorized by NCDOT) was utilized as a tool in the development of the forecast.

Forecast Methodology

The 2016 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 2016 and 2040, straight line interpolation between the 2016 Base Year No-Build and the 2040 scenarios is acceptable. The 2016 Base Year No-Build volumes may be used as a

surrogate for the 2016 Base Year Build volumes for interpolation and extrapolation purposes. 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 January 24, 2017.

cc: (Final distribution for your records via e-mail as PDF attachments):
Glenn Mumford, PE, Roadway Design Unit
Keith Dixon, Transportation Planning Branch
Scott Walston, Transportation Planning Branch
Rupal Desai, Transportation Planning Branch
James Dunlop, PE, Congestion Management Section
David Keilson, Division 5 Division Planning Engineer
Chris Lukasina, CAMPO Executive Director

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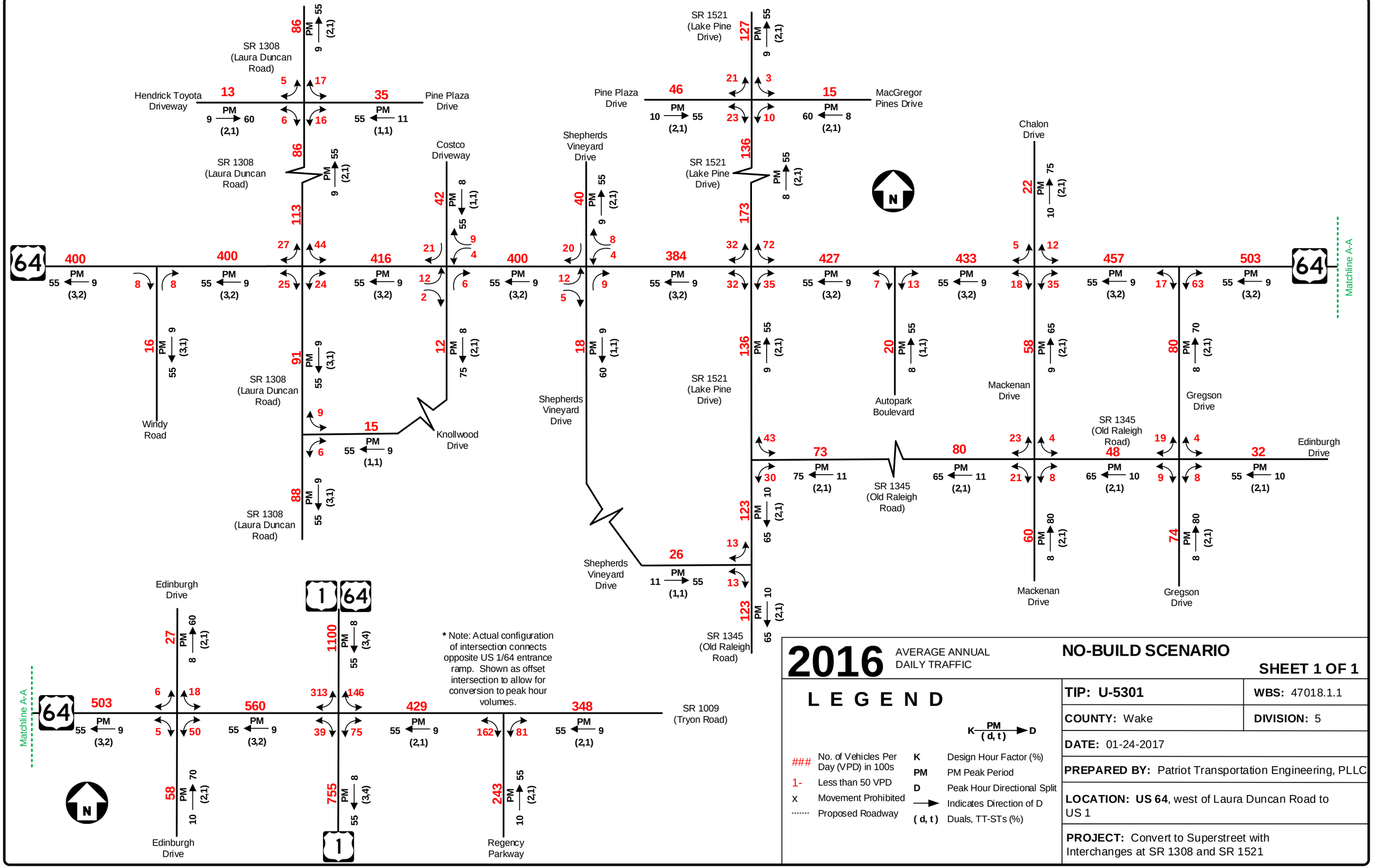


2016 AVERAGE ANNUAL DAILY TRAFFIC

NO-BUILD SCENARIO

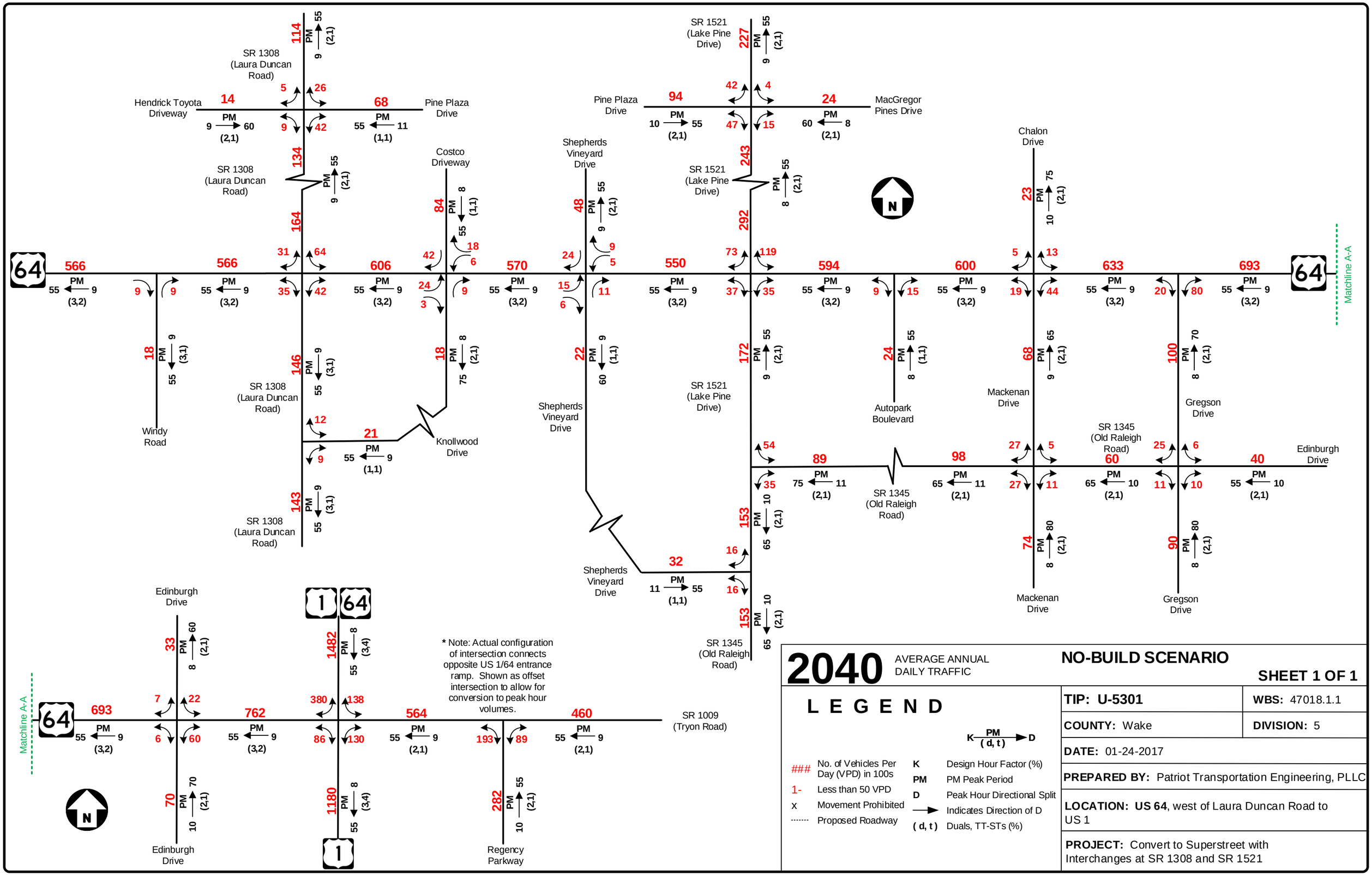
SHEET 1 OF 1

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
-------	Proposed Roadway	→	Indicates Direction of D
		(d, t)	Duals, TT-STs (%)

TIP: U-5301	**WBS:** 47018.1.1
COUNTY: Wake	**DIVISION:** 5
DATE: 01-24-2017	
PREPARED BY: Patriot Transportation Engineering, PLLC	
LOCATION: **US 64**, west of Laura Duncan Road to US 1	
PROJECT: Convert to Superstreet with Interchanges at SR 1308 and SR 1521	



2040 AVERAGE ANNUAL DAILY TRAFFIC

NO-BUILD SCENARIO

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
-------	Proposed Roadway	→	Indicates Direction of D
		(d, t)	Duals, TT-STs (%)

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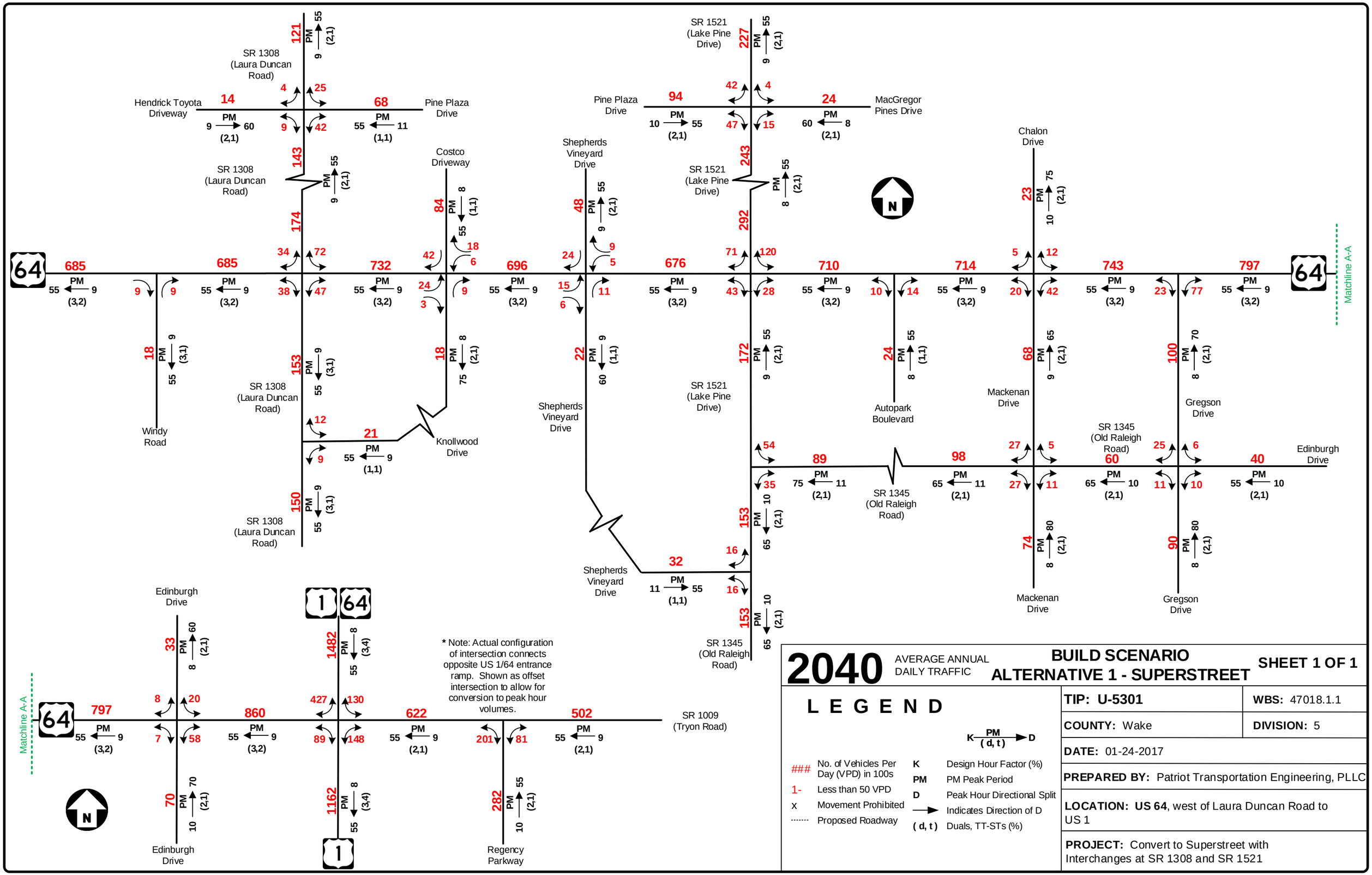


2040 AVERAGE ANNUAL DAILY TRAFFIC

BUILD SCENARIO
ALTERNATIVE 1 - SUPERSTREET

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
-------	Proposed Roadway	→	Indicates Direction of D
		(d, t)	Duals, TT-STs (%)

TIP: U-5301 | **WBS:** 47018.1.1

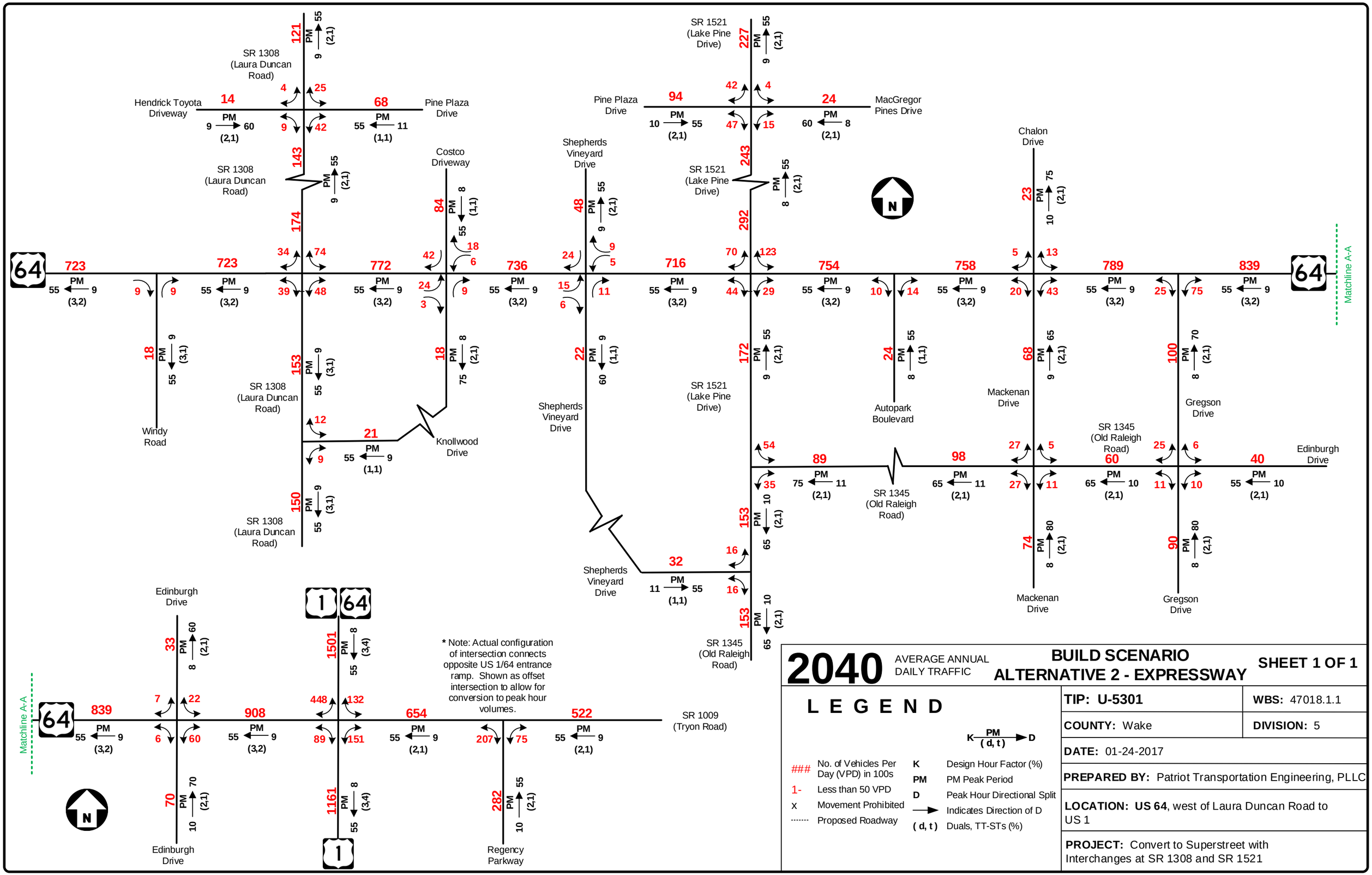
COUNTY: Wake | **DIVISION:** 5

DATE: 01-24-2017

PREPARED BY: Patriot Transportation Engineering, PLLC

LOCATION: **US 64**, west of Laura Duncan Road to US 1

PROJECT: Convert to Superstreet with Interchanges at SR 1308 and SR 1521



2040 AVERAGE ANNUAL DAILY TRAFFIC

BUILD SCENARIO
ALTERNATIVE 2 - EXPRESSWAY

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
-------	Proposed Roadway	→	Indicates Direction of D
		(d, t)	Duals, TT-STs (%)

TIP: U-5301 | **WBS:** 47018.1.1

COUNTY: Wake | **DIVISION:** 5

DATE: 01-24-2017

PREPARED BY: Patriot Transportation Engineering, PLLC

LOCATION: **US 64**, west of Laura Duncan Road to US 1

PROJECT: Convert to Superstreet with Interchanges at SR 1308 and SR 1521

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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 Number U-5301; US 64 corridor upgrade and improvements in Wake County.

1.1 PROJECT REQUEST INFORMATION

The traffic forecast request for this project was requested by NCDOT Project Development and Environmental Analysis Unit in support of project development activities, including National Environmental Policy Act (NEPA) documentation and Preliminary Design for the project. The scope of work for the traffic forecast was finalized in November 2016.

For the purposes of the environmental document, it was decided through project scoping with NCDOT that Base Year scenarios would use 2016 and Future Year scenarios would use 2040. The 2016 Base Year traffic forecast includes only the No-Build scenario. The 2040 Future Year traffic forecast includes Build and No-Build scenarios for two alternatives.

1.2 FORECAST HISTORY

This is the first request for a traffic forecast for this project in its current form. A traffic forecast for the US 64 Corridor Study Phase IIA was developed in September 2008 that includes the same study area; however, the assumed vision for the corridor in the previous forecast included a freeway from Pittsboro to NC 540 and an expressway from NC 540 to US 1.

1.3 PROJECT DESCRIPTION

NCDOT proposes to improve approximately 2.5 miles of US 64 from Laura Duncan Road (SR 1308) to US 1 in Wake County including interchanges at Laura Duncan Road (SR 1308) and Lake Pine Drive (SR 1521) with a 6-lane superstreet from east of Lake Pine Drive to US 1.

1.4 AREA INFORMATION

Wake County has an estimated population of 901,000 citizens based on 2010 census data and a 2015 population of 1,007,600 according to the North Carolina Office of State Budget and Management. The county covers approximately 857 square miles and consists of several cities and towns including; Raleigh, Cary, Apex, Fuquay-Varina, Garner, Holly Springs, Knightdale, Morrisville, Rolesville, Wake Forest, Wendell, and Zebulon. Raleigh-Durham International Airport (RDU) is located on the western side of the county. Raleigh is both the county seat of Wake County and the state capital of North Carolina.

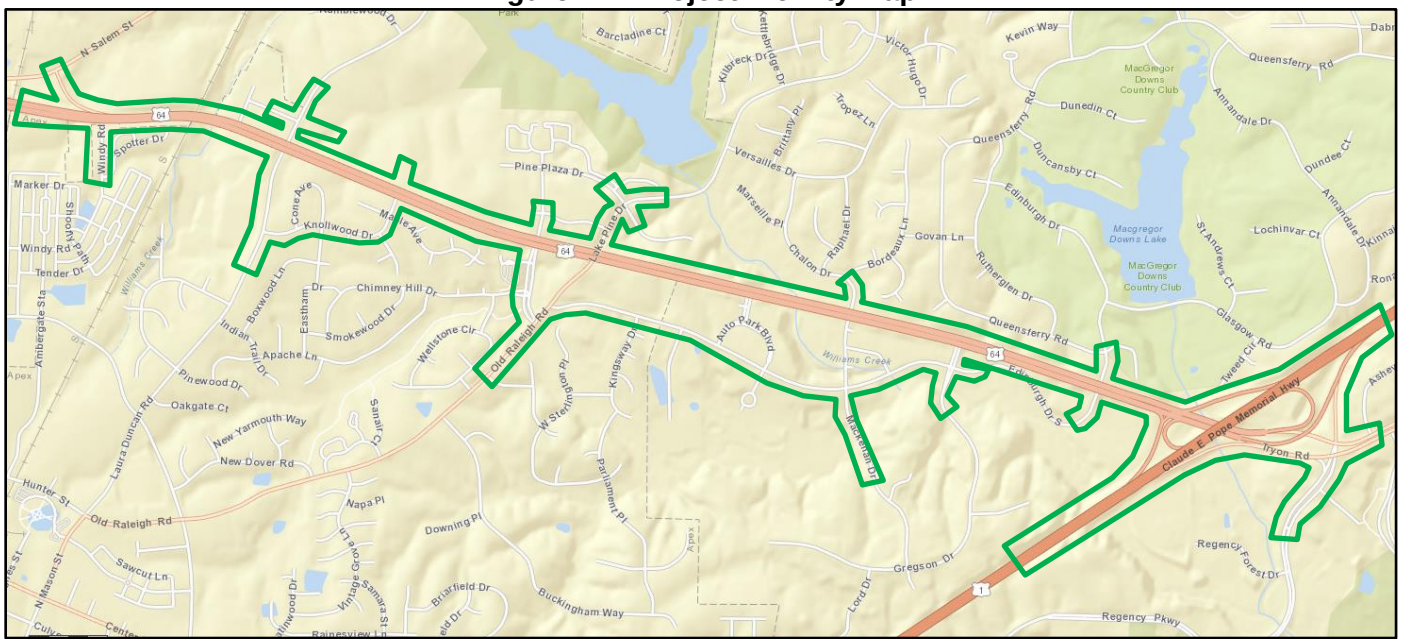
The project location map for the U-5301 forecast is shown on Figure 1-1: Project Vicinity Map.

1.5 ROUTE INFORMATION

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

The **US 64** corridor is classified as an *Other Principal Arterial* within the traffic forecast study area and serves the inter-county travel demands between Wake and Chatham counties. US 64 is a median-separated facility with access mostly provided by roadway intersections and limited driveway access. The land use along the corridor in the project study area is primarily commercial but not uniformly dense along the corridor. Several large residential developments exist on either side of the corridor, with access provided from the Y-lines. The speed limit along US 64 is 55 miles per hour.

Figure 1-1: Project Vicinity Map



US 1 is designated as an *Other Freeway* within the project study area and provides direct access NC-540 as well as Chatham and Lee Counties to the southwest and to I-40, I-440, and the City of Raleigh to the northeast. The speed limit along US 1 is 65 miles per hour.

Laura Duncan Road (SR 1308) is designated as a *Major Collector* within the project study area. The speed limit along Laura Duncan Road is 35 miles per hour south of US 64 and 45 miles per hour north of US 64. Apex High School is located on Laura Duncan Road, south of US 64.

Lake Pine Drive (SR 1521) is designated as a *Major Collector* within the project study area. The speed limit along Lake Pine Drive is 45 miles per hour south of US 64 and 35 miles per hour north of US 64.

Old Raleigh Road (SR 1345) has a non-linear alignment in the project study area. South of the Lake Pine Drive (SR 1521)/Old Raleigh Road (SR 1345) intersection, Old Raleigh Road is designated as a *Major Collector* with a speed limit of 45 miles per hour. East of the Lake Pine Drive/Old Raleigh Road intersection, Old Raleigh Road is designated as a *Local Road*, with a speed limit of 35 miles per hour.

Tryon Road (SR 1009) is designated as a *Minor Arterial* within the project study area. The speed limit along Tryon Road is 45 miles per hour. Western Wake Medical Center is located at the intersection of Tryon Road and Kildaire Farm Road (SR 1300), to the east of the project study area.

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 boundaries of the Capital Area Metropolitan Planning Organization (CAMPO); therefore, the travel demand model and traffic forecasts are fiscally constrained to match the assumptions of the corresponding Metropolitan Transportation Plan (MTP), with the exception of the study project (see details below).

The *Capital Area Metropolitan Planning Organization 2040 Metropolitan Transportation Plan* (2040 MTP) includes several projects that overlap the study location with both an interim and a long-term solution for US 64 within the limits of the subject forecast. The subject project that is currently funded (Alternative 1) is an interim solution and an

additional long term solution for the corridor (widening it to six lanes and upgrading it to an expressway from US 1 to NC 540) is also included in the fiscally constrained 2040 MTP. The interim project is included as MTP Projects A380, F15a1 and F15a2 and has a horizon year of 2030. The ultimate project is included as MTP Project F15a and has a horizon year of 2040. Based on a conversation with the NCDOT State Traffic Forecast Engineer on August 22, 2016 and CAMPO on November 4, 2016 it was decided that, due to the overlapping nature of the projects, the full ultimate project (six-lane expressway for the entire extent from US 1 to NC 540) would not be included in the forecast for the 2040 scenario. Therefore, only the interim solution (Alternative 1) and the additional upgrade of the portion of the corridor from east of Lake Pine Drive to US 1 to an expressway (Alternative 2) are included in this forecast. The MTP describes the interim solution projects as follows:

- MTP Project A380 – US 64 (superstreet), from US 1 to Laura Duncan Road – Construct superstreet (2030)
- MTP Project F15a1 – US 64/Laura Duncan Interchange (New) – New interchange (2030)
- MTP Project F15a2 – US 64/Lake Pine Interchange (New) – New interchange (2030)

The following projects that may affect the proposed project are assumed to be constructed prior to 2040:

- MTP Project A410 – Lake Pine Drive/Old Raleigh Road, from Cary Parkway to Apex Peakway – Widen from 2 to 4 lanes (2040)
- MTP Project F110 – US 1, from US 64 to I-540 – Widen from 4 lanes to 6 lanes (2040)
- MTP Project F5 – NC 540 Tri-Ex (Phase IV), from NC 55 Bypass to US 401 (South) – New freeway location (2020)
- MTP Project A187b – Apex Peakway (East) from Laura Duncan Road to NC 55 – New Location 4-lane median divided roadway (2040)
- MTP Project A166 – Center St/1010, from US 1 to Apex Peakway – Widen from 2 to 4 lanes (2030)
- MTP Project A28b – Davis Drive, from US 64 to Farm Pond Road – Widen from 2 to 4 lanes (2040)

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 were utilized as a tool when preparing the traffic forecasts. Only one past traffic forecast that included the study area roadways and was less than ten years old was located. The following forecast was used in the traffic forecast development process:

- US 64 Corridor Study Phase IIA, US 64 from US 64 Bypass (Pittsboro) to US 1, September 2008

This forecast was a valuable asset in determining design data and providing reasonableness checks for the traffic volumes developed in the traffic forecast for the proposed project.

2.2 HISTORIC AADT

Existing traffic count data for study area roadways from 1995 to 2015 was provided by the NCDOT Traffic Survey Group (TSG). Data sources included:

- NCDOT TSG Average Annual Daily Traffic (AADT) history from 1995 to 2015

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 March 2016 through the NCDOT TSG on-call contract and included seventeen 13-hour turning movement counts and three 48-hour classification counts.

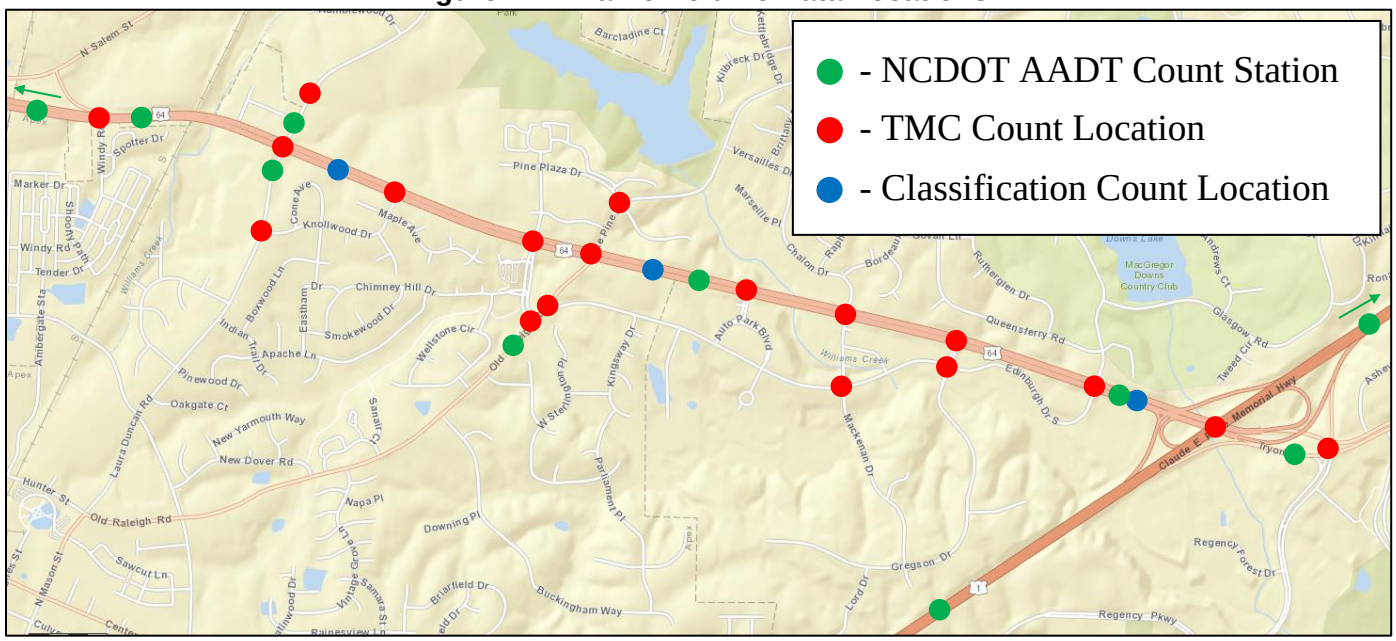
The traffic count locations fall under the following TSG ATR classification:

- 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).

ATR Group 11 (Applies to urban interstate and some rural locations strongly influenced by nearby large urban areas) was considered for US 1 due to the freeway operations being comparable to an Interstate route; however, when the ATR adjustment was applied it resulted in volumes that were substantially higher than the historic AADT data. Therefore, ATR Group 1 was used for US 1 instead.

The traffic count locations are listed in Table 2-1 and are displayed in Figure 2-1.

Figure 2-1: Traffic Volume Data Locations



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) for the y-lines and project specific factors for US 64 based on the proportion of traffic during the 13-hour period compared to the daily volume for the 48-hour classification counts. The count expansion factors for the y-lines were also compared to the count data from the 48-hour volume, speed, classification count and determined to be adequate.

Table 2-1: Collected Traffic Count Locations

Location	Count Type	Date(s)	County	ATR Group	Seasonal Adjustment Factor
US 64 at Windy Rd/US 64 WB off-ramp	13-hour TMC	10/12/16	Wake	1	0.96
US 64 at Laura Duncan Rd (SR 1308)	13-hour TMC	10/12/16	Wake	1	0.96
US 64 at Knollwood Dr/Costco Dwy	13-hour TMC	10/13/16	Wake	1	0.93
US 64 at Shepherds Vineyard Dr	13-hour TMC	10/05/16	Wake	1	0.96
US 64 at Lake Pine Dr (SR 1521)	13-hour TMC	10/04/16	Wake	1	0.99
US 64 at Autopark Blvd	13-hour TMC	10/04/16*	Wake	1	0.99
US 64 at Mackenan Dr/Chalon Dr	13-hour TMC	10/04/16*	Wake	1	0.99
US 64 at Gregson Dr	13-hour TMC	10/04/16*	Wake	1	0.99
US 64 at Edinburgh Dr	13-hour TMC	10/04/16*	Wake	1	0.99
US 64 at US 1/US 64	13-hour TMC	10/12/16	Wake	1	0.96
US 64/Tryon Rd (SR 1009) at US 1/US 64/Regency Pkwy	13-hour TMC	10/12/16	Wake	1	0.96
Laura Duncan Rd (SR 1308) at Knollwood Dr	13-hour TMC	10/04/16	Wake	1	0.99
Laura Duncan Rd (SR 1308) at Hendrick Toyota Dwy/Pine Plaza Dr	13-hour TMC	10/04/16	Wake	1	0.99

Location	Count Type	Date(s)	County	ATR Group	Seasonal Adjustment Factor
Old Raleigh Rd (SR 1435) at Shepherds Vineyard Dr	13-hour TMC	10/04/16*	Wake	1	0.99
Lake Pine Dr (SR 1521)/Old Raleigh Rd (SR 1435) at Old Raleigh Rd (SR 1435)	13-hour TMC	10/04/16*	Wake	1	0.99
Lake Pine Dr (SR 1521) at Pine Plaza Dr/MacGregor Pines Dr	13-hour TMC	10/04/16*	Wake	1	0.99
Old Raleigh Rd (SR 1435) at Mackenan Dr	13-hour TMC	10/04/16*	Wake	1	0.99
Old Raleigh Dr (SR 1435)/Edinburgh Dr at Gregson Dr	13-hour TMC	10/04/16	Wake	1	0.99
US 64 east of Laura Duncan Rd (SR 108)	48-hour VSC	10/11/16-10/12/16	Wake	1	0.99/0.96
US 64 east of Lake Pine Dr (SR 1521)	48-hour VSC	10/11/16-10/12/16	Wake	1	0.99/0.96
US 64 west of US 1	48-hour VSC	10/11/16-10/12/16	Wake	1	0.99/0.96

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

* denotes a count that includes a portion of the count being collected during the previous day. All locations have identical Seasonal Adjustment Factors for both days

2.4 FIELD INVESTIGATION

An orientation field trip was taken as part of the traffic forecast initiation process. The field trip was taken on December 19 and 20, 2016. The following observations were noted:

- The MacGregor Village commercial center, located off of Edinburgh Drive, south of US 64, does not currently have full utilization of its commercial spaces.
- Additional retail and commercial space was under construction north of US 64, opposite Knollwood Drive. No structures have been built, but the land has been cleared and grading was being completed.
- The observed directional flow was largely in line with the directional factors given by the count data, except at the US 64/Windy Road intersection. Field observations indicated the PM peak hour primary direction of travel to be westbound or, perhaps, an even 50/50 split, while count data showed a primary direction of eastbound. It is possible however that this was due to the metering of traffic in the westbound direction due to the presence of signalized intersections.
- While there is substantial activity at the side streets, most traffic on US 64 appears to be through traffic.
- In the PM peak period, substantial congestion along US 64 develops so that queued vehicles (westbound at Lake Pine Drive and eastbound at Edinburgh Drive) wait through multiple signal cycles.
- Traffic on Gregson Drive and Edinburgh Drive is highly directional.
- At the intersections that serve as the "gateways" to US 64 on the west side of US 1 (i.e., Edinburgh Drive for westbound traffic and Laura Duncan Road for eastbound traffic), substantial queues were observed in the peak periods. Queue lengths of approximately 1,200 feet were observed at both locations.

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:

- *Chris Lukasina, Capital Area MPO – Executive Director
- *Alex Rickard, Capital Area MPO – Deputy Director
- Tim Gardiner, Wake County – Transportation Planner
- *Tyler Bray, Town of Cary – Transportation Planning Engineer
- *Juliet Andes, Town of Cary – Facilities Planning Manager
- *Will Hartye, Town of Cary – Planner II
- *Russell Dalton, Town of Apex – Transportation Engineer
- *Shannon Cox, Town of Apex – Senior Transportation Planner
- David Keilson, NCDOT Division 5 – Division Planning Engineer
- Al Grandy, NCDOT Division 5 – Division Traffic Engineer
- Reid Elmore, NCDOT Division 5 – District 1 Engineer
- Rupal Desai, NCDOT TPB
- Scott Walston, NCDOT TPB

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.* August 2016. Available: https://connect.ncdot.gov/projects/planning/STIPDocuments1/LIVE_STIP.pdf

Capital Area Metropolitan Planning Organization. *Capital Area Metropolitan Planning Organization 2040 Metropolitan Transportation Plan.* Adopted April 1, 2013 and Amended October 2015. Available: http://www.campo-nc.us/adopted-2040-mtp

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

3. BASE YEAR 2016 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 2016 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 2016 Base Year forecast were less than 1.6. 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 2016 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 aforementioned factors are described below.

3.2.1 TRUCK PERCENTAGES

Truck Percentages were determined using the 48-Hour mainline classification count data, the 13-Hour TMC data, and the previous traffic forecast listed in Section 2.1. 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 were fairly consistent along US 64 ranging from two to three percent duals and one to two percent TTSTs. One count showed a 17 percent result for duals; however, this count was determined to be less reliable as it was collected using Wavetronix sensors. The forecast utilizes three percent duals and two percent TTSTs along the entire length of the US 64 corridor.

- The truck percentages for US 1 were also consistent with both counts showing three percent duals and the TTST counts showing three to four percent. The forecast utilizes three percent duals and four percent TTSTs for the full extent of USS 1.

- Y-lines – The truck percentages collected for the Y-lines showed low volumes of truck with all counts showing 3 percent or less for duals and no counts exceeding one percent for TTSTs. The forecast utilizes truck percentages that are consistent with the count percentages.

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, generally D was in the 51% to 58% range for US 64. D values for y-lines typically fell within the range of 55% to 65% with the exception of several of the y-lines in the business park located to the south of US 64 near US 1 that exhibited higher directional distributions. 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:

- US 64 Corridor – the directional distribution along US 64 ranged from 51 to 58 percent with a consistent PM peak period direction in the westbound direction. The average distribution was approximately 55 percent along the entire corridor and based on a review of the data it was determined that a single value would be used for the entire length of the US 64 corridor. The directional distribution was determined to be 55 percent along the entire corridor with a PM peak in the westbound direction.

- US 1 – the directional distribution along US 1 ranged from 54 to 57 percent in the southbound direction. It was determined that a directional distribution of 55 percent would be the most appropriate distribution with the PM peak direction in the southbound direction.

- Y-lines along US 64 – the directional distributions for Y-lines along US 64 generally ranged from 55 to 80 percent and the selected directional distributions were largely 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. The K-factors in this traffic forecast range from 8% to 11%. 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:

- US 64 Corridor – the peak hour factor along US 64 ranged from eight to ten percent and had relatively consistent percentages along the corridor with a vast majority of the counts having nine percent. The peak hour factor for the corridor was determined to be nine percent, which is consistently maintained along the corridor.

- US 1 – the peak hour factors for US 1 were eight percent for both collected counts. A peak hour factor of eight percent was selected for US 1.

- Y-lines along US 64 – the peak hour factors for Y-lines along US 64 generally ranged from seven to eleven 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 2016 Base Year No-Build Scenario were calculated. Adjusted counts were compared to trend line analyses and the extrapolation of data to 2016 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 volume relied primarily on the field collected data as compared to the historic AADT. Based on input from local planners, the current growth rate is approximately 5% in the area, which is higher than historic rates. Combined with several developments in the area (Costco, residential development further west, etc.) it was determined that utilizing the actual count data would be the most reliable method for determining the Base Year volumes.

- The turning movement counts taken along US 64 at Windy Drive showed lower volumes than at the adjacent intersection with Laura Duncan Road. It appears as though the count was collected to include the exit ramp to Salem Street opposite Windy Drive that is not included in the forecast. Therefore, the forecast relied more heavily on the Laura Duncan count and the historic AADT data at the western edge of the forecast for US 64.

- The traffic forecast includes break lines at five locations where it was determined that the volumes along the roadway between the subject intersections were affected substantially enough by intervening side streets or driveways that a single link volume was not representative of the volume between the two intersections.

4. MODEL DATA

The study area for the forecast is included the Triangle Regional Travel Demand Model. The study area is located in the southwestern area of the model and has relatively good connectivity, with the model including all of the major roadways (US 64, US 1, Laura Duncan Road (SR 1308), Lake Pine Drive (SR 1521), and Tryon Road (SR 1009)), but none of the minor y-line roadways except for Regency Parkway. The Triangle Regional Model v5 build version 416 (provided by ITRE on 09/22/2016 as authorized by NCDOT) was utilized as a tool in the development of the forecast to determine the Future year scenarios traffic volumes.

The Triangle Model was developed in TransCAD (version 5 Build 1880) and was calibrated based on a base year of 2010, and has models for an intermediate year of 2015 and a future year of 2040. Due to the effect on traffic volumes along the US 64 corridor from the construction of NC 540 it was determined that utilizing 2015 model volumes would be the most appropriate method for determining growth and diversion rates for the 2040 volumes.

Table C5 can be found in Appendix C and displays the model performance for the 2010 model against 2009 NCDOT AADTs, the 2015 model volumes, the 2040 model volumes and an extrapolated volume for 2016 based on the 2015 and 2040 model output. A discussion of the model performance for the project study area corridors is included as follows:

- US 64 Corridor – the 2010 model volumes for the corridor were higher than the corresponding AADT by 7,000 vehicles per day on the west end of the project and by 20,000 vehicles per day on the east end of the project. The 2016 interpolated model volumes were also higher than the AADT, with volume discrepancies of 3,000 to 15,000 vehicles per day.
- Laura Duncan Road (SR 1308) – the 2010 model volumes are higher than the corresponding AADT (by 3,000 to 8,000 vehicles per day). The 2016 interpolated model volumes were also higher than the AADT (by about 5,000 vehicles per day).
- US 1 Corridor – the 2010 model volumes for the corridor were higher than the corresponding AADT by about 4,000 vehicles per day on the south end of the project and lower than the corresponding AADT count by about 2,000 vehicles per day on the north end. The 2016 interpolated model volumes were higher than the corresponding AADT by about 11,000 vehicles per day on the south end of the project and by about 4,000 vehicles per day on the north end.

5. FUTURE YEAR 2040 NO-BUILD TRAFFIC FORECAST

5.1 ASSUMPTIONS

A Future Year of 2040 was chosen for the U-5301 traffic volume examination as it is the latest year available in the Triangle Regional Travel Demand Model and to correspond with the horizon year of the MTP. All 2040 fiscally-constrained projects, with the exception of U-5301, listed in the *Capital Area Metropolitan Planning Organization 2040 Metropolitan Transportation Plan* (2040 MTP) were included in the 2040 No-Build alternative model run.

The modeling aspects for the 2040 No-Build scenario include utilizing the Triangle Regional 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, the revisions detailed in Appendix D were made to the 2040 future year model. The model revisions were discussed and agreed upon with Brian Wert (NCDOT State Traffic Forecast Engineer) on October 31, 2016.

5.2 METHODOLOGY

The Triangle Regional 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/2015 Model Value) ^1/25) -1

Additionally, the raw model volumes were compared to determine the total change in model volume between 2015 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 2016 No-Build traffic volumes and extrapolated to determine the 2040 traffic volumes.

5.3 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 2016 Base Year factors were still adequate and that none of the design factors would change from those included in the 2016 Base Year forecast.

5.4 TRAFFIC FORECAST VOLUMES

Based on the methodology described in Section 5.2, 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 2040 model volumes and CAGR along US 64 was reviewed. The CAGR along US 64 was shown to range from 0.45% to 0.94% between 2015 and 2040. The 2015 model output over predicted the volume along US 64 by roughly 10,000 vehicles per day; therefore, the calculation of future growth rates are slightly suppressed due to the higher initial volume. Coordination with local planners (included in Appendix B) found that the development pattern assumed when the socioeconomic data was developed in 2010 has changed. The

socioeconomic data assumed a majority of the growth would be south of Apex (Veridea) whereas the current pattern expected is to have higher intensity development along US 64, especially west of NC 540. Additionally, the socioeconomic data appears to underrepresent the planned Chatham Park development near Pittsboro (planned build out of nearly 28,000 dwelling units and 23 million square feet of office/commercial with no defined horizon year). This data supports the use of a higher growth rate; however, the existing congested traffic operations and increasing travel times along the corridor results in limitations to the amount of growth that can occur and be accommodated on the existing highway network. Therefore, the chosen growth rate considered the model growth rate, planner input and the limitations of the existing transportation network and concluded that a CAGR of roughly 1.4% was the most reasonable rate for the corridor

- The model CAGR for Y-lines along the corridor generally ranged from 0.5% to 1.0% due the fact that a majority of the adjacent land along the corridor is already well developed. The model CAGR for Laura Duncan Road (0.9% to 1.9%) is largely due to the additional commercial and high density mixed use developments planned on the north side of US 64. Likewise, the model CAGR for Lake Pine Drive (0.9% south of US 64 and 2.5% north of US 64) reflect the growth from this additional high intensity development combined with the effect of the widening from two to four-lanes. The selected growth rates for the Y-lines in the forecast are generally slightly higher than the model rates due to a review of the socioeconomic data and input from local planners.

- The model CAGR for US 1 ranged from 1.2% to 1.9% with the selected growth rates largely matching the model growth rates.

6. FUTURE YEAR 2040 BUILD TRAFFIC FORECAST

6.1 ASSUMPTIONS

The 2040 Build traffic forecast contains all of the assumptions found in the 2040 No-Build traffic volume network discussed in Section 5.1. The U-5301 project for Alternative 1 was coded into the model by modifying the model to include interchanges at Laura Duncan Road and Lake Pine Drive and a six-lane superstreet from east of Lake Pine Drive to US 1. Alternative 2 was coded into the model with a six-lane expressway typical section.

6.2 METHODOLOGY

The Triangle Regional Travel Demand Model and engineering judgment were heavily relied upon in the calculation of the 2040 Future Year Build traffic volumes. For Alternative 1, the segment of the project from east of Lake Pine Drive to US 1 includes a superstreet configuration. The superstreet configuration was represented in the TRM by increasing the capacity of the links by 15 percent to account for the improved operations, due to better progression and fewer signal phases, that occur when a superstreet is implemented. For Alternative 2, the model was modified to include a six-lane expressway for the length of the proposed project. Details on the changes made to the TRM are included in Appendix D.

Once the travel demand model was run to include U-5301, 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. These diversion percentages were reviewed and an appropriate diversion rate was selected and then applied to the 2040 No-Build traffic volumes in order to develop 2040 Build 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. 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 5.3.

6.4 TRAFFIC FORECAST VOLUMES

Based on the methodology described in Section 6.2, traffic volumes for the 2040 Future Year Build Forecast Scenario were calculated for both alternatives. Table C7 in Appendix C show the comparisons of model output, diversion percentages, the resulting 2015-2040 CAGR 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 for Alternative 1 show diversion rates from 11% to 23% due to the increase in capacity from the inclusion of interchanges at Laura Duncan Road and Lake Pine Drive as well as the six-lane superstreet from east of Lake Pine Drive to US 1. The selected diversion rates were very similar to the model diversion rates and resulted in a CAGR of 1.7% to 2.3% between 2015 and 2040, which is approximately one-half percent higher than the rate for the no-build scenario.

- The 2040 Build volumes for Alternative 1 were very similar or identical to the no-build volumes for many of the y-lines in the forecast as there are very limited options for local traffic along the corridor. The forecast

included a slight increase in traffic on Laura Duncan Road. The volume on US 1 changed slightly, with the section to the south of US 1 dropping slightly due to the increased through traffic on US 64.

- The 2040 Build volumes for Alternative 2 show diversion rates that are slightly higher than those for Alternative 1 as a result of the conversion of the facility to an expressway. The conversion to expressway was shown to have diversion rates ranging from 14% to 28% with the selected diversion rates being 19% to 30%. The primary reason for the slightly higher rate selected was that the TRM has high capacities (nearly 1500 vehicles per hour per lane) for standard arterials; therefore, it was decided that the conversion to expressway would likely result in slightly more diversion that was shown in the model. The selected diversion rates resulted in a CAGR of 2.0% to 2.5% between 2015 and 2040, which is approximately 0.7% higher than the rate for the no-build scenario.

- As was the case for Alternative 1, the 2040 Build volumes for Alternative 2 were very similar or identical to the no-build volumes for many of the y-lines in the forecast as there are very limited options for local traffic along the corridor. The forecast included the same slight increase in traffic on Laura Duncan Road. The volume on US 1 changed slightly, with the section to the south of US 1 dropping slightly due to the increased through traffic on US 64.

APPENDIX A:

HISTORIC AADT COUNT DATA

Table A1: NCDOT Historic AADT

Location	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005
US 64 - Windy Rd to Laura Duncan Rd (SR 1308)	37,000				33,000		31,000		35,000		30,000
US 64 - Lake Pine Dr (SR 1521) to Autopark Blvd	39,000		38,000		36,000		34,000		37,000		32,000
US 64 - Edinburgh Dr to US 1	48,000		53,000		46,000		42,000		47,000		42,000
US 64 - US 1 to Regency Pkwy	*22,000*		35,000		*21,000*		34,000		36,000		33,000
Laura Duncan Rd (SR 1308) - north of US 64	11,000		7,500		6,900		5,600		6,300		6,500
Laura Duncan Rd (SR 1308) - south of US 64	8,400		8,500		8,100		7,300		9,300		8,700
Old Raleigh Rd (SR 1435) - south of Shepherds Vineyard Dr	11,000		11,000		9,600						11,000
US 1/US 64 - north of US 64	98,000		93,000		99,000	*85,000*	94,000		85,000		
US 1 - south of US 64	63,000		57,000		60,000	*37,000*	59,000		37,000		48,000

Location	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995
US 64 - Windy Rd to Laura Duncan Rd (SR 1308)		31,000		30,000			17,000		14,000	
US 64 - Lake Pine Dr (SR 1521) to Autopark Blvd		37,000		35,000			29,000		20,000	
US 64 - Edinburgh Dr to US 1		45,000		48,000			38,000		30,000	
US 64 - US 1 to Regency Pkwy		33,000		34,000			26,000		21,000	
Laura Duncan Rd (SR 1308) - north of US 64										
Laura Duncan Rd (SR 1308) - south of US 64		9,300								
Old Raleigh Rd (SR 1435) - south of Shepherds Vineyard Dr		11,000								
US 1/US 64 - north of US 64		70,000		76,000	66,000		56,000		49,000	
US 1 - south of US 64		44,000								

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:

LOCAL REPRESENTATIVE QUESTIONNAIRES

Response From: Capital Area MPO – Chris Lukasina, Executive Director; and Alex Rickard, Deputy Director

Patriot Transportation Engineering is currently in the process of developing a traffic forecast for NCDOT STIP Project No. U-5301, which includes upgrading US 64 to a six-lane superstreet from Us 1 to Lake Pine Drive and constructing interchanges as Lake Pine Drive and Laura Duncan Road. The forecast includes base year (2016) and design year (2040) forecasts. The forecast study area is shown in the following figure:

We have reviewed the CAMPO 2040 Metropolitan Transportation Plan (adopted April 2013, amended October 2015) 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: peter@pt-engineering.net.

If you would rather discuss the questions over the phone, I will be following up with a phone call later 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 have varied over the past 20 years. Volumes along US 64 have grown relatively steadily over the past two decades and match the development trend along the corridor. Over the past 20 years the volumes along US 64 within the forecast study area grew at an average rate that ranged from 1.8 to 4.0 percent per year with the higher percentage increases at the western edge of the study area. Over the past 10 years the growth rate has been somewhat tempered by the economic downturn, but has grown steadily along the corridor at a 1.6 percent per year rate
   a. Do you agree with this statement?
   ☒ Yes
   ☐ No

   Comments: ADT trends along with accounting for new and committed development may be a good source to base forecasts for this corridor on at the project level.

   b. What growth patterns have you noticed?
   Commercial development appears to be on the rise throughout the corridor. Mixed use, primarily residential on the western reaches of the corridor and beyond.

Response From: Capital Area MPO – Chris Lukasina, Executive Director; and Alex Rickard, Deputy Director

c. What do think the growth rate per year will be over the next 20 years?
☐ Lower than the 1.6% per year trend from the past decade
☒ Similar to the 1.6% per year trend from the past decade
☒ Between 2% and 3% per year, similar to the rate over the past 20 years
☐ Greater than 3.5%, similar to the 20-year trend for the western portions of US 64
☐ Other, explain below

Comments: Depending on which way development leans, more mixed use or more commercial we could see higher or lower rates but the historic trend identified would be a minimum.

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

2) Aside from school being in session, are there any noticeable seasonal differences in traffic on this facility? This is probably one of the more balanced corridors in terms of directional flow.

3) According to the North Carolina Office of State Budget and Management (OSBM) the current population of Wake County is approximately 1,025,400 and is projected to grow by 1.7% per year to around 1,406,700 in 2035. The population projections for Wake County that are contained within the MTP are slightly different, showing a projected population of 1,990,000 in the year 2040 (approximately a 2.1% per year growth rate from the base year population). In the recent State of the Town address, Mayor Harold Weinbrecht noted the Town of Cary was growing at less than 3% per year while the October 2016 Apex Development Report projects an average growth rate of 4.1%
   a. Which of the following best describes your opinion of the growth rate for the traffic forecast study area:
   ☐ I think the growth rate will be less than the 1.7% per year estimate by the NC OSBM
   ☒ I think the growth rate will be similar to the 1.7% per year estimate by the NC OSBM
   ☐ I think the growth rate will be similar to the 2.1% per year estimate in in the MTP
   ☐ I think the growth rate will be similar to the approximately 3% per year rate in Cary
   ☐ I think the growth rate will be similar to the 4.1% per year rate for Apex
   ☐ I think the growth rate will be higher than the 4.1% per year rate

   Comments: The main difference you are seeing between the MTP and the OSBM is based on when you looked at the OSBM projection. If you looked at OSBM projections that were done at the time of the MTP they would match exactly for Wake County. This is due to the MTP using the OSBM as the source for the future year projection at the county level. In other words there is no real difference, just when you looked at the data.

   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 Metropolitan Transportation Plan (MTP) includes the following projects in the vicinity of the forecast that have the potential to affect the traffic volumes in the traffic forecast study area:
   i. Lake Pine Road Widening – MTP Project A410 – Widen from 2 to 4 lanes from Apex Peakway to Cary Parkway
   ii. US 1 Widening – MTP Project F110 – Widen from 4 lanes to 6 lanes from US 64 to NC 540

Response From: Capital Area MPO – Chris Lukasina, Executive Director; and Alex Rickard, Deputy Director

iii. NC 540 Tri-ex – MTP Project F5 – New Location Freeway NC 55 Bypass to US 401 (South)
iv. Ten-Ten Road Widening – MTP Project A166 – Widen from 2 to 4 lanes from US 1 to Apex Peakway
v. Davis Dr Widening – MTP Project A28b – Widen from 2 to 4 lanes from US 64 to Farm Pond Rd

a. How do you think each of these projects will affect traffic volumes in the study area? Based on past projections all of these projects are needed.

b. How do you think the completion of NC 540 all the way around Raleigh will affect volumes on US 64? Do you think it will increase or decrease traffic along US 64 within the traffic forecast study area? It may increase traffic on the western end. Overall we do not anticipate a major shift in traffic from US 64 to NC 540.

c. 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? This TIP project includes two interchanges (Lake Pine and Laura Duncan). These will probably impact volumes to some degree (increase).

5) A traffic forecast was prepared for this area in 2008 for the US 64 Corridor Study, are you aware of any other previous traffic forecasts that were performed in or near the study area?
Only TIAs since 2010.

6) We are currently aware of the following developments within the study area:

i. Apex High School Reconstruction – Reconstruction of High School to accommodate roughly the same number of students
ii. Townes at North Salem Development (between US 64 and Salem Street) – 196 unit development – No direct access to US 64
iii. Nichols Plaza – 4 parcels with commercial development
iv. Meridian at Nichols Plaza – 270 unit development along Pine Plaza Drive
v. Several rezoning cases at the US 64/Davis Drive/Salem Street interchange
vi. Villages of Apex South – 225 unit development with 5+ acres of mixed use development located in vicinity of Laura Duncan Road/Apex Peakway intersection
vii. Regency Creek and Regency Woods II Office Buildings – total of approximately 400,000 sf of office space located south of Tryon Road/Regency Parkway intersection

a. Do you know of any other <u>substantial</u> ongoing or planned developments in the vicinity of the traffic forecast area that may affect our traffic forecast?

7) The Town of Cary Land Use Plan includes the area south of US 64 as predominantly Commercial and Office/Industrial while north of US 64 is shown as low density residential. The Town of Apex Land Use Plan includes the area north of US 64 between Lake Pine Drive and Laura Duncan Road as Commercial (with a neighborhood retail focus) and the area south of US 64 as Medium Density Residential.

a. Do you think this development pattern is likely based on your experience in the area?

i. Not sure Costco would qualify as neighborhood retail focus.

Response From: Capital Area MPO – Chris Lukasina, Executive Director; and Alex Rickard, Deputy Director

b. Do you think there will be any substantial redevelopment to higher densities along the corridor? Costco has already come in. Similar bigger box retail may be allowed for the area.

c. Do you think there will be any substantial commercials or mixed use nodes along US 64 that have not been identified in the current plans?

8) The traffic forecast will utilize the Triangle Regional Model as tool to evaluate growth in the area. The currently approved version of the model includes Socioeconomic Data developed in advance of the 2040 MTP that was approved in 2013. Several individuals have expressed that the model may under represent the growth along US 64 as the future year data was developed during the economic downturn and that the focus of development in Apex was focused more on the Veridea development at that time, while the current trend is toward more development closer to the core area of Apex.
   a. Do you agree with these concerns?
   ☒ Yes
   ☐ No

   Comments:

   b. Do you think the growth along US 64 will be higher or lower than may have been anticipated when the socioeconomic data was developed?
   Based on actual development since 2012, it appears to be higher.

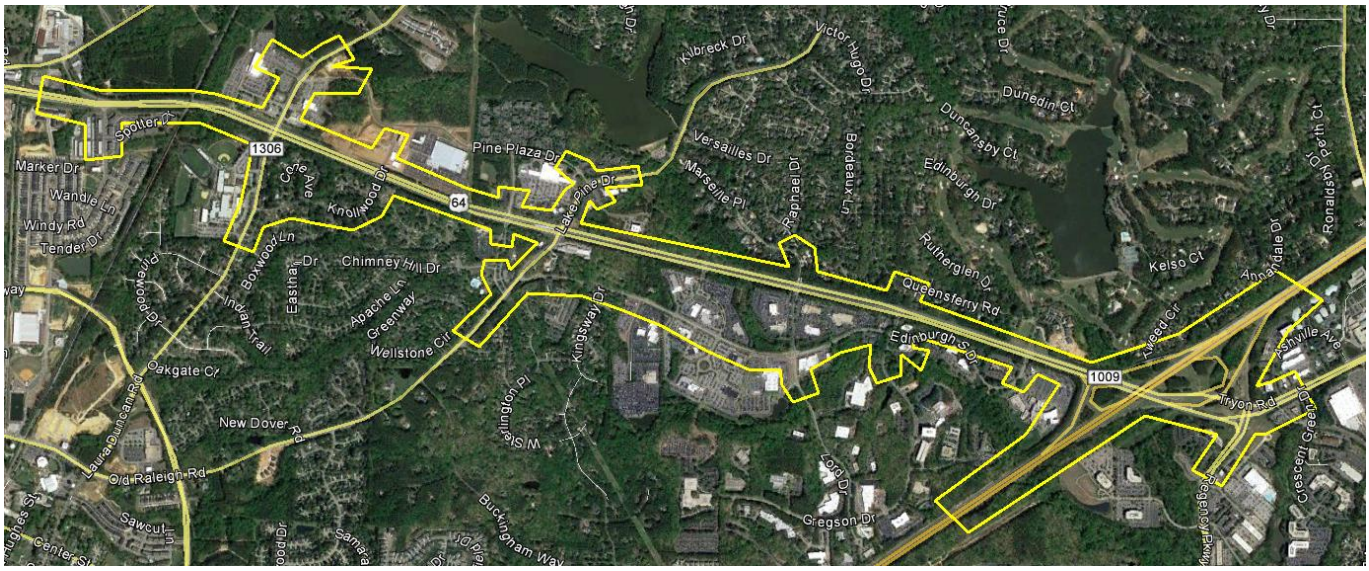
9) Do you have any additional comments that would be helpful in our development of the traffic forecast?

10) This questionnaire is being sent to the following individuals:
   i. Chris Lukasina, Capital Area MPO – Executive Director (Chris.Lukasina@campo-nc.us)
   ii. Alex Rickard, Capital Area MPO – Deputy Director (Alex.Rickard@campo-nc.us)
   iii. Tim Gardiner, Wake County – Transportation Planner (tim.gardiner@wakegov.com)
   iv. Juliet Andes, Town of Cary – Facilities Planning Manager (Juliet.andes@townofcary.org)
   v. Tyler Bray, Town of Cary – Transportation Planning Engineer (tyler.bray@townofcary.org)
   vi. Russell Dalton, Town of Apex – Transportation Engineer (Russell.Dalton@apexnc.org)
   vii. Shannon Cox, Town of Apex – Senior Transportation Planner (Shannon.Cox@apexnc.org)
   viii. David Keilson, NCDOT Division 5 – Division Planning Engineer (dpkeilson@ncdot.gov)
   ix. Al Grandy, NCDOT Division 5 – Division Traffic Engineer (agrandy@ncdot.gov)
   x. Reid Elmore, NCDOT Division 5 – District 1 Engineer (trelmore@ncdot.gov)
   xi. Rupal Desai, NCDOT TPB (rpdesai@ncdot.gov)
   xii. Scott Walston, NCDOT TPB (swalston@ncdot.gov)

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

Response From: Town of Apex - Shannon Cox, Senior Transportation Planner; Russell Dalton, Transportation Engineer; and Brendie Vega, Principal Planner

Patriot Transportation Engineering is currently in the process of developing a traffic forecast for NCDOT STIP Project No. U-5301, which includes upgrading US 64 to a six-lane superstreet from US 1 to Lake Pine Drive and constructing interchanges as Lake Pine Drive and Laura Duncan Road. The forecast includes base year (2016) and design year (2040) forecasts. The forecast study area is shown in the following figure:



We have reviewed the CAMPO 2040 Metropolitan Transportation Plan (adopted April 2013, amended October 2015) 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: peter@pt-engineering.net.

If you would rather discuss the questions over the phone, I will be following up with a phone call later 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 have varied over the past 20 years. Volumes along US 64 have grown relatively steadily over the past two decades and match the development trend along the corridor. Over the past 20 years the volumes along US 64 within the forecast study area grew at an average rate that ranged from 1.8 to 4.0 percent per year with the higher percentage increases at the western edge of the study area. Over the past 10 years the growth rate has been somewhat tempered by the economic downturn, but has grown steadily along the corridor at a 1.6 percent per year rate
    a. Do you agree with this statement?
    ☐ Yes
    ☒ No

    Comments:

    b. What growth patterns have you noticed?

    Traffic volumes are likely to continue to steadily increase along the US 64 corridor with most large-scale development occurring west of NC 540 and the majority of trips

Response From: Town of Apex - Shannon Cox, Senior Transportation Planner; Russell Dalton, Transportation Engineer; and Brendie Vega, Principal Planner

associated with new development anticipated to travel east on US 64. Recent Traffic Impact Analyses have used traffic growth rates between 2 - 3 percent per year. The 1.6 percent per year rate is likely too low.

c. What do think the growth rate per year will be over the next 20 years?

☐ Lower than the 1.6% per year trend from the past decade
☐ Similar to the 1.6% per year trend from the past decade
☒ Between 2% and 3% per year, similar to the rate over the past 20 years
☐ Greater than 3.5%, similar to the 20-year trend for the western portions of US 64
☐ Other, explain below

Comments:

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

While there is substantial growth along the US 64 corridor west of NC 540, an overall traffic growth rate of close to 3 percent for the corridor is likely appropriate for this analysis and is consistent with recent traffic impact analyses for development projects in the vicinity of the corridor.

2) Aside from school being in session, are there any noticeable seasonal differences in traffic on this facility?

No

3) According to the North Carolina Office of State Budget and Management (OSBM) the current population of Wake County is approximately 1,025,400 and is projected to grow by 1.7% per year to around 1,406,700 in 2035. The population projections for Wake County that are contained within the MTP are slightly different, showing a projected population of 1,990,000 in the year 2040 (approximately a 2.1% per year growth rate from the base year population). In the recent State of the Town address, Mayor Harold Weinbrecht noted the Town of Cary was growing at less than 3% per year while the October 2016 Apex Development Report projects an average growth rate of 4.1%

a. Which of the following best describes your opinion of the growth rate for the traffic forecast study area:

☐ I think the growth rate will be less than the 1.7% per year estimate by the NC OSBM
☐ I think the growth rate will be similar to the 1.7% per year estimate by the NC OSBM
☐ I think the growth rate will be similar to the 2.1% per year estimate in in the MTP
☐ I think the growth rate will be similar to the approximately 3% per year rate in Cary
☒ I think the growth rate will be similar to the 4.1% per year rate for Apex
☐ I think the growth rate will be higher than the 4.1% per year rate

Comments:

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

The *2035 Land Use Plan Update - Economic Study and Market Analysis* prepared for the Town in May 2016 provided demographic information for the Apex Planning Area. The focus of this study was not the US 64 corridor, but demographic data provided for the planning area may

Response From: Town of Apex - Shannon Cox, Senior Transportation Planner; Russell Dalton, Transportation Engineer; and Brendie Vega, Principal Planner

be useful. The study is available at this link: http://www.apexnc.org/1012/2035-Land-Use-Plan-Update. The growth rate described for the Apex Planning Area was 4.6%.

4) The Metropolitan Transportation Plan (MTP) includes the following projects in the vicinity of the forecast that have the potential to affect the traffic volumes in the traffic forecast study area:
   i. Lake Pine Drive/Old Raleigh Road Widening – MTP Project A410 – Widen from 2 to 4 lanes from Apex Peakway to Cary Parkway
   ii. US 1 Widening – MTP Project F110 – Widen from 4 lanes to 6 lanes from US 64 to NC 540
   iii. NC 540 Tri-ex – MTP Project F5 – New Location Freeway NC 55 Bypass to US 401 (South)
   iv. Ten-Ten Road Widening – MTP Project A166 – Widen from 2 to 4 lanes from US 1 to Apex Peakway
   v. Davis Dr Widening – MTP Project A28b – Widen from 2 to 4 lanes from US 64 to Farm Pond Rd

   a. How do you think each of these projects will affect traffic volumes in the study area?

      The 2040 MTP projected and mapped traffic volumes and volume to capacity ratios for both existing conditions and committed transportation improvements in the 2040 plan. Overall, the study area is anticipated to experience similar traffic volumes with or without the projects identified. Traffic volumes are expected to increase on NC 55, NC 540, and the Apex Peakway with the projects identified.

      The identified projects are expected to improve the V/C ratios overall throughout the study area. In particular, the projected V/C ratios for US 64, NC 540, US 1, and NC 55 are improved with the committed projects. V/C ratios on major thoroughfares carrying traffic to US 64 are high with or without the committed projects.

   b. How do you think the completion of NC 540 all the way around Raleigh will affect volumes on US 64? Do you think it will increase or decrease traffic along US 64 within the traffic forecast study area?

      The completion of NC 540 would likely have the greatest impact on traffic volumes near the US 1/US 64 interchange. Some traffic originating in southeast Wake County and accessing I-40 via the US 1/US 64 interchange may be diverted to NC 540.

   c. 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?

      West of the traffic forecast study area: The Jenks Road/US 64 intersection will be upgraded to a super street as part of the Sweetwater development. The Sweetwater and Smith Farm developments will complete sections of Richardson Road. Peak 502 at Beaver Creek includes improvements along Kelly Road in the vicinity of US 64.

      South of the traffic forecast study area: The NC 55 widening project (TIP U-2901), the Apex Peakway Southwest Connector (U-5928), and Apex Peakway Southeast Connector may impact traffic volumes.

      Information about Town transportation projects is available at this link: http://www.apexnc.org/371/Transportation-Projects.

Response From: Town of Apex - Shannon Cox, Senior Transportation Planner; Russell Dalton, Transportation Engineer; and Brendie Vega, Principal Planner

5) A traffic forecast was prepared for this area in 2008 for the US 64 Corridor Study, are you aware of any other previous traffic forecasts that were performed in or near the study area?

Numerous traffic impact analyses have been conducted around the US 64 Corridor Study Area as part of development projects. These can be provided if needed and include all of the development projects listed below.

The last comprehensive update of the Town of Apex Transportation Plan was conducted in 2011 and is available at this link: http://www.apexnc.org/219/Transportation-Plan. The plan used traffic projections from the Triangle Regional Model.

6) We are currently aware of the following developments within the study area:

i. Apex High School Reconstruction – Reconstruction of High School to accommodate roughly the same number of students
ii. Townes at North Salem Development (between US 64 and Salem Street) – 196 unit development – No direct access to US 64
iii. Nichols Plaza – 4 parcels with commercial development
iv. Meridian at Nichols Plaza – 270 unit development along Pine Plaza Drive
v. Several rezoning cases at the US 64/Davis Drive/Salem Street interchange
vi. Villages of Apex South – 225 unit development with 5+ acres of mixed use development located in vicinity of Laura Duncan Road/Apex Peakway intersection
vii. Regency Creek and Regency Woods II Office Buildings – total of approximately 400,000 sf of office space located south of Tryon Road/Regency Parkway intersection

a. Do you know of any other substantial ongoing or planned developments in the vicinity of the traffic forecast area that may affect our traffic forecast?

The most current source of information for new developments that may affect the traffic forecast is the online Town of Apex Development map (http://apexnc.maps.arcgis.com/apps/OnePane/basicviewer/index.html?appid=fa9ba2017b784030b15ef4da27d9e795).

In addition to the projects identified above, there are several substantial developments west of the traffic forecast area that are likely to affect the traffic forecast, including: Sweetwater, Smith Farm, Westford PUD, the Preserve at White Oak Creek, and Deer Creek. Peak Charter Academy is also planned to open in fall 2017, located on Blackburn Road at US 64. Information for each of these projects is available through the referenced map.

7) The Town of Cary Land Use Plan includes the area south of US 64 as predominantly Commercial and Office/Industrial while north of US 64 is shown as low density residential. The Town of Apex Land Use Plan includes the area north of US 64 between Lake Pine Drive and Laura Duncan Road as Commercial (with a neighborhood retail focus) and the area south of US 64 as Medium Density Residential.

a. Do you think this development pattern is likely based on your experience in the area?

The area to the north of US 64 along the new Pine Plaza Drive will have high-density residential added with the approval of the Meridian at Nichols Plaza Apartments. Along

Response From: Town of Apex - Shannon Cox, Senior Transportation Planner; Russell Dalton, Transportation Engineer; and Brendie Vega, Principal Planner

Laura Duncan just north of Pine Plaza Drive, we will be seeing a new Senior Assisted Living facility. The higher densities may bring about more redevelopment of the large-lot single-family homes to smaller residential lots or townhomes. To the south, there should be little change with the possible exception of the SE corner of Lake Pine and US 64.

b. Do you think there will be any substantial redevelopment to higher densities along the corridor?

Not significantly higher densities. There is the possibility that some of the larger residential lots north and south of the corridor could re-develop as higher density residential, but it would not be a substantial amount of re-development or a significant increase in density.

c. Do you think there will be any substantial commercials or mixed use nodes along US 64 that have not been identified in the current plans?

It is possible that the SE corner of Lake Pine and US 64 could re-develop with the current underutilized industrial parcel and the large lot residential surrounding it. In order for this to occur, someone would have to be able to tie up all of the properties between US 64, Lake Pine, and Old Raleigh Road.

8) The traffic forecast will utilize the Triangle Regional Model as tool to evaluate growth in the area. The currently approved version of the model includes Socioeconomic Data developed in advance of the 2040 MTP that was approved in 2013. Several individuals have expressed that the model may under represent the growth along US 64 as the future year data was developed during the economic downturn and that the focus of development in Apex was focused more on the Veridea development at that time, while the current trend is toward more development closer to the core area of Apex.

a. Do you agree with these concerns?

☒ Yes

☐ No

Comments:

In addition to development closer to the core area of Apex, there has been extensive development west of NC 540 both north and south of the US 64 corridor.

b. Do you think the growth along US 64 will be higher or lower than may have been anticipated when the socioeconomic data was developed?

The Preferred Growth Scenario for the Triangle Regional Model projected most growth in the area between US 1, NC 55 and NC 540 and north of US 1/west of NC 55. The model likely underestimated the growth along US 64, especially west of NC 540.

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

Response From: Town of Apex - Shannon Cox, Senior Transportation Planner; Russell Dalton, Transportation Engineer; and Brendie Vega, Principal Planner

10) This questionnaire is being sent to the following individuals:
    i. Chris Lukasina, Capital Area MPO – Executive Director (Chris.Lukasina@campo-nc.us)
    ii. Alex Rickard, Capital Area MPO – Deputy Director (Alex.Rickard@campo-nc.us)
    iii. Tim Gardiner, Wake County – Transportation Planner (tim.gardiner@wakegov.com)
    iv. Juliet Andes, Town of Cary – Facilities Planning Manager (Juliet.andes@townofcary.org)
    v. Tyler Bray, Town of Cary – Transportation Planning Engineer (tyler.bray@townofcary.org)
    vi. Russell Dalton, Town of Apex – Transportation Engineer (Russell.Dalton@apexnc.org)
    vii. Shannon Cox, Town of Apex – Senior Transportation Planner (Shannon.Cox@apexnc.org)
    viii. David Keilson, NCDOT Division 5 – Division Planning Engineer (dpkeilson@ncdot.gov)
    ix. Al Grandy, NCDOT Division 5 – Division Traffic Engineer (agrandy@ncdot.gov)
    x. Reid Elmore, NCDOT Division 5 – District 1 Engineer (trelmore@ncdot.gov)
    xi. Rupal Desai, NCDOT TPB (rpdesai@ncdot.gov)
    xii. Scott Walston, NCDOT TPB (swalston@ncdot.gov)

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

        This response includes input from Russell Dalton, Transportation Engineer, Town of Apex and Brendie Vega, Principal Planner, Town of Apex.

Response From: Town of Cary -Juliet Andes, Facilities Planning Manager; Tyler Bray, Transportation Planning Engineer; and Will Hartye, Planner II

Patriot Transportation Engineering is currently in the process of developing a traffic forecast for NCDOT STIP Project No. U-5301, which includes upgrading US 64 to a six-lane superstreet from Us 1 to Lake Pine Drive and constructing interchanges as Lake Pine Drive and Laura Duncan Road. The forecast includes base year (2016) and design year (2040) forecasts. The forecast study area is shown in the following figure:

We have reviewed the CAMPO 2040 Metropolitan Transportation Plan (adopted April 2013, amended October 2015) 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: peter@pt-engineering.net.

If you would rather discuss the questions over the phone, I will be following up with a phone call later 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 have varied over the past 20 years. Volumes along US 64 have grown relatively steadily over the past two decades and match the development trend along the corridor. Over the past 20 years the volumes along US 64 within the forecast study area grew at an average rate that ranged from 1.8 to 4.0 percent per year with the higher percentage increases at the western edge of the study area. Over the past 10 years the growth rate has been somewhat tempered by the economic downturn, but has grown steadily along the corridor at a 1.6 percent per year rate
    a. Do you agree with this statement?
    ☒ Yes
    ☐ No

    Comments:

    b. What growth patterns have you noticed?
    Primarily commercial infill with a lesser amount of residential infill as well. Note: I am only referring to the portion of growth generated by land use changes within the Town of Cary portion.

Response From: Town of Cary -Juliet Andes, Facilities Planning Manager; Tyler Bray, Transportation Planning Engineer; and Will Hartye, Planner II

c. What do think the growth rate per year will be over the next 20 years?
☐ Lower than the 1.6% per year trend from the past decade
☒ Similar to the 1.6% per year trend from the past decade
☐ Between 2% and 3% per year, similar to the rate over the past 20 years
☐ Greater than 3.5%, similar to the 20-year trend for the western portions of US 64
☐ Other, explain below

Comments: As mentioned above, I don't see a lot of traffic being generated by land use changes within the Town of Cary. However, I do anticipate increased traffic through the corridor, particularly from the west and south due to increased growth in those directions (Apex, Holly Springs, Fuquay-Varina).

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

2) Aside from school being in session, are there any noticeable seasonal differences in traffic on this facility? There is some spring/summer bicycle traffic on US64 heading to/from Lake Jordan.

3) According to the North Carolina Office of State Budget and Management (OSBM) the current population of Wake County is approximately 1,025,400 and is projected to grow by 1.7% per year to around 1,406,700 in 2035. The population projections for Wake County that are contained within the MTP are slightly different, showing a projected population of 1,990,000 in the year 2040 (approximately a 2.1% per year growth rate from the base year population). In the recent State of the Town address, Mayor Harold Weinbrecht noted the Town of Cary was growing at less than 3% per year while the October 2016 Apex Development Report projects an average growth rate of 4.1%

a. Which of the following best describes your opinion of the growth rate for the traffic forecast study area:
☐ I think the growth rate will be less than the 1.7% per year estimate by the NC OSBM
☐ I think the growth rate will be similar to the 1.7% per year estimate by the NC OSBM
☒ I think the growth rate will be similar to the 2.1% per year estimate in in the MTP
☐ I think the growth rate will be similar to the approximately 3% per year rate in Cary
☐ I think the growth rate will be similar to the 4.1% per year rate for Apex
☐ I think the growth rate will be higher than the 4.1% per year rate

Comments:

b. Do you know of any other population projections for this area that may be helpful as we review the growth in the area? No

4) The Metropolitan Transportation Plan (MTP) includes the following projects in the vicinity of the forecast that have the potential to affect the traffic volumes in the traffic forecast study area:

i. Lake Pine Road Widening – MTP Project A410 – Widen from 2 to 4 lanes from Apex Peakway to Cary Parkway
ii. US 1 Widening – MTP Project F110 – Widen from 4 lanes to 6 lanes from US 64 to NC 540
iii. NC 540 Tri-ex – MTP Project F5 – New Location Freeway NC 55 Bypass to US 401 (South)
iv. Ten-Ten Road Widening – MTP Project A166 – Widen from 2 to 4 lanes from US 1 to Apex Peakway

Response From: Town of Cary -Juliet Andes, Facilities Planning Manager; Tyler Bray, Transportation Planning Engineer; and Will Hartye, Planner II

v. Davis Dr Widening – MTP Project A28b – Widen from 2 to 4 lanes from US 64 to Farm Pond Rd

a. How do you think each of these projects will affect traffic volumes in the study area? I believe that the effects are negligible.

b. How do you think the completion of NC 540 all the way around Raleigh will affect volumes on US 64? Do you think it will increase or decrease traffic along US 64 within the traffic forecast study area? I believe that the effects are negligible.

c. 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.

5) A traffic forecast was prepared for this area in 2008 for the US 64 Corridor Study, are you aware of any other previous traffic forecasts that were performed in or near the study area? No.

6) We are currently aware of the following developments within the study area:

i. Apex High School Reconstruction – Reconstruction of High School to accommodate roughly the same number of students
ii. Townes at North Salem Development (between US 64 and Salem Street) – 196 unit development – No direct access to US 64
iii. Nichols Plaza – 4 parcels with commercial development
iv. Meridian at Nichols Plaza – 270 unit development along Pine Plaza Drive
v. Several rezoning cases at the US 64/Davis Drive/Salem Street interchange
vi. Villages of Apex South – 225 unit development with 5+ acres of mixed use development located in vicinity of Laura Duncan Road/Apex Peakway intersection
vii. Regency Creek and Regency Woods II Office Buildings – total of approximately 400,000 sf of office space located south of Tryon Road/Regency Parkway intersection

a. Do you know of any other substantial ongoing or planned developments in the vicinity of the traffic forecast area that may affect our traffic forecast?

I'm not sure if your Regency total includes a 110K square foot office building at 600 Regency Forest Drive that is coming in for a pre-application meeting next week (Regency Forest, Phase 4).

At the same pre-application meeting there is a proposal to convert 301 Gregson Drive from office to a 350 student school. There could be more conversions in this office park as it is still pretty spread out compared to modern office development density.

There are steady rumblings each year that the MacGregor Village and possibly the auto dealers may flip to more intensive use at some point in the future, but so far that's as far as it's gone. Our soon-to-be adopted updated Comprehensive Plan (Imagine Cary), allows for more infill and redevelopment than previous plans but there are no specific small-area plans for this part of Cary.

7) The Town of Cary Land Use Plan includes the area south of US 64 as predominantly Commercial and Office/Industrial while north of US 64 is shown as low density residential. The Town of Apex

Response From: Town of Cary -Juliet Andes, Facilities Planning Manager; Tyler Bray, Transportation Planning Engineer; and Will Hartye, Planner II

Land Use Plan includes the area north of US 64 between Lake Pine Drive and Laura Duncan Road as Commercial (with a neighborhood retail focus) and the area south of US 64 as Medium Density Residential.

a. Do you think this development pattern is likely based on your experience in the area? Yes

b. Do you think there will be any substantial redevelopment to higher densities along the corridor? The likelihood increasing over time as historically rising property values encourage more efficient use.

c. Do you think there will be any substantial commercials or mixed use nodes along US 64 that have not been identified in the current plans? As far as within the Town of Cary, only ones that comes from the redevelopment discussed above (MacGregor Village, Auto Park).

8) The traffic forecast will utilize the Triangle Regional Model as tool to evaluate growth in the area. The currently approved version of the model includes Socioeconomic Data developed in advance of the 2040 MTP that was approved in 2013. Several individuals have expressed that the model may under represent the growth along US 64 as the future year data was developed during the economic downturn and that the focus of development in Apex was focused more on the Veridea development at that time, while the current trend is toward more development closer to the core area of Apex.

a. Do you agree with these concerns?

☐ Yes

☐ No

Comments: I will defer to the Apex planners on this.

b. Do you think the growth along US 64 will be higher or lower than may have been anticipated when the socioeconomic data was developed?
I would check the current work being done to update the Regional Model data that was adopted in 2013. There should be new data within the next month or two if not already (See: John Hodges-Copple – Triangle J Council of Governments)

9) Do you have any additional comments that would be helpful in our development of the traffic forecast? See previous comment above regarding new regional model data coming soon.

Response From: Town of Cary -Juliet Andes, Facilities Planning Manager; Tyler Bray, Transportation Planning Engineer; and Will Hartye, Planner II

10) This questionnaire is being sent to the following individuals:
    i. Chris Lukasina, Capital Area MPO – Executive Director (Chris.Lukasina@campo-nc.us)
    ii. Alex Rickard, Capital Area MPO – Deputy Director (Alex.Rickard@campo-nc.us)
    iii. Tim Gardiner, Wake County – Transportation Planner (tim.gardiner@wakegov.com)
    iv. Juliet Andes, Town of Cary – Facilities Planning Manager (Juliet.andes@townofcary.org)
    v. Tyler Bray, Town of Cary – Transportation Planning Engineer (tyler.bray@townofcary.org)
    vi. Russell Dalton, Town of Apex – Transportation Engineer (Russell.Dalton@apexnc.org)
    vii. Shannon Cox, Town of Apex – Senior Transportation Planner (Shannon.Cox@apexnc.org)
    viii. David Keilson, NCDOT Division 5 – Division Planning Engineer (dpkeilson@ncdot.gov)
    ix. Al Grandy, NCDOT Division 5 – Division Traffic Engineer (agrandy@ncdot.gov)
    x. Reid Elmore, NCDOT Division 5 – District 1 Engineer (trelmore@ncdot.gov)
    xi. Rupal Desai, NCDOT TPB (rpdesai@ncdot.gov)
    xii. Scott Walston, NCDOT TPB (swalston@ncdot.gov)

    a. Are there any other individuals whom you think we should contact to discuss this forecast? Will Hartye – answers in red. Via Tyler Bray

Traffic Forecasting for STIP Project U-5301 (US 64 Improvements US 1 to Laura Duncan Road))
Project Coordination Meeting
November 4, 2016

Meeting Minutes

Attendees: Chris Lukasina (CAMPO, Executive Director)
Alex Rickard (CAMPO, Deputy Director)
Peter Trencansky (Patriot Transportation Engineering)
Lee Klieman (Patriot Transportation Engineering)

Location: CAMPO Offices
Fayetteville Street, Raleigh NC

Purpose: Discussion of Future Year Project Characteristics for Modeling Purposes

The project for the upgrading and widening of US 64 from US 1/US 64 to NC 540 was the subject of the meeting. The synthesis of three separate projects was discussed and how they worked together to create the future project that is the subject of the forecasting effort.

The ultimate vision for this project corridor is for the corridor to be characteristic of a "light freeway" or "heavy expressway." Access from driveways will be limited and all cross traffic will be controlled via interchanges. It is possible that there may be some right-in/right-out access permitted (for example, at Shepherd's Vineyard Rd).

The interim solution for the improvement of the corridor is to upgrade US 64 to a superstreet as there is no public support for the ultimate vision at this time. It was decided that the characteristics of the U-5301 project that would be modeled are:

- Six-lane boulevard with a 60-mph speed from US 1/64 to the interchange at Lake Pine Drive
- Four-lane expressway with a 65-mph speed from the Lake Pine Drive interchange to NC 540

The future interchanges at Lake Pine Drive and Laura Duncan Road would be included in the model for the U-5301 project design (the interim solution) and the expressway design (ultimate solution).

The ultimate project outlook would be a six-lane expressway with a 65-mph speed along its entire length from US 1 to NC 540.

Patriot Transportation Engineering, PLLC
3008 Anderson Drive, Suite 120
Raleigh, North Carolina 27609
Phone: 919.706.9408

APPENDIX C:

TRAFFIC FORECAST TABLES

Table C1: 2016 Base Year No-Build Traffic Volumes

Forecast Location	NCDOT Historic Count Data							AADT Exptrapolated to 2016[1]	Project Specific Count Data[2]		2016 No-Build Traffic Forecast
	2009	2010	2011	2012	2013	2014	2015		TMC	Mainline	
US 64 - west of Windy Rd									33,700 (3)		**40,000**
US 64 - Windy Rd to Laura Duncan Rd (SR 1308)	31,000		33,000				37,000	40,700	33,800 (3) 39,900 (3)		**40,000**
US 64 - Laura Duncan Rd (SR 1308) to Knollwood Dr									40,300 (3) 40,700 (3)	41,900 (4)	**41,600**
US 64 - Knollwood Dr to Shepherds Vineyard Dr									38,600 (3) 41,000 (3)		**40,000**
US 64 - Shepherds Vineyard Dr to Lake Pine Dr (SR 1521)									39,200 (3) 39,800 (3)		**38,400**
US 64 - Lake Pine Dr (SR 1521) to Autopark Blvd	34,000		36,000		38,000		39,000	40,800	44,000 (3) 43,600 (3)	44,300 (4)	**42,700**
US 64 - Autopark Blvd to Chalon Dr/Mackenan Dr									44,300 (3) 44,500 (3)		**43,300**
US 64 - Chalon Dr/Mackenan Dr to Gregson Dr									46,800 (3) 47,000 (3)		**45,700**
US 64 - Gregson Dr to Edinburgh Dr									51,700 (3) 51,300 (3)		**50,300**
US 64 - Edinburgh Dr to US 1/US 64	42,000		46,000		53,000		48,000	51,600	56,900 (3) 58,200 (3)	56,200 (4)	**56,000**
Tryon Rd (SR 1009) - US 1/US 64 to Regency Pkwy	34,000		*21,000*		35,000		*22,000*	40,400	44,400 (3) 49,000 (3)		**42,900**
Tryon Rd (SR 1009) - east of Regency Pkwy									40,500 (3)		**34,800**
Windy Rd - south of US 64									1,600 (3)		**1,600**
Knollwood Dr - east of Laura Duncan Rd (SR 1308)									1,500 (3)		**1,500**
Laura Duncan Rd (SR 1308) - south of Knollwood Dr									8,700 (3)		**8,800**
Laura Duncan Rd (SR 1308) - Knollwood Dr to US 64	7,300		8,100		8,500		8,400	8,000	9,000 (3) 9,300 (3)		**9,100**
Laura Duncan Rd (SR 1308) - north of US 64	5,600		6,900		7,500		11,000	9,600	11,300 (3)		**11,300**
Laura Duncan Rd (SR 1308) - south of Pine Plaza Dr/Hendrick Toyota Dwy									8,700 (3)		**8,600**

Table C1: 2016 Base Year No-Build Traffic Volumes

Forecast Location	NCDOT Historic Count Data							AADT Exptrapolated to 2016[1]	Project Specific Count Data[2]		2016 No-Build Traffic Forecast
	2009	2010	2011	2012	2013	2014	2015		TMC	Mainline	
Laura Duncan Rd (SR 1308) - north of Pine Plaza Dr/Hendrick Toyota Dwy									8,600 (3)		**8,600**
Hendrick Toyota Dwy - west of Laura Duncan Rd (SR 1308)									1,200 (3)		**1,300**
Pine Plaza Dr - east of Lauran Duncan Rd (SR 1308)									3,500 (3)		**3,500**
Knollwood Dr - south of US 64									1,000 (3)		**1,200**
Costco Dwy - north of US 64									3,900 (3)		**4,200**
Shepherds Vineyard Dr - south of US 64									2,000 (3)		**1,800**
Shepherds Vineyard Dr - north of US 64									4,200 (3)		**4,000**
Shepherds Vineyard Dr - west of Old Raleigh Rd (SR 1435)									2,700 (3)		**2,600**
Old Raleigh Rd (SR 1435) - south of Shepherds Vineyard Dr			9,600		11,000		11,000	10,600	12,300 (3)		**12,300**
Old Raleigh Rd (SR 1435) - Shepherds Vineyard Dr to Old Raleigh Rd (SR 1435)									12,300 (3) 12,200 (3)		**12,300**
Lake Pine Dr (SR 1521) - Old Raleigh Rd (SR 1435) to US 64									13,100 (3) 13,500 (3)		**13,600**
Lake Pine Dr (SR 1521) - north of US 64									17,300 (3)		**17,300**
Lake Pine Dr (SR 1521) - south of Pine Plaza Dr/MacGregor Pines Dr									13,500 (3)		**13,600**
Lake Pine Dr (SR 1521) - north of Pine Plaza Dr/MacGregor Pines Dr									12,700 (3)		**12,700**
Old Raleigh Rd (SR 1435) - east of Lake Pine Dr (SR 1521)/Old Raleigh Rd (SR 1435)									7,300 (3)		**7,300**
Pine Plaza Dr - west of Lake Pine Dr (SR 1521)									4,600 (3)		**4,600**
MacGregor Pines Dr - east of Lake Pine Dr (SR 1521)									1,400 (3)		**1,500**
Autopark Blvd - south of US 64									2,000 (3)		**2,000**
Old Raleigh Rd (SR 1435) - west of Mackenan Dr									8,000 (3)		**8,000**
Old Raleigh Rd (SR 1435) - Mackenan Dr to Gregson Dr									4,700 (3) 4,900 (3)		**4,800**
Edinburgh Dr - east of Gregson Dr									3,200 (3)		**3,200**
Mackenan Dr - south of Old Raleigh Rd (SR 1435)									6,000 (3)		**6,000**

Table C1: 2016 Base Year No-Build Traffic Volumes

Forecast Location	NCDOT Historic Count Data							AADT Exptrapolated to 2016[1]	Project Specific Count Data[2]		2016 No-Build Traffic Forecast
	2009	2010	2011	2012	2013	2014	2015		TMC	Mainline	
Mackenan Dr - Old Raleigh Rd (SR 1435) to US 64									5,700 (3) 5,900 (3)		**5,800**
Chalon Dr - north of US 64									2,000 (3)		**2,200**
Gregson Dr - south of Old Raleigh Rd (SR 1435)/Edinburgh Dr									7,300 (3)		**7,400**
Gregson Dr - Old Raleigh Rd (SR 1435)/Edinburgh Dr to US 64									7,800 (3) 8,100 (3)		**8,000**
Edinburgh Dr - south of US 64									5,800 (3)		**5,800**
Edinburgh Dr - north of US 64									2,800 (3)		**2,700**
US 1 - south of US 64/Tryon Rd (SR 1009)	59,000	*37,000*	60,000		57,000		63,000	64,800	75,500 (3)		**75,500**
US 1/US 64 - north of US 64/Tryon Rd (SR 1009)	94,000	*85,000*	99,000		93,000		98,000	106,300	110,300 (3)		**110,000**
Regency Pkwy - south of US 64/Tryon Rd (SR 1009)									24,300 (3)		**24,300**

Notes:

Red Italics denote numbers removed from data set dut to outlier status.

(1) Data extrapolated to 2016 based on linear regression of 1996-2015 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) 2016 13-hour Turning Movement Count - factored to 24-hour volumes and adjusted to AADT.

(4) 2016 Project Specific Mainline Count - Adjusted to AADT.

Table C2: 2016 Base Year No-Build Design Data - Truck Percentages

Forecast Location	Previous Forecast		Project Specific Count Data		Selected 2016 BY NB Value
	Truck Percentage	TIP Project	TMC	Mainline	
US 64 - west of Windy Rd	4 , 2	US 64 CS	3 , 2 (1)		**3 , 2**
US 64 - Windy Rd to Laura Duncan Rd (SR 1308)	4 , 2	US 64 CS	3 , 2 (1) 2 , 1 (1)		**3 , 2**
US 64 - Laura Duncan Rd (SR 1308) to Knollwood Dr	4 , 2	US 64 CS	2 , 1 (1) 3 , 1 (1)	3 , 2 (2)	**3 , 2**
US 64 - Knollwood Dr to Shepherds Vineyard Dr	4 , 2	US 64 CS	3 , 1 (1) 2 , 1 (1)		**3 , 2**
US 64 - Shepherds Vineyard Dr to Lake Pine Dr (SR 1521)	3 , 2	US 64 CS	2 , 1 (1) 2 , 1 (1)		**3 , 2**
US 64 - Lake Pine Dr (SR 1521) to Autopark Blvd	3 , 2	US 64 CS	2 , 1 (1) 3 , 1 (1)	3 , 2 (2)	**3 , 2**
US 64 - Autopark Blvd to Chalon Dr/Mackenan Dr	3 , 2	US 64 CS	3 , 1 (1) 3 , 1 (1)		**3 , 2**
US 64 - Chalon Dr/Mackenan Dr to Gregson Dr	3 , 2	US 64 CS	3 , 1 (1) 3 , 1 (1)		**3 , 2**
US 64 - Gregson Dr to Edinburgh Dr	3 , 2	US 64 CS	3 , 1 (1) 3 , 1 (1)		**3 , 2**
US 64 - Edinburgh Dr to US 1/US 64	3 , 2	US 64 CS	2 , 1 (1) 1 , 1 (1)	17 , 2 (3)	**3 , 2**
Tryon Rd (SR 1009) - US 1/US 64 to Regency Pkwy			1 , 1 (1) 1 , 1 (1)		**2 , 1**
Tryon Rd (SR 1009) - east of Regency Pkwy	2 , 1	US 64 CS	1 , 1 (1)		**2 , 1**
Windy Rd - south of US 64			3 , 1 (1)		**3 , 1**
Knollwood Dr - east of Laura Duncan Rd (SR 1308)			1 , 0 (1)		**1 , 1**
Laura Duncan Rd (SR 1308) - south of Knollwood Dr			3 , 1 (1)		**3 , 1**
Laura Duncan Rd (SR 1308) - Knollwood Dr to US 64	3 , 1	US 64 CS	3 , 1 (1) 2 , 1 (1)		**3 , 1**
Laura Duncan Rd (SR 1308) - north of US 64	3 , 1	US 64 CS	2 , 1 (1)		**2 , 1**
Laura Duncan Rd (SR 1308) - south of Pine Plaza Dr/Hendrick Toyota Dwy			2 , 1 (1)		**2 , 1**

Table C2: 2016 Base Year No-Build Design Data - Truck Percentages

Forecast Location	Previous Forecast		Project Specific Count Data		Selected 2016 BY NB Value
	Truck Percentage	TIP Project	TMC	Mainline	
Laura Duncan Rd (SR 1308) - north of Pine Plaza Dr/Hendrick Toyota Dwy			2 , 1 (1)		**2 , 1**
Hendrick Toyota Dwy - west of Laura Duncan Rd (SR 1308)			2 , 1 (1)		**2 , 1**
Pine Plaza Dr - east of Lauran Duncan Rd (SR 1308)			1 , 1 (1)		**1 , 1**
Knollwood Dr - south of US 64	2 , 1	US 64 CS	2 , 0 (1)		**2 , 1**
Costco Dwy - north of US 64			1 , 1 (1)		**1 , 1**
Shepherds Vineyard Dr - south of US 64	3 , 1	US 64 CS	1 , 1 (1)		**1 , 1**
Shepherds Vineyard Dr - north of US 64	3 , 1	US 64 CS	2 , 1 (1)		**2 , 1**
Shepherds Vineyard Dr - west of Old Raleigh Rd (SR 1435)			1 , 0 (1)		**1 , 1**
Old Raleigh Rd (SR 1435) - south of Shepherds Vineyard Dr			1 , 1 (1)		**2 , 1**
Old Raleigh Rd (SR 1435) - Shepherds Vineyard Dr to Old Raleigh Rd (SR 1435)			1 , 1 (1) 1 , 1 (1)		**2 , 1**
Lake Pine Dr (SR 1521) - Old Raleigh Rd (SR 1435) to US 64	2 , 1	US 64 CS	1 , 1 (1) 1 , 1 (1)		**2 , 1**
Lake Pine Dr (SR 1521) - north of US 64	2 , 1	US 64 CS	1 , 1 (1)		**2 , 1**
Lake Pine Dr (SR 1521) - south of Pine Plaza Dr/MacGregor Pines Dr			1 , 1 (1)		**2 , 1**
Lake Pine Dr (SR 1521) - north of Pine Plaza Dr/MacGregor Pines Dr			1 , 1 (1)		**2 , 1**
Old Raleigh Rd (SR 1435) - east of Lake Pine Dr (SR 1521)/Old Raleigh Rd (SR 1435)	1 , 1	US 64 CS	1 , 1 (1)		**2 , 1**
Pine Plaza Dr - west of Lake Pine Dr (SR 1521)			2 , 1 (1)		**2 , 1**
MacGregor Pines Dr - east of Lake Pine Dr (SR 1521)			2 , 1 (1)		**2 , 1**
Autopark Blvd - south of US 64	2 , 2	US 64 CS	1 , 1 (1)		**1 , 1**
Old Raleigh Rd (SR 1435) - west of Mackenan Dr			2 , 1 (1)		**2 , 1**
Old Raleigh Rd (SR 1435) - Mackenan Dr to Gregson Dr	2 , 1	US 64 CS	2 , 1 (1) 2 , 1 (1)		**2 , 1**
Edinburgh Dr - east of Gregson Dr	2 , 1	US 64 CS	1 , 1 (1)		**2 , 1**
Mackenan Dr - south of Old Raleigh Rd (SR 1435)			2 , 1 (1)		**2 , 1**

Table C2: 2016 Base Year No-Build Design Data - Truck Percentages

Forecast Location	Previous Forecast		Project Specific Count Data		Selected 2016 BY NB Value
	Truck Percentage	TIP Project	TMC	Mainline	
Mackenan Dr - Old Raleigh Rd (SR 1435) to US 64	2 , 1	US 64 CS	2 , 1 (1) 2 , 1 (1)		**2 , 1**
Chalon Dr - north of US 64	2 , 1	US 64 CS	3 , 0 (1)		**2 , 1**
Gregson Dr - south of Old Raleigh Rd (SR 1435)/Edinburgh Dr	3 , 2	US 64 CS	2 , 0 (1)		**2 , 1**
Gregson Dr - Old Raleigh Rd (SR 1435)/Edinburgh Dr to US 64	3 , 2	US 64 CS	2 , 0 (1) 2 , 1 (1)		**2 , 1**
Edinburgh Dr - south of US 64	3 , 2	US 64 CS	1 , 1 (1)		**2 , 1**
Edinburgh Dr - north of US 64	2 , 1	US 64 CS	2 , 1 (1)		**2 , 1**
US 1 - south of US 64/Tryon Rd (SR 1009)	3 , 2	US 64 CS	3 , 4 (1)		**3 , 4**
US 1/US 64 - north of US 64/Tryon Rd (SR 1009)	3 , 2	US 64 CS	3 , 3 (1)		**3 , 4**
Regency Pkwy - south of US 64/Tryon Rd (SR 1009)	2 , 1	US 64 CS	1 , 1 (1)		**2 , 1**

Notes:

(1) 2016 13-hour Turning Movement Count

(2) 2016 Volume, Speed, Class Mainline Count

(3) 2016 Volume, Speed, Class Mainline count using Wavetronix Sensor

Table C3: 2016 Base Year No-Build Design Data - Directional Distribution

Forecast Location	Previous Forecast		Project Specific Count Data		Selected 2016 BY NB Value
	Directional Distribution	TIP Project	TMC	Mainline	
US 64 - west of Windy Rd	55	US 64 CS	55 (1)		**55**
US 64 - Windy Rd to Laura Duncan Rd (SR 1308)	55	US 64 CS	55 (1) 55 (1)		**55**
US 64 - Laura Duncan Rd (SR 1308) to Knollwood Dr	55	US 64 CS	55 (1) 55 (1)	55 (2)	**55**
US 64 - Knollwood Dr to Shepherds Vineyard Dr	55	US 64 CS	55 (1) 55 (1)		**55**
US 64 - Shepherds Vineyard Dr to Lake Pine Dr (SR 1521)	55	US 64 CS	55 (1) 55 (1)		**55**
US 64 - Lake Pine Dr (SR 1521) to Autopark Blvd	55	US 64 CS	55 (1) 60 (1)	55 (2)	**55**
US 64 - Autopark Blvd to Chalon Dr/Mackenan Dr	55	US 64 CS	55 (1) 60 (1)		**55**
US 64 - Chalon Dr/Mackenan Dr to Gregson Dr	55	US 64 CS	55 (1) 55 (1)		**55**
US 64 - Gregson Dr to Edinburgh Dr	55	US 64 CS	55 (1) 55 (1)		**55**
US 64 - Edinburgh Dr to US 1/US 64	55	US 64 CS	55 (1) 55 (1)	55 (2)	**55**
Tryon Rd (SR 1009) - US 1/US 64 to Regency Pkwy			55 (1) 55 (1)		**55**
Tryon Rd (SR 1009) - east of Regency Pkwy	60	US 64 CS	55 (1)		**55**
Windy Rd - south of US 64			55 (1)		**55**
Knollwood Dr - east of Laura Duncan Rd (SR 1308)			55 (1)		**55**
Laura Duncan Rd (SR 1308) - south of Knollwood Dr			55 (1)		**55**
Laura Duncan Rd (SR 1308) - Knollwood Dr to US 64	55	US 64 CS	55 (1) 55 (1)		**55**
Laura Duncan Rd (SR 1308) - north of US 64	55	US 64 CS	55 (1)		**55**
Laura Duncan Rd (SR 1308) - south of Pine Plaza Dr/Hendrick Toyota Dwy			55 (1)		**55**

Table C3: 2016 Base Year No-Build Design Data - Directional Distribution

Forecast Location	Previous Forecast		Project Specific Count Data		Selected 2016 BY NB Value
	Directional Distribution	TIP Project	TMC	Mainline	
Laura Duncan Rd (SR 1308) - north of Pine Plaza Dr/Hendrick Toyota Dwy			55 (1)		**55**
Hendrick Toyota Dwy - west of Laura Duncan Rd (SR 1308)			60 (1)		**60**
Pine Plaza Dr - east of Lauran Duncan Rd (SR 1308)			55 (1)		**55**
Knollwood Dr - south of US 64	55	US 64 CS	80 (1)		**75**
Costco Dwy - north of US 64			55 (1)		**55**
Shepherds Vineyard Dr - south of US 64	60	US 64 CS	65 (1)		**60**
Shepherds Vineyard Dr - north of US 64	60	US 64 CS	55 (1)		**55**
Shepherds Vineyard Dr - west of Old Raleigh Rd (SR 1435)			55 (1)		**55**
Old Raleigh Rd (SR 1435) - south of Shepherds Vineyard Dr			65 (1)		**65**
Old Raleigh Rd (SR 1435) - Shepherds Vineyard Dr to Old Raleigh Rd (SR 1435)			65 (1) 65 (1)		**65**
Lake Pine Dr (SR 1521) - Old Raleigh Rd (SR 1435) to US 64	55	US 64 CS	55 (1) 55 (1)		**55**
Lake Pine Dr (SR 1521) - north of US 64	55	US 64 CS	55 (1)		**55**
Lake Pine Dr (SR 1521) - south of Pine Plaza Dr/MacGregor Pines Dr			55 (1)		**55**
Lake Pine Dr (SR 1521) - north of Pine Plaza Dr/MacGregor Pines Dr			55 (1)		**55**
Old Raleigh Rd (SR 1435) - east of Lake Pine Dr (SR 1521)/Old Raleigh Rd (SR 1435)	60	US 64 CS	75 (1)		**75**
Pine Plaza Dr - west of Lake Pine Dr (SR 1521)			55 (1)		**55**
MacGregor Pines Dr - east of Lake Pine Dr (SR 1521)			60 (1)		**60**
Autopark Blvd - south of US 64	50	US 64 CS	55 (1)		**55**
Old Raleigh Rd (SR 1435) - west of Mackenan Dr			65 (1)		**65**
Old Raleigh Rd (SR 1435) - Mackenan Dr to Gregson Dr	55	US 64 CS	65 (1) 55 (1)		**65**
Edinburgh Dr - east of Gregson Dr	65	US 64 CS	65 (1)		**55**
Mackenan Dr - south of Old Raleigh Rd (SR 1435)			85 (1)		**80**

Table C3: 2016 Base Year No-Build Design Data - Directional Distribution

Forecast Location	Previous Forecast		Project Specific Count Data		Selected 2016 BY NB Value
	Directional Distribution	TIP Project	TMC	Mainline	
Mackenan Dr - Old Raleigh Rd (SR 1435) to US 64	65	US 64 CS	70 (1) 70 (1)		**65**
Chalon Dr - north of US 64	65	US 64 CS	75 (1)		**75**
Gregson Dr - south of Old Raleigh Rd (SR 1435)/Edinburgh Dr	65	US 64 CS	80 (1)		**80**
Gregson Dr - Old Raleigh Rd (SR 1435)/Edinburgh Dr to US 64	65	US 64 CS	70 (1) 70 (1)		**70**
Edinburgh Dr - south of US 64	55	US 64 CS	70 (1)		**70**
Edinburgh Dr - north of US 64	55	US 64 CS	60 (1)		**60**
US 1 - south of US 64/Tryon Rd (SR 1009)	60	US 64 CS	55 (1)		**55**
US 1/US 64 - north of US 64/Tryon Rd (SR 1009)	60	US 64 CS	55 (1)		**55**
Regency Pkwy - south of US 64/Tryon Rd (SR 1009)	55	US 64 CS	60 (1)		**55**

Notes:

(1) 2016 13-hour Turning Movement Count

(2) 2016 Volume, Speed, Class Mainline Count

Table C4: 2016 Base Year No-Build Design Data - Peak Hour Factor

Forecast Location	Previous Forecast		Project Specific Count Data		Selected 2016 BY NB Value
	Peak Hour Factor	TIP Project	TMC	Mainline	
US 64 - west of Windy Rd	9	US 64 CS	10 (1)		**9**
US 64 - Windy Rd to Laura Duncan Rd (SR 1308)	9	US 64 CS	10 (1) 9 (1)		**9**
US 64 - Laura Duncan Rd (SR 1308) to Knollwood Dr	9	US 64 CS	9 (1) 9 (1)	9 (2)	**9**
US 64 - Knollwood Dr to Shepherds Vineyard Dr	9	US 64 CS	9 (1) 9 (1)		**9**
US 64 - Shepherds Vineyard Dr to Lake Pine Dr (SR 1521)	9	US 64 CS	9 (1) 9 (1)		**9**
US 64 - Lake Pine Dr (SR 1521) to Autopark Blvd	9	US 64 CS	8 (1) 8 (1)	8 (2)	**9**
US 64 - Autopark Blvd to Chalon Dr/Mackenan Dr	9	US 64 CS	8 (1) 9 (1)		**9**
US 64 - Chalon Dr/Mackenan Dr to Gregson Dr	9	US 64 CS	9 (1) 9 (1)		**9**
US 64 - Gregson Dr to Edinburgh Dr	9	US 64 CS	9 (1) 9 (1)		**9**
US 64 - Edinburgh Dr to US 1/US 64	9	US 64 CS	9 (1) 9 (1)	9 (2)	**9**
Tryon Rd (SR 1009) - US 1/US 64 to Regency Pkwy	9		8 (1) 9 (1)		**9**
Tryon Rd (SR 1009) - east of Regency Pkwy	9	US 64 CS	8 (1)		**9**
Windy Rd - south of US 64			9 (1)		**9**
Knollwood Dr - east of Laura Duncan Rd (SR 1308)			9 (1)		**9**
Laura Duncan Rd (SR 1308) - south of Knollwood Dr			10 (1)		**9**
Laura Duncan Rd (SR 1308) - Knollwood Dr to US 64	10	US 64 CS	10 (1) 9 (1)		**9**
Laura Duncan Rd (SR 1308) - north of US 64	10	US 64 CS	8 (1)		**9**
Laura Duncan Rd (SR 1308) - south of Pine Plaza Dr/Hendrick Toyota Dwy			9 (1)		**9**

Table C4: 2016 Base Year No-Build Design Data - Peak Hour Factor

Forecast Location	Previous Forecast		Project Specific Count Data		Selected 2016 BY NB Value
	Peak Hour Factor	TIP Project	TMC	Mainline	
Laura Duncan Rd (SR 1308) - north of Pine Plaza Dr/Hendrick Toyota Dwy			10 (1)		**9**
Hendrick Toyota Dwy - west of Laura Duncan Rd (SR 1308)			9 (1)		**9**
Pine Plaza Dr - east of Lauran Duncan Rd (SR 1308)			11 (1)		**11**
Knollwood Dr - south of US 64	10	US 64 CS	7 (1)		**8**
Costco Dwy - north of US 64			8 (1)		**8**
Shepherds Vineyard Dr - south of US 64	10	US 64 CS	9 (1)		**9**
Shepherds Vineyard Dr - north of US 64	12	US 64 CS	9 (1)		**9**
Shepherds Vineyard Dr - west of Old Raleigh Rd (SR 1435)			11 (1)		**11**
Old Raleigh Rd (SR 1435) - south of Shepherds Vineyard Dr			10 (1)		**10**
Old Raleigh Rd (SR 1435) - Shepherds Vineyard Dr to Old Raleigh Rd (SR 1435)			10 (1) 10 (1)		**10**
Lake Pine Dr (SR 1521) - Old Raleigh Rd (SR 1435) to US 64	10	US 64 CS	9 (1) 8 (1)		**9**
Lake Pine Dr (SR 1521) - north of US 64	10	US 64 CS	7 (1)		**8**
Lake Pine Dr (SR 1521) - south of Pine Plaza Dr/MacGregor Pines Dr			8 (1)		**8**
Lake Pine Dr (SR 1521) - north of Pine Plaza Dr/MacGregor Pines Dr			9 (1)		**9**
Old Raleigh Rd (SR 1435) - east of Lake Pine Dr (SR 1521)/Old Raleigh Rd (SR 1435)	11	US 64 CS	11 (1)		**11**
Pine Plaza Dr - west of Lake Pine Dr (SR 1521)			10 (1)		**10**
MacGregor Pines Dr - east of Lake Pine Dr (SR 1521)			7 (1)		**8**
Autopark Blvd - south of US 64	9	US 64 CS	8 (1)		**8**
Old Raleigh Rd (SR 1435) - west of Mackenan Dr			10 (1)		**11**
Old Raleigh Rd (SR 1435) - Mackenan Dr to Gregson Dr	10	US 64 CS	11 (1) 10 (1)		**10**
Edinburgh Dr - east of Gregson Dr	11	US 64 CS	11 (1)		**10**
Mackenan Dr - south of Old Raleigh Rd (SR 1435)			8 (1)		**8**

Table C4: 2016 Base Year No-Build Design Data - Peak Hour Factor

Forecast Location	Previous Forecast		Project Specific Count Data		Selected 2016 BY NB Value
	Peak Hour Factor	TIP Project	TMC	Mainline	
Mackenan Dr - Old Raleigh Rd (SR 1435) to US 64	11	US 64 CS	9 (1) 9 (1)		**9**
Chalon Dr - north of US 64	10	US 64 CS	11 (1)		**10**
Gregson Dr - south of Old Raleigh Rd (SR 1435)/Edinburgh Dr	10	US 64 CS	7 (1)		**8**
Gregson Dr - Old Raleigh Rd (SR 1435)/Edinburgh Dr to US 64	10	US 64 CS	8 (1) 9 (1)		**8**
Edinburgh Dr - south of US 64	10	US 64 CS	10 (1)		**10**
Edinburgh Dr - north of US 64	10	US 64 CS	8 (1)		**8**
US 1 - south of US 64/Tryon Rd (SR 1009)	9	US 64 CS	8 (1)		**8**
US 1/US 64 - north of US 64/Tryon Rd (SR 1009)	9	US 64 CS	8 (1)		**8**
Regency Pkwy - south of US 64/Tryon Rd (SR 1009)	9	US 64 CS	10 (1)		**10**

Notes:

(1) 2016 13-hour Turning Movement Count

(2) 2016 Volume, Speed, Class Mainline Count

Table C5: Model Validation

Forecast Location	Model Calibration 2010		2015 Data		Interpolated Model [2]	Forecast Volume	FY NB Volumes	
	Model	AADT [1]	Model	AADT	2016	2016 NB	2040 Model	2040 Forecast
US 64 - west of Windy Rd	38,512		40,221		40,600	40,000	50,826	56,600
US 64 - Windy Rd to Laura Duncan Rd (SR 1308)	38,512	31,000	40,221	37,000	40,600	40,000	50,826	56,600
US 64 - Laura Duncan Rd (SR 1308) to Knollwood Dr	39,706		41,936		42,200	41,600	48,426	60,600
US 64 - Knollwood Dr to Shepherds Vineyard Dr	40,550		42,160		42,400	40,000	48,083	57,000
US 64 - Shepherds Vineyard Dr to Lake Pine Dr (SR 1521)	40,550		42,160		42,400	38,400	48,083	55,000
US 64 - Lake Pine Dr (SR 1521) to Autopark Blvd	50,168	34,000	50,113	39,000	50,300	42,700	56,016	59,400
US 64 - Autopark Blvd to Chalon Dr/Mackenan Dr	50,168		50,113		50,300	43,300	56,016	60,000
US 64 - Chalon Dr/Mackenan Dr to Gregson Dr	52,806		52,885		53,200	45,700	59,882	63,300
US 64 - Gregson Dr to Edinburgh Dr	59,838		60,886		61,300	50,300	71,920	69,300
US 64 - Edinburgh Dr to US 1/US 64	62,563	42,000	63,988	48,000	64,500	56,000	76,209	76,200
Tryon Rd (SR 1009) - US 1/US 64 to Regency Pkwy	42,510		44,775		45,100		53,415	56,400
Tryon Rd (SR 1009) - east of Regency Pkwy	37,983		39,418		39,800	42,900	47,866	46,000
Laura Duncan Rd (SR 1308) - Knollwood Dr to US 64	10,535	7,300	13,047	8,400	13,400	9,100	20,743	14,600
Laura Duncan Rd (SR 1308) - north of US 64	13,275	5,600	15,903	11,000	16,100	11,300	21,674	16,400
Laura Duncan Rd (SR 1308) - north of Pine Plaza Dr/Hendrick Toyota Dwy	12,749		14,305		14,400		17,903	11,400
Hendrick Toyota Dwy - west of Laura Duncan Rd (SR 1308) [3]	*1,661*		*2,275*				*6,342*	1,400
Pine Plaza Dr - east of Lauran Duncan Rd (SR 1308) [3]	*3,987*		*5,095*				*7,293*	6,800
Knollwood Dr - south of US 64 [3]	*2,014*		*1,957*		*2,000*	1,200	*3,384*	1,800
Lake Pine Dr (SR 1521) - Old Raleigh Rd (SR 1435) to US 64	14,259		14,039		14,200	13,600	17,328	17,200
Lake Pine Dr (SR 1521) - north of US 64	10,160		10,457		10,800	17,300	19,145	29,200
Lake Pine Dr (SR 1521) - south of Pine Plaza Dr/MacGregor Pines Dr	10,160		10,457		10,800	13,600	19,145	24,300
Lake Pine Dr (SR 1521) - north of Pine Plaza Dr/MacGregor Pines Dr	7,329		7,757		8,000	12,700	14,367	22,700
Pine Plaza Dr - west of Lake Pine Dr (SR 1521) [3]	*3,427*		*3,372*		*3,500*	4,600	*5,995*	9,400
MacGregor Pines Dr - east of Lake Pine Dr (SR 1521) [3]	*380*		*460*		*500*	1,500	*931*	2,400
Mackenan Dr - Old Raleigh Rd (SR 1435) to US 64 [3]	*7,936*		*8,378*		*8,400*	5,800	*9,536*	6,800
Chalon Dr - north of US 64 [3]	*1,068*		*1,071*		*1,100*	2,200	*998*	2,300
Gregson Dr - Old Raleigh Rd (SR 1435)/Edinburgh Dr to US 64 [3]	*20,322*		*21,595*		*21,800*	8,000	*26,028*	10,000
Edinburgh Dr - south of US 64 [3]	*5,352*		*5,595*		*5,600*	5,800	*6,209*	7,000
Edinburgh Dr - north of US 64 [3]	*2,451*		*2,539*		*2,600*	2,700	*2,935*	3,300

Table C5: Model Validation

Forecast Location	Model Calibration 2010		2015 Data		Interpolated Model [2]	Forecast Volume	FY NB Volumes	
	Model	AADT [1]	Model	AADT	2016	2016 NB	2040 Model	2040 Forecast
US 1 - south of US 64/Tryon Rd (SR 1009)	63,022	59,000	74,204	63,000	75,900	75,500	117,424	118,000
US 1/US 64 - north of US 64/Tryon Rd (SR 1009)	92,164	94,000	102,303	98,000	103,800	110,000	138,565	148,200
Regency Pkwy - south of US 64/Tryon Rd (SR 1009)	23,902		25,017		25,200	24,300	28,864	28,200

Notes:

(1) AADT Data shown is for 2009 as 2010 counts were not taken in the Raleigh Urban Area in 2010.

(2) Interpolated volume between 2015 and 2040 model data

(3) Model Volume Shown is for a centroid connector that was determined to be representative of the location and function of the subject roadway

Table C6: 2040 No-Build Traffic Volumes

Forecast Location	Forecast 2016 BY NB	Historic Growth Rate		Model Growth Rate (1)	Model Volume Change	Chosen Growth Rate (1)	Chosen Volume Change	Future Year No-Build Volumes	
	AADT	2005-2015	1996-2015	2015- 2040	2015-2040	2015-2040	2015-2040	2040 Model	2040 Forecast
US 64 - west of Windy Rd	40,000			0.94%	10,600	1.40%	16,600	50,826	**56,600**
US 64 - Windy Rd to Laura Duncan Rd (SR 1308)	40,000	1.60%	4.00%	0.94%	10,600	1.40%	16,600	50,826	**56,600**
US 64 - Laura Duncan Rd (SR 1308) to Knollwood Dr	41,600			0.58%	6,500	1.52%	19,000	48,426	**60,600**
US 64 - Knollwood Dr to Shepherds Vineyard Dr	40,000			0.53%	5,900	1.43%	17,000	48,083	**57,000**
US 64 - Shepherds Vineyard Dr to Lake Pine Dr (SR 1521)	38,400			0.53%	5,900	1.45%	16,600	48,083	**55,000**
US 64 - Lake Pine Dr (SR 1521) to Autopark Blvd	42,700	1.60%	2.10%	0.45%	5,900	1.33%	16,700	56,016	**59,400**
US 64 - Autopark Blvd to Chalon Dr/Mackenan Dr	43,300			0.45%	5,900	1.31%	16,700	56,016	**60,000**
US 64 - Chalon Dr/Mackenan Dr to Gregson Dr	45,700			0.50%	7,000	1.31%	17,600	59,882	**63,300**
US 64 - Gregson Dr to Edinburgh Dr	50,300			0.67%	11,000	1.29%	19,000	71,920	**69,300**
US 64 - Edinburgh Dr to US 1/US 64	56,000	1.60%	1.90%	0.70%	12,200	1.24%	20,200	76,209	**76,200**
Tryon Rd (SR 1009) - US 1/US 64 to Regency Pkwy	42,900	0.40%	2.40%	0.71%	8,600	1.10%	13,500	53,415	**56,400**
Tryon Rd (SR 1009) - east of Regency Pkwy	34,800			0.78%	8,400	1.12%	11,200	47,866	**46,000**
Windy Rd - south of US 64	1,600			n/a	n/a	0.47%	200	n/a	**1,800**
Knollwood Dr - east of Laura Duncan Rd (SR 1308)	1,500			n/a	n/a	1.35%	600	n/a	**2,100**
Laura Duncan Rd (SR 1308) - south of Knollwood Dr	8,800			1.87%	7,700	1.96%	5,500	20,743	**14,300**
Laura Duncan Rd (SR 1308) - Knollwood Dr to US 64	9,100	-50.00%	-0.90%	1.87%	7,700	1.91%	5,500	20,743	**14,600**
Laura Duncan Rd (SR 1308) - north of US 64	11,300	5.70%	n/a	1.25%	5,800	1.50%	5,100	21,674	**16,400**
Laura Duncan Rd (SR 1308) - south of Pine Plaza Dr/Hendrick Toyota Dwy	8,600			1.25%	5,800	1.79%	4,800	21,674	**13,400**
Laura Duncan Rd (SR 1308) - north of Pine Plaza Dr/Hendrick Toyota Dwy	8,600			0.90%	3,600	1.13%	2,800	17,903	**11,400**
Hendrick Toyota Dwy - west of Laura Duncan Rd (SR 1308)	1,300			4.19%	4,100	0.30% (2)	100	6,342	**1,400**
Pine Plaza Dr - east of Lauran Duncan Rd (SR 1308)	3,500			1.44%	2,200	2.69% (2)	3,300	7,293	**6,800**
Knollwood Dr - south of US 64	1,200			2.21%	1,400	1.64% (2)	600	3,384	**1,800**
Costco Dwy - north of US 64	4,200			n/a	n/a	2.81%	4,200	n/a	**8,400**
Shepherds Vineyard Dr - south of US 64	1,800			n/a	n/a	0.81%	400	n/a	**2,200**
Shepherds Vineyard Dr - north of US 64	4,000			n/a	n/a	0.73%	800	n/a	**4,800**
Shepherds Vineyard Dr - west of Old Raleigh Rd (SR 1435)	2,600			n/a	n/a	0.83%	600	n/a	**3,200**
Old Raleigh Rd (SR 1435) - south of Shepherds Vineyard Dr	12,300	0.00%	-0.20%	0.85%	3,300	0.88%	3,000	17,328	**15,300**

Table C6: 2040 No-Build Traffic Volumes

Forecast Location	Forecast 2016 BY NB	Historic Growth Rate		Model Growth Rate (1)	Model Volume Change	Chosen Growth Rate (1)	Chosen Volume Change	Future Year No-Build Volumes	
	AADT	2005-2015	1996-2015	2015- 2040	2015-2040	2015-2040	2015-2040	2040 Model	2040 Forecast
Old Raleigh Rd (SR 1435) - Shepherds Vineyard Dr to Old Raleigh Rd (SR 1435)	12,300			0.85%	3,300	0.88%	3,000	17,328	**15,300**
Lake Pine Dr (SR 1521) - Old Raleigh Rd (SR 1435) to US 64	13,600			0.85%	3,300	0.94%	3,600	17,328	**17,200**
Lake Pine Dr (SR 1521) - north of US 64	17,300			2.45%	8,700	2.12%	11,900	19,145	**29,200**
Lake Pine Dr (SR 1521) - south of Pine Plaza Dr/MacGregor Pines Dr	13,600			2.45%	8,700	2.35%	10,700	19,145	**24,300**
Lake Pine Dr (SR 1521) - north of Pine Plaza Dr/MacGregor Pines Dr	12,700			2.50%	6,600	2.35%	10,000	14,367	**22,700**
Old Raleigh Rd (SR 1435) - east of Lake Pine Dr (SR 1521)/Old Raleigh Rd (SR 1435)	7,300			n/a	n/a	0.80%	1,600	n/a	**8,900**
Pine Plaza Dr - west of Lake Pine Dr (SR 1521)	4,600			2.33%	2,600	2.90% (2)	4,800	5,995	**9,400**
MacGregor Pines Dr - east of Lake Pine Dr (SR 1521)	1,500			2.86%	500	1.90% (2)	900	931	**2,400**
Autopark Blvd - south of US 64	2,000			n/a	n/a	0.73%	400	n/a	**2,400**
Old Raleigh Rd (SR 1435) - west of Mackenan Dr	8,000			n/a	n/a	0.82%	1,800	n/a	**9,800**
Old Raleigh Rd (SR 1435) - Mackenan Dr to Gregson Dr	4,800			n/a	n/a	0.90%	1,200	n/a	**6,000**
Edinburgh Dr - east of Gregson Dr	3,200			n/a	n/a	0.90%	800	n/a	**4,000**
Mackenan Dr - south of Old Raleigh Rd (SR 1435)	6,000			n/a	n/a	0.84%	1,400	n/a	**7,400**
Mackenan Dr - Old Raleigh Rd (SR 1435) to US 64	5,800			0.52%	1,200	0.64% (2)	1,000	9,536	**6,800**
Chalon Dr - north of US 64	2,200			-0.28%	-100	0.18% (2)	100	998	**2,300**
Gregson Dr - south of Old Raleigh Rd (SR 1435)/Edinburgh Dr	7,400			n/a	n/a	0.79%	1,600	n/a	**9,000**
Gregson Dr - Old Raleigh Rd (SR 1435)/Edinburgh Dr to US 64	8,000			0.75%	4,400	0.90% (2)	2,000	26,028	**10,000**
Edinburgh Dr - south of US 64	5,800			0.42%	600	0.76% (2)	1,200	6,209	**7,000**
Edinburgh Dr - north of US 64	2,700			0.58%	400	0.81% (2)	600	2,935	**3,300**
US 1 - south of US 64/Tryon Rd (SR 1009)	75,500	3.70%	3.40%	1.85%	43,200	1.80%	42,500	117,424	**118,000**
US 1/US 64 - north of US 64/Tryon Rd (SR 1009)	110,000	1.30%	3.50%	1.22%	36,300	1.20%	38,200	138,565	**148,200**
Regency Pkwy - south of US 64/Tryon Rd (SR 1009)	24,300			0.57%	3,800	0.60%	3,900	28,864	**28,200**

Notes:

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

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

Table C7: 2040 Build Traffic Volumes - Alternative 1

Forecast Location	2040 Model Volumes, Daily		Model Diversion Percent	Chosen Diversion Percent	Chosen Growth Rate [2]	2040 Forecast Volumes	
	No-Build	Build Alt-1			2015-2040	No-Build	Build Alt-1
US 64 - west of Windy Rd	50,826	61,313	20.63%	21.02%	2.18%	56,600	**68,500**
US 64 - Windy Rd to Laura Duncan Rd (SR 1308)	50,826	61,313	20.63%	21.02%	2.18%	56,600	**68,500**
US 64 - Laura Duncan Rd (SR 1308) to Knollwood Dr	48,426	59,062	21.96%	20.79%	2.29%	60,600	**73,200**
US 64 - Knollwood Dr to Shepherds Vineyard Dr	48,083	59,007	22.72%	22.11%	2.24%	57,000	**69,600**
US 64 - Shepherds Vineyard Dr to Lake Pine Dr (SR 1521)	48,083	59,007	22.72%	22.91%	2.29%	55,000	**67,600**
US 64 - Lake Pine Dr (SR 1521) to Autopark Blvd	56,016	65,360	16.68%	19.53%	2.05%	59,400	**71,000**
US 64 - Autopark Blvd to Chalon Dr/Mackenan Dr	56,016	65,360	16.68%	19.00%	2.02%	60,000	**71,400**
US 64 - Chalon Dr/Mackenan Dr to Gregson Dr	59,882	69,139	15.46%	17.38%	1.96%	63,300	**74,300**
US 64 - Gregson Dr to Edinburgh Dr	71,920	80,716	12.23%	15.01%	1.86%	69,300	**79,700**
US 64 - Edinburgh Dr to US 1/US 64	76,209	84,454	10.82%	12.86%	1.73%	76,200	**86,000**
Tryon Rd (SR 1009) - US 1/US 64 to Regency Pkwy	53,415	59,464	11.32%	10.28%	1.50%	56,400	**62,200**
Tryon Rd (SR 1009) - east of Regency Pkwy	47,866	50,283	5.05%	9.13%	1.48%	46,000	**50,200**
Windy Rd - south of US 64	n/a	n/a	n/a	0.00%	0.47%	1,800	**1,800**
Knollwood Dr - east of Laura Duncan Rd (SR 1308)	n/a	n/a	n/a	0.00%	1.35%	2,100	**2,100**
Laura Duncan Rd (SR 1308) - south of Knollwood Dr	20,743	21,553	3.90%	4.90%	2.16%	14,300	**15,000**
Laura Duncan Rd (SR 1308) - Knollwood Dr to US 64	20,743	21,553	3.90%	4.79%	2.10%	14,600	**15,300**
Laura Duncan Rd (SR 1308) - north of US 64	21,674	22,946	5.87%	6.10%	1.74%	16,400	**17,400**
Laura Duncan Rd (SR 1308) - south of Pine Plaza Dr/Hendrick Toyota Dwy	21,674	22,946	5.87%	6.72%	2.05%	13,400	**14,300**
Laura Duncan Rd (SR 1308) - north of Pine Plaza Dr/Hendrick Toyota Dwy	17,903	18,809	5.06%	6.14%	1.38%	11,400	**12,100**
Hendrick Toyota Dwy - west of Laura Duncan Rd (SR 1308)	*6,342*	*6,342*	0.00%	0.00% [1]	0.30%	1,400	**1,400**
Pine Plaza Dr - east of Lauran Duncan Rd (SR 1308)	*7,293*	*7,291*	-0.03%	0.00% [1]	2.69%	6,800	**6,800**
Knollwood Dr - south of US 64	*3,384*	*2,819*	-16.70%	0.00% [1]	1.64%	1,800	**1,800**
Costco Dwy - north of US 64	n/a	n/a	n/a	0.00%	2.81%	8,400	**8,400**
Shepherds Vineyard Dr - south of US 64	n/a	n/a	n/a	0.00%	0.81%	2,200	**2,200**
Shepherds Vineyard Dr - north of US 64	n/a	n/a	n/a	0.00%	0.73%	4,800	**4,800**
Shepherds Vineyard Dr - west of Old Raleigh Rd (SR 1435)	n/a	n/a	n/a	0.00%	0.83%	3,200	**3,200**
Old Raleigh Rd (SR 1435) - south of Shepherds Vineyard Dr	17,328	16,368	-5.54%	0.00%	0.88%	15,300	**15,300**

Table C7: 2040 Build Traffic Volumes - Alternative 1

Forecast Location	2040 Model Volumes, Daily		Model Diversion Percent	Chosen Diversion Percent	Chosen Growth Rate [2]	2040 Forecast Volumes	
	No-Build	Build Alt-1			2015-2040	No-Build	Build Alt-1
Old Raleigh Rd (SR 1435) - Shepherds Vineyard Dr to Old Raleigh Rd (SR 1435)	17,328	16,368	-5.54%	0.00%	0.88%	15,300	**15,300**
Lake Pine Dr (SR 1521) - Old Raleigh Rd (SR 1435) to US 64	17,328	16,368	-5.54%	0.00%	0.94%	17,200	**17,200**
Lake Pine Dr (SR 1521) - north of US 64	19,145	18,827	-1.66%	0.00%	2.12%	29,200	**29,200**
Lake Pine Dr (SR 1521) - south of Pine Plaza Dr/MacGregor Pines Dr	19,145	18,827	-1.66%	0.00%	2.35%	24,300	**24,300**
Lake Pine Dr (SR 1521) - north of Pine Plaza Dr/MacGregor Pines Dr	14,367	14,120	-1.72%	0.00%	2.35%	22,700	**22,700**
Old Raleigh Rd (SR 1435) - east of Lake Pine Dr (SR 1521)/Old Raleigh Rd (SR 1435)	n/a	n/a	n/a	0.00%	0.80%	8,900	**8,900**
Pine Plaza Dr - west of Lake Pine Dr (SR 1521)	*5,995*	*6,022*	0.45%	0.00% (1)	2.90%	9,400	**9,400**
MacGregor Pines Dr - east of Lake Pine Dr (SR 1521)	*931*	*932*	0.11%	0.00% (1)	1.90%	2,400	**2,400**
Autopark Blvd - south of US 64	n/a	n/a	n/a	0.00%	0.73%	2,400	**2,400**
Old Raleigh Rd (SR 1435) - west of Mackenan Dr	n/a	n/a	n/a	0.00%	0.82%	9,800	**9,800**
Old Raleigh Rd (SR 1435) - Mackenan Dr to Gregson Dr	n/a	n/a	n/a	0.00%	0.90%	6,000	**6,000**
Edinburgh Dr - east of Gregson Dr	n/a	n/a	n/a	0.00%	0.90%	4,000	**4,000**
Mackenan Dr - south of Old Raleigh Rd (SR 1435)	n/a	n/a	n/a	0.00%	0.84%	7,400	**7,400**
Mackenan Dr - Old Raleigh Rd (SR 1435) to US 64	*9,536*	*9,678*	1.49%	0.00% (1)	0.64%	6,800	**6,800**
Chalon Dr - north of US 64	*998*	*1,226*	22.85%	0.00% (1)	0.18%	2,300	**2,300**
Gregson Dr - south of Old Raleigh Rd (SR 1435)/Edinburgh Dr	n/a	n/a	n/a	0.00%	0.79%	9,000	**9,000**
Gregson Dr - Old Raleigh Rd (SR 1435)/Edinburgh Dr to US 64	*26,028*	*26,250*	0.85%	0.00% (1)	0.90%	10,000	**10,000**
Edinburgh Dr - south of US 64	*6,209*	*6,306*	1.56%	0.00% (1)	0.76%	7,000	**7,000**
Edinburgh Dr - north of US 64	*2,935*	*3,042*	3.65%	0.00% (1)	0.81%	3,300	**3,300**
US 1 - south of US 64/Tryon Rd (SR 1009)	117,424	115,833	-1.35%	-1.53%	1.74%	118,000	**116,200**
US 1/US 64 - north of US 64/Tryon Rd (SR 1009)	138,565	139,509	0.68%	0.00%	1.20%	148,200	**148,200**
Regency Pkwy - south of US 64/Tryon Rd (SR 1009)	28,864	29,373	1.76%	0.00%	0.60%	28,200	**28,200**

Notes:

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

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

Table C8: 2040 Build Traffic Volumes - Alternative 2

Forecast Location	2040 Model Volumes, Daily		Model Diversion Percent	Chosen Diversion Percent	Chosen Growth Rate [1]	2040 Forecast Volumes	
	No-Build	Build Alt-2			2015-2040	No-Build	Build Alt-2
US 64 - west of Windy Rd	50,826	63,513	24.96%	27.74%	2.40%	56,600	**72,300**
US 64 - Windy Rd to Laura Duncan Rd (SR 1308)	50,826	63,513	24.96%	27.74%	2.40%	56,600	**72,300**
US 64 - Laura Duncan Rd (SR 1308) to Knollwood Dr	48,426	61,658	27.32%	27.39%	2.50%	60,600	**77,200**
US 64 - Knollwood Dr to Shepherds Vineyard Dr	48,083	61,668	28.25%	29.12%	2.47%	57,000	**73,600**
US 64 - Shepherds Vineyard Dr to Lake Pine Dr (SR 1521)	48,083	61,668	28.25%	30.18%	2.52%	55,000	**71,600**
US 64 - Lake Pine Dr (SR 1521) to Autopark Blvd	56,016	68,317	21.96%	26.94%	2.30%	59,400	**75,400**
US 64 - Autopark Blvd to Chalon Dr/Mackenan Dr	56,016	68,317	21.96%	26.33%	2.27%	60,000	**75,800**
US 64 - Chalon Dr/Mackenan Dr to Gregson Dr	59,882	72,092	20.39%	24.64%	2.21%	63,300	**78,900**
US 64 - Gregson Dr to Edinburgh Dr	71,920	83,577	16.21%	21.07%	2.07%	69,300	**83,900**
US 64 - Edinburgh Dr to US 1/US 64	76,209	87,177	14.39%	19.16%	1.95%	76,200	**90,800**
Tryon Rd (SR 1009) - US 1/US 64 to Regency Pkwy	53,415	59,480	11.35%	15.96%	1.70%	56,400	**65,400**
Tryon Rd (SR 1009) - east of Regency Pkwy	47,866	50,982	6.51%	13.48%	1.64%	46,000	**52,200**
Windy Rd - south of US 64	n/a	n/a	n/a	0.00%	0.47%	1,800	**1,800**
Knollwood Dr - east of Laura Duncan Rd (SR 1308)	n/a	n/a	n/a	0.00%	1.35%	2,100	**2,100**
Laura Duncan Rd (SR 1308) - south of Knollwood Dr	20,743	21,416	3.24%	4.90%	2.16%	14,300	**15,000**
Laura Duncan Rd (SR 1308) - Knollwood Dr to US 64	20,743	21,416	3.24%	4.79%	2.10%	14,600	**15,300**
Laura Duncan Rd (SR 1308) - north of US 64	21,674	23,049	6.34%	6.10%	1.74%	16,400	**17,400**
Laura Duncan Rd (SR 1308) - south of Pine Plaza Dr/Hendrick Toyota Dwy	21,674	23,049	6.34%	6.72%	2.05%	13,400	**14,300**
Laura Duncan Rd (SR 1308) - north of Pine Plaza Dr/Hendrick Toyota Dwy	17,903	18,998	6.12%	6.14%	1.38%	11,400	**12,100**
Hendrick Toyota Dwy - west of Laura Duncan Rd (SR 1308)	*6,342*	*6,336*	-0.09%	0.00% (1)	0.30%	1,400	**1,400**
Pine Plaza Dr - east of Lauran Duncan Rd (SR 1308)	*7,293*	*7,126*	-2.29%	0.00% (1)	2.69%	6,800	**6,800**
Knollwood Dr - south of US 64	*3,384*	*2,897*	-14.39%	0.00% (1)	1.64%	1,800	**1,800**
Costco Dwy - north of US 64	n/a	n/a	n/a	0.00%	2.81%	8,400	**8,400**
Shepherds Vineyard Dr - south of US 64	n/a	n/a	n/a	0.00%	0.81%	2,200	**2,200**
Shepherds Vineyard Dr - north of US 64	n/a	n/a	n/a	0.00%	0.73%	4,800	**4,800**
Shepherds Vineyard Dr - west of Old Raleigh Rd (SR 1435)	n/a	n/a	n/a	0.00%	0.83%	3,200	**3,200**
Old Raleigh Rd (SR 1435) - south of Shepherds Vineyard Dr	17,328	16,216	-6.42%	0.00%	0.88%	15,300	**15,300**

Table C8: 2040 Build Traffic Volumes - Alternative 2

Forecast Location	2040 Model Volumes, Daily		Model Diversion Percent	Chosen Diversion Percent	Chosen Growth Rate [1]	2040 Forecast Volumes	
	No-Build	Build Alt-2			2015-2040	No-Build	Build Alt-2
Old Raleigh Rd (SR 1435) - Shepherds Vineyard Dr to Old Raleigh Rd (SR 1435)	17,328	16,216	-6.42%	0.00%	0.88%	15,300	**15,300**
Lake Pine Dr (SR 1521) - Old Raleigh Rd (SR 1435) to US 64	17,328	16,216	-6.42%	0.00%	0.94%	17,200	**17,200**
Lake Pine Dr (SR 1521) - north of US 64	19,145	19,010	-0.71%	0.00%	2.12%	29,200	**29,200**
Lake Pine Dr (SR 1521) - south of Pine Plaza Dr/MacGregor Pines Dr	19,145	19,010	-0.71%	0.00%	2.35%	24,300	**24,300**
Lake Pine Dr (SR 1521) - north of Pine Plaza Dr/MacGregor Pines Dr	14,367	14,101	-1.85%	0.00%	2.35%	22,700	**22,700**
Old Raleigh Rd (SR 1435) - east of Lake Pine Dr (SR 1521)/Old Raleigh Rd (SR 1435)	n/a	n/a	n/a	0.00%	0.80%	8,900	**8,900**
Pine Plaza Dr - west of Lake Pine Dr (SR 1521)	*5,995*	*6,189*	3.24%	0.00% (1)	2.90%	9,400	**9,400**
MacGregor Pines Dr - east of Lake Pine Dr (SR 1521)	*931*	*933*	0.21%	0.00% (1)	1.90%	2,400	**2,400**
Autopark Blvd - south of US 64	n/a	n/a	n/a	0.00%	0.73%	2,400	**2,400**
Old Raleigh Rd (SR 1435) - west of Mackenan Dr	n/a	n/a	n/a	0.00%	0.82%	9,800	**9,800**
Old Raleigh Rd (SR 1435) - Mackenan Dr to Gregson Dr	n/a	n/a	n/a	0.00%	0.90%	6,000	**6,000**
Edinburgh Dr - east of Gregson Dr	n/a	n/a	n/a	0.00%	0.90%	4,000	**4,000**
Mackenan Dr - south of Old Raleigh Rd (SR 1435)	n/a	n/a	n/a	0.00%	0.84%	7,400	**7,400**
Mackenan Dr - Old Raleigh Rd (SR 1435) to US 64	*9,536*	*9,678*	1.49%	0.00% (1)	0.64%	6,800	**6,800**
Chalon Dr - north of US 64	*998*	*1,279*	28.16%	0.00% (1)	0.18%	2,300	**2,300**
Gregson Dr - south of Old Raleigh Rd (SR 1435)/Edinburgh Dr	n/a	n/a	n/a	0.00%	0.79%	9,000	**9,000**
Gregson Dr - Old Raleigh Rd (SR 1435)/Edinburgh Dr to US 64	*26,028*	*26,258*	0.88%	0.00% (1)	0.90%	10,000	**10,000**
Edinburgh Dr - south of US 64	*6,209*	*6,306*	1.56%	0.00% (1)	0.76%	7,000	**7,000**
Edinburgh Dr - north of US 64	*2,935*	*3,045*	3.75%	0.00% (1)	0.81%	3,300	**3,300**
US 1 - south of US 64/Tryon Rd (SR 1009)	117,424	115,770	-1.41%	-1.61%	1.74%	118,000	**116,100**
US 1/US 64 - north of US 64/Tryon Rd (SR 1009)	138,565	139,770	0.87%	1.28%	1.25%	148,200	**150,100**
Regency Pkwy - south of US 64/Tryon Rd (SR 1009)	28,864	29,419	1.92%	0.00%	0.60%	28,200	**28,200**

Notes:

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

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

APPENDIX D:

MODIFICATIONS TO TRIANGLE REGIONAL MODEL

The Triangle Regional Travel Demand Model was reviewed prior to utilizing it as a tool for the traffic forecast.

2040 Future Year Network Review

The first step was to determine if the changes included in the fiscally constrained MTP have been properly included in the model. The following projects that are in proximity to the study area are correctly modeled in the future Model network:

- MTP Project F5 – NC 540 Tri-Ex (Phase IV), from NC 55 Bypass to US 401 (South) – New freeway location (2020)
- MTP Project A166 – Center St/1010, from US 1 to Apex Peakway – Widen from 2 to 4 lanes (2030)
- MTP Project F15a1 – US 64/Laura Duncan Interchange (New) – New interchange (2030)
- MTP Project F15a2 – US 64/Lake Pine Interchange (New) – New interchange (2030)
- MTP Project F15a – US 64, from US 1/64 to I-540 – Widen from 4 to 6 lanes and upgrade to Expressway (2040)
- MTP Project A410 – Lake Pine Drive/Old Raleigh Road, from Cary Parkway to Apex Peakway – Widen from 2 to 4 lanes (2040)
- MTP Project F110 – US 1, from US 64 to NC 540 – Widen from 4 lanes to 6 lanes (2040)
- MTP Project A187b – Apex Peakway (East) from Laura Duncan Road to NC 55 – New Location 4-lane median divided roadway (2040)
- MTP Project A28b – Davis Drive, from US 64 to Farm Pond Road – Widen from 2 to 4 lanes (2040)

After consultation with officials from CAMPO, it was determined that the following project needed modification in the future Model network to correctly reflect the proposed project parameters of the interim solution:

- MTP Project A380 – US 64 (superstreet), from US 1 to Laura Duncan Road – Construct superstreet (2030)

This is the traffic forecasting subject project, so it was especially important to model correctly.

In addition, MTP Project F15a would not be modeled for the forecast as it is the full build-out project that would replace the interim solution.

Project Corridor Model Descriptions

The project study corridor has two future build conditions: the interim scenario (A380) is Alternative 1, and an expressway version of the interim scenario is Alternative 2. Both scenarios were included in the traffic forecast for the year 2040.

Alternative 1 – Interim Project Scenario

The interim scenario represents the conditions for MTP Project A380, which is described in the MTP as an upgrade of US 64 to a superstreet from the US 1/64 junction to Laura Duncan Blvd. Following discussion with officials from CAMPO, it was decided to model this project as a superstreet, widened from 4 to 6 lanes, from the US 1/64 junction to Lake Pine Drive and as an expressway, without widening,

from Lake Pine Drive to NC 540. The superstreet section would be modeled with a posted speed of 60 mph, and the expressway section would have a posted speed of 65 mph.

Alternative 2 – Expressway Scenario

The Alternative 2 scenario represents an expressway version of the interim project, which would make the six-lane superstreet into a six-lane expressway. In addition, in order to model the corridor upgrade to an expressway, the posted speed was increased from 60 mph to 65 mph and the traffic signals were removed from consideration.

Project Model Coding

Network Coding

The Triangle Regional Model does not have a list of discrete roadway facility types that describe the model's network links. Instead, a combination of five separate parameters are used to determine each link's facility type code. Each facility type code can be used for multiple combinations of parameters. The facility type code is then found in a look-up table, from which capacities, volume-delay parameters, and other speed-decay values are read.

The roadway parameters that are used to determine the facility type code are:

- Number of lanes,
- Posted speed,
- Median/left-turn treatment,
- Signal density, and
- "Special," which is a hierarchical roadway descriptor.

No-Build Scenario

The no-build (existing) scenario for US 64 was modeled as:

- 4 lanes
- 55 mph
- Fully-divided median
- Signal density of 2-3 signals per mile
- Special = all other highway link types

These parameters equate to a facility type code of 33. The speed-capacity values from the lookup table for facility type code 33 are:

- Capacity = 1,488 vphpl (vehicles per hour per lane)
- FFSpeed = 60
- CongSpd = 60.0
- Alpha = 10.00
- Beta = 1.00

Alternative 1 – Interim Project Scenario

As described above, the interim project scenario contained two different treatments along US 64, with a superstreet from US 1/64 to Lake Pine Drive and a limited expressway from Lake Pine Drive to NC 540. The combination of roadway parameters developed for the superstreet, in consultation with CAMPO staff, did not currently exist within the TRM, nor did there appear to be any existing superstreet

designations to compare to. Superstreets are not one of the "special" designations as a link parameter. Therefore, a new facility type code was created for the US 64 superstreet. The capacity of the superstreet lanes should be greater than the existing condition in order to reflect the greater vehicle throughput possible with the operation of the superstreet. To reflect this, the per-lane capacity for the superstreet was 15 percent greater than the existing conditions.

The superstreet portion of the interim project scenario for US 64 was modeled as:

- 6 lanes
- 60 mph
- Fully-divided median
- Irrelevant signal density
- Special = suburban freeway/expressway

These parameters equate to the new facility type code of 131. The speed-capacity values from the lookup table for facility type code 131 are:

- Capacity = 1,711 vphpl
- FFSpeed = 65
- CongSpd = 65.0
- Alpha = 10.00
- Beta = 1.00

The limited expressway portion of the US 64 corridor was able to use an existing facility type code. The limited expressway portion of the interim project scenario for US 64 was modeled as:

- 4 lanes
- 65 mph
- Fully-divided median
- Irrelevant signal density
- Special = suburban freeway

These parameters equate to a facility type code of 12. The speed-capacity values from the lookup table for facility type code 12 are:

- Capacity = 2,141 vphpl
- FFSpeed = 70
- CongSpd = 70.0
- Alpha = 10.00
- Beta = 1.00

Alternative 2 – Expressway Scenario

The expressway scenario for US 64 was modeled as:

- 6 lanes
- 65 mph
- Fully-divided median
- Irrelevant signal density
- Special = suburban freeway

These parameters equate to a facility type code of 15. The speed-capacity values from the lookup table for facility type code 15 are:

- Capacity = 2,141 vphpl
- FFSpeed = 70
- CongSpd = 70.0
- Alpha = 10.00
- Beta = 1.00

Model Parameter Table Coding

The TRM contains multiple parameter look-up tables in the "Parameters" folder within the "Input" folder of each project scenario directory. Three look-up tables were re-coded in order to model the interim project scenario.

FacilityType.bin

The FacilityType.bin file is used to determine the facility type of each link based on the number of lanes, posted speed, median, signal density, and special designation (as described above). A new row was inserted into the table to describe the superstreet parameters with a new facility type code of 131 (again, as described above). The only other value not previously discussed is the Bus Speed Category. A Bus Speed Category value of 4 was used for the new superstreet parameter combination and facility type, which matched the same value used for the existing and full build-out facility type codes.

SpeedCapacity.bin

The SpeedCapacity.bin file is a look-up table. The facility type code is found in the table, and capacities, volume-delay parameters, and other speed-decay values are read. A new row was inserted into the table for facility type code 131 with the parameters as described above.

CapacityFactor.bin

The CapacityFactor.bin file is another look-up table that includes the factors for expanding the peak hour capacities into peak period capacities for each facility type. Three rows were inserted into the table for facility type code 131, one for each area type. The AM factor is 3.50, the PM factor is 3.50, and the Off-peak factor is 7.14. These factors are the same for all facility types.

A Note on Running the TRM

All model runs of the TRM were made with 8 feedback iteration loops.

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