



## MEMORANDUM

**TO:** Thad F. Duncan PE, CPM, NCDOT Division 12

**FROM:** Trent M. Moody, PE, STV Engineers, Inc.

**DATE:** May 14, 2018

**SUBJECT:** U-5965 Intersection US 29 / US 74 and NC 274 – Growth Rate Estimation Memo

### Introduction

Under NCDOT STIP U-5965, intersection improvements via the construction of turn lanes at the intersection of US 29 / US 74 (Franklin Boulevard) and NC 274 (South Broad Street) are proposed. The project is located in Gaston County within the limits of Gastonia, NC. This memo summarizes growth trends from historic annual average daily traffic (AADT) information and Metrolina Regional Travel Demand Model (MRM18v1.0). The proposed growth rates for all of the approaches within the study intersection are to be used in the capacity analysis for this project. This memo was reviewed by the NCDOT Transportation Planning Division and approved on May 14, 2018.

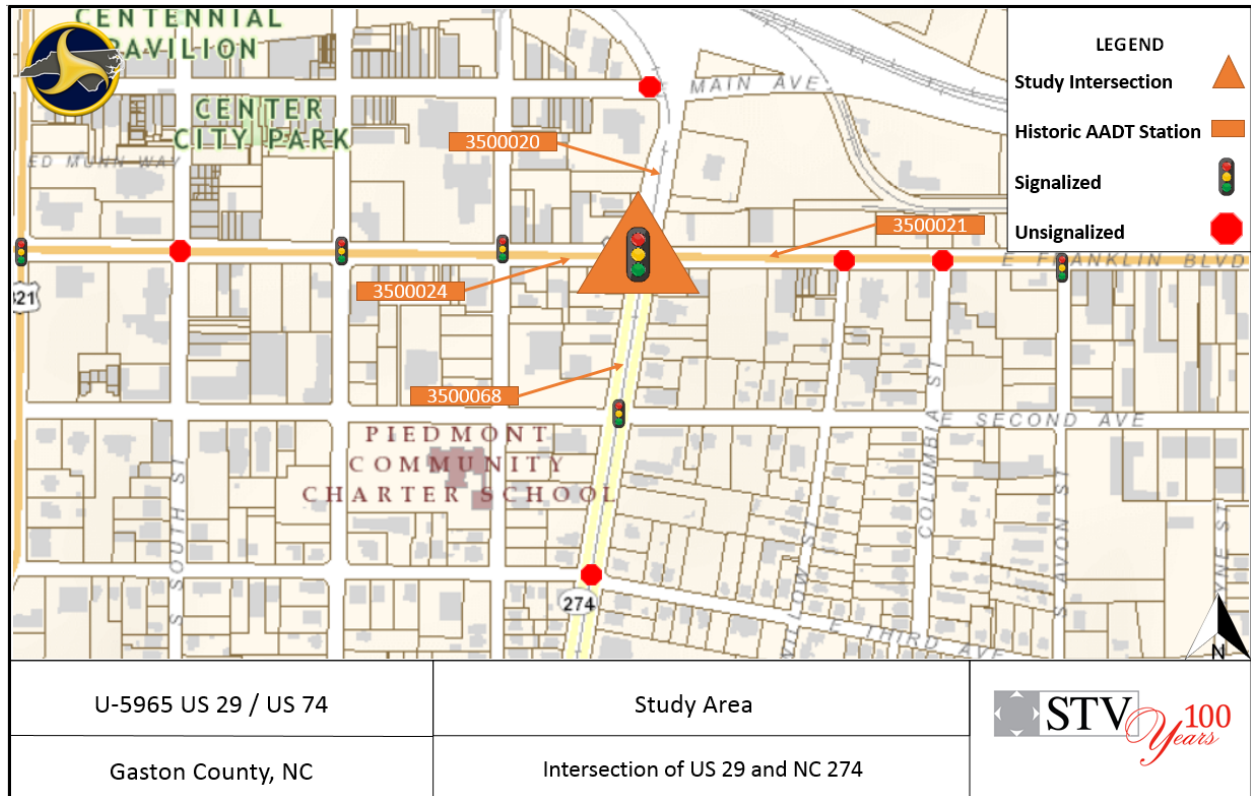
US 29 / US 74 (Franklin Boulevard) is a principal arterial that runs east-west in the study area. The cross-section is a five lane undivided roadway with a speed limit of 35 mph. NC 274 is named North Broad Street north of US 29 / US 74 and is classified as a local road, it is named South Broad Street south of US 29 / US 74 and is classified as a principal arterial. The segment is divided by rail that runs north-south, parallel with NC 274 and crosses US 29 / US 74 through the signalized intersection with railroad preemption.

Historic AADT information from NCDOT Traffic Survey Group (TSG) was obtained for the following locations (location numbers in parenthesis):

- S Broad St S of E Main Ave (3500020)
- NC 274 N of E 3<sup>rd</sup> Ave (3500068)
- US 29 / US 74 (Franklin Boulevard) E of Oakland Street (3500024)
- US 29 / US 74 (Franklin Boulevard) E of NC 274 (3500021)

Refer to Figure 1 for a map of the study intersection and NCDOT AADT station locations.

**Figure 1: Study Intersection and NCDOT AADT Locations**



**Historic AADT Information and Traffic Growth Projections**

Growth rates in this memo are derived from information from NCDOT’s Traffic Forecast Utility (TFU) spreadsheet (utilizing historic AADT information), and the MRM. The most recent historic AADTs available are from 2016, therefore a short term Compounded Annual Growth Rate (CAGR) (from 2006-2016) and long term CAGR (from 1995-2016) were calculated for the four AADT locations. The “AADT Trend Analysis” from the TFU spreadsheet also calculated CAGRs from the linear and exponential trend lines using NCDOT AADTs available since 1995.

The historic AADT data with CAGRs are presented in Table 1.

**Table 1: CAGR Rates from Historic AADTs**

ID	Location	AADT Information				CAGR (%)		Linear*		Exponential*	
		1995 AADT	2006 AADT	2008 AADT	2016 AADT	10 Yr (2006-2016)	21 Yr (1995-2016)	Rate (%)	R-Sq. (0-1)	Rate (%)	R-Sq. (0-1)
3500020	S Broad Street south of Main Avenue	11000	11000	12000	13000	1.68%	0.80%	2.03%	0.3371	3.24%	0.3018
3500068	S Broad Street north of 3rd Avenue	13000	13000	13000	14000	0.74%	0.35%	0.66%	0.1273	0.82%	0.1757
3500031	US 29 / US 74 (Franklin Boulevard) west NC 274	25000	17000	16000	16000	-0.60%	-2.10%	-1.90%	0.7799	-1.86%	0.8054
3500024	US 29 / US 74 (Franklin Boulevard) east of NC 274	24000	17000	15000	16000	-0.60%	-1.91%	-2.37%	0.7555	-2.37%	0.7587
3500021	S Broad Street south of Main Avenue	23000	18000	18000	17000	-0.57%	-1.43%	-1.30%	0.8575	-1.27%	0.873

Sources: Historic AADT information from NCDOT Traffic Survey Group

\*Statistical results calculated by NCDOT's Traffic Forecasting Utility Spreadsheet (TFU).

Analysis of the historic AADT data indicate NC 274 experiences a lower growth rate long term compared to short term values. The northern leg of the intersection ranges 0.80% - 1.68% and the southern leg ranges 0.35% - 0.74% increase in growth. The opposite is the case for US 29 / US 74, where decrease in growth is higher in long term CAGR values. The western leg of the intersection witnesses a decrease in growth that ranges in 0.60% - 1.91% and the eastern leg shows ranges of 0.57% - 1.43% decrease in growth. Further information was compiled from other sources in an attempt to accurately calculate future growth rates.

The Metrolina Regional Model (MRM18v1.0) was consulted in development of this memorandum. Highway networks, transit networks, socio-economic data, and external trip tables for the base and future years are included in the official model files. Base and future years utilized within the model were 2015 and 2045, respectively. The future year network was reviewed to ensure that fiscally constrained projects as included within the area’s MTP were incorporated within the model. The project is located within the boundaries of the Gaston-Cleveland-Lincoln Metropolitan Planning Organization (GCLMPO). The travel demand model is fiscally constrained to reflect the assumptions of the corresponding MTP. GCLMPO Metropolitan Transportation Plan 2018-2040 includes these projects that may affect the proposed project. The 2015 base year model was reviewed for the project area and the surrounding areas and then compared to the 2045 future year model. Table 2 illustrates the CAGRs as observed from the MRM when comparing base and future conditions. Outputs from the MRM are also included as an attachment.

**Table 2: Metrolina Regional Model Data**

Location	2015 MRM AADT	2045 MRM AADT	CAGR (%)
S Broad Street south of Main Avenue	15600	17,600	0.40%
S Broad Street north of 3rd Avenue	14600	18,100	0.72%
US 29 / US 74 (Franklin Boulevard) west NC 274	13800	16400	0.58%
US 29 / US 74 (Franklin Boulevard) east of NC 274	12200	13400	0.31%

### Proposed CAGRs

This section describes the proposed CAGRs to be utilized with the capacity analysis and justification for the rates.

#### US 29 / US 74 (E Franklin Boulevard)

A CAGR of **0.50%** is proposed. While the historic AADT’s along US 29 / US 74 illustrate a decrease in traffic of 1.43% over a long-term period, and a decrease in traffic of 0.57% in the short-term period, this proposition is based on the growth illustrated within the MRM when comparing base year and future year conditions.

#### NC 274 (Broad Street)

A CAGR of **0.75%** is proposed on NC 274. CAGR values were observed to grow at a 0.72% east of US 29 / US 74 according to the Metrolina Model. This recommendation coincides with short-term historic CAGRs along NC 274 (Broad Street) north of 3<sup>rd</sup> Avenue (0.74%) and long-term historic CAGRs along S Broad Street south of Main Avenue (0.80%).

Table 3 summarizes the CAGR data utilized in this estimation memo and includes the recommended growth rates for the study intersection legs.

**Table 3: CAGR Summary**

Location	Historic AADT CAGR 10-yr (%)	Historic AADT CAGR 21-yr (%)	MRM CAGR (%)	Recommended Growth %
S Broad Street south of Main Avenue	1.68%	0.80%	0.40%	<b>0.75%</b>
S Broad Street north of 3rd Avenue	0.74%	0.35%	0.72%	
US 29 / US 74 (Franklin Boulevard) west NC 274	-0.60%	-1.91%	0.58%	<b>0.50%</b>
US 29 / US 74 (Franklin Boulevard) east of NC 274	-0.57%	-1.43%	0.31%	

If you would like to discuss this memo with me, please contact me at your earliest convenience at 704.285.7493 or trent.moody@stvinc.com.

**Attachments:**

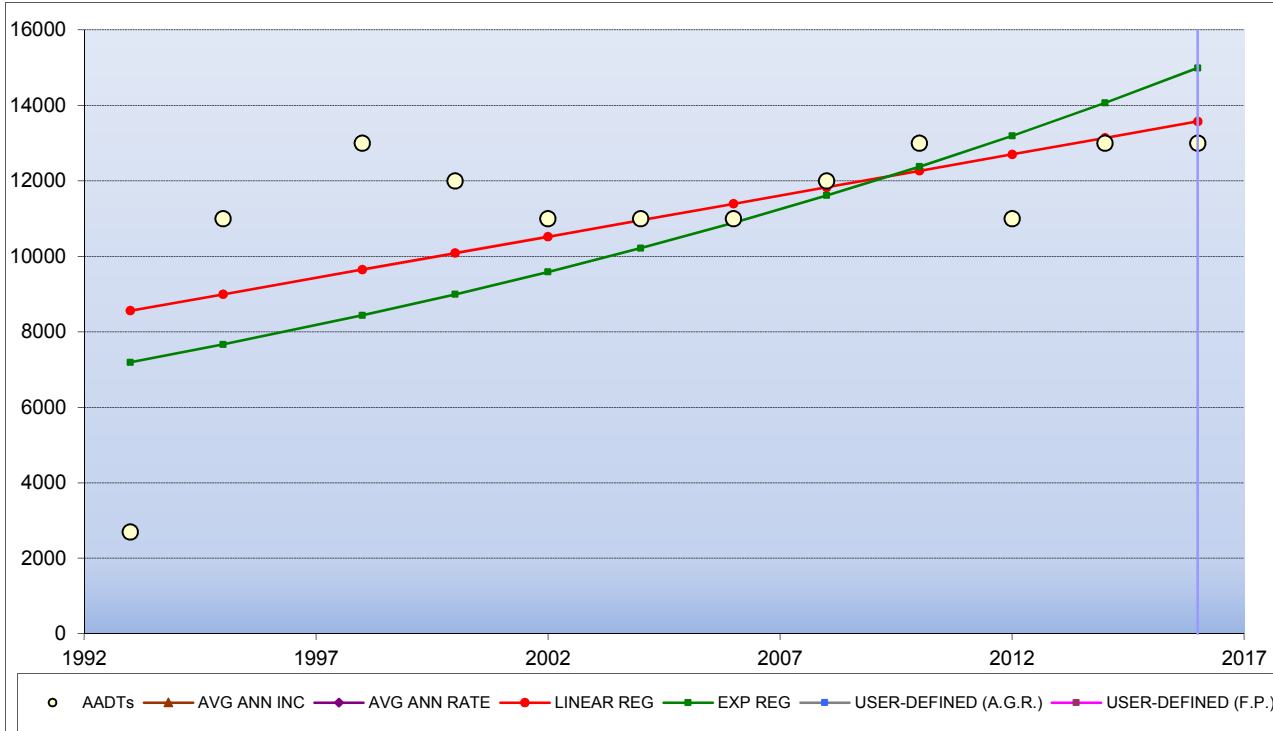
- Historic NCDOT AADT Information
- TFU AADT Trend Analysis Charts
- Metrolina Regional Model Outputs

**Historic AADT Estimates**  
U-5965 Growth Rate Estimation

ID #	Location Description	Unique ID	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	
1	S BROAD ST S OF E MAIN AVE	3500020			13000		13000		11000		13000		12000		11000		11000		11000		12000		13000		11000		2700				
2	NC 274 N OF E 3RD AVE	3500068			14000		13000		13000		13000		13000		13000		14000		13000		16000		16000		13000		10000				9000
3	US 29-74/NC 274 (FRANKLIN AVE) E OF S MARIETTA ST	3500031			16000		15000		14000		15000		16000		17000		18000		19000		19000		21000				25000		21000		21000
4	US 29-74/NC 274 (FRANKLIN AVE) E OF N OAKLAND ST	3500024			16000		15000		15000		15000		15000		17000		24000		19000		22000		24000				24000				24000
5	US 29-74 (FRANKLIN AVE) E OF NC 274	3500021			17000				17000				18000		18000		18000		19000		20000		22000				23000		22000		22000

# AADT TREND ANALYSIS

## #1 -- S BROAD ST S OF E MAIN AVE



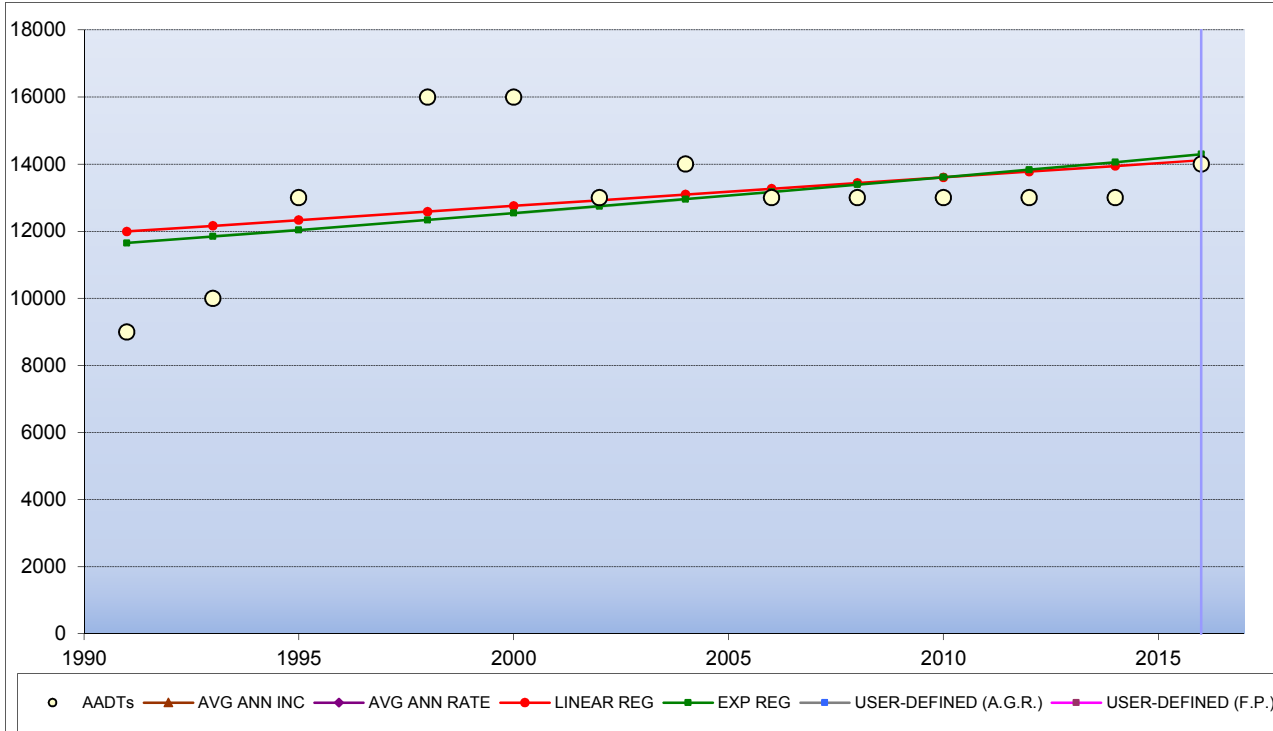
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Year	AADT	LINEAR REG:	218.2
1993	2700	LINEAR %:	2.03%
1995	11000	EXPONENTIAL REG:	3.24%
1998	13000		
2000	12000		
2002	11000	<b>R-SQUARED</b>	
2004	11000	LINEAR:	0.3371
2006	11000	EXPONENTIAL:	0.3018
2008	12000		
2010	13000		
2012	11000	<b>NUMBER OF DATA POINTS:</b>	
2014	13000		12
2016	13000		

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		#3 2030
		#4 2035
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION / TRANSP. PLANNING BRANCH		#5 2040

FUTURE PROJECTIONS:			
Avg Ann Inc	Avg Ann Rate	Linear Reg	Exp Reg
13000	13000	13578	14993
16583	22458	15323	19357
17030	24046	15541	19985
19270	33840	16632	23444
21509	47623	17723	27503
23748	67019	18814	32263

# AADT TREND ANALYSIS

## #2 -- NC 274 N OF E 3RD AVE



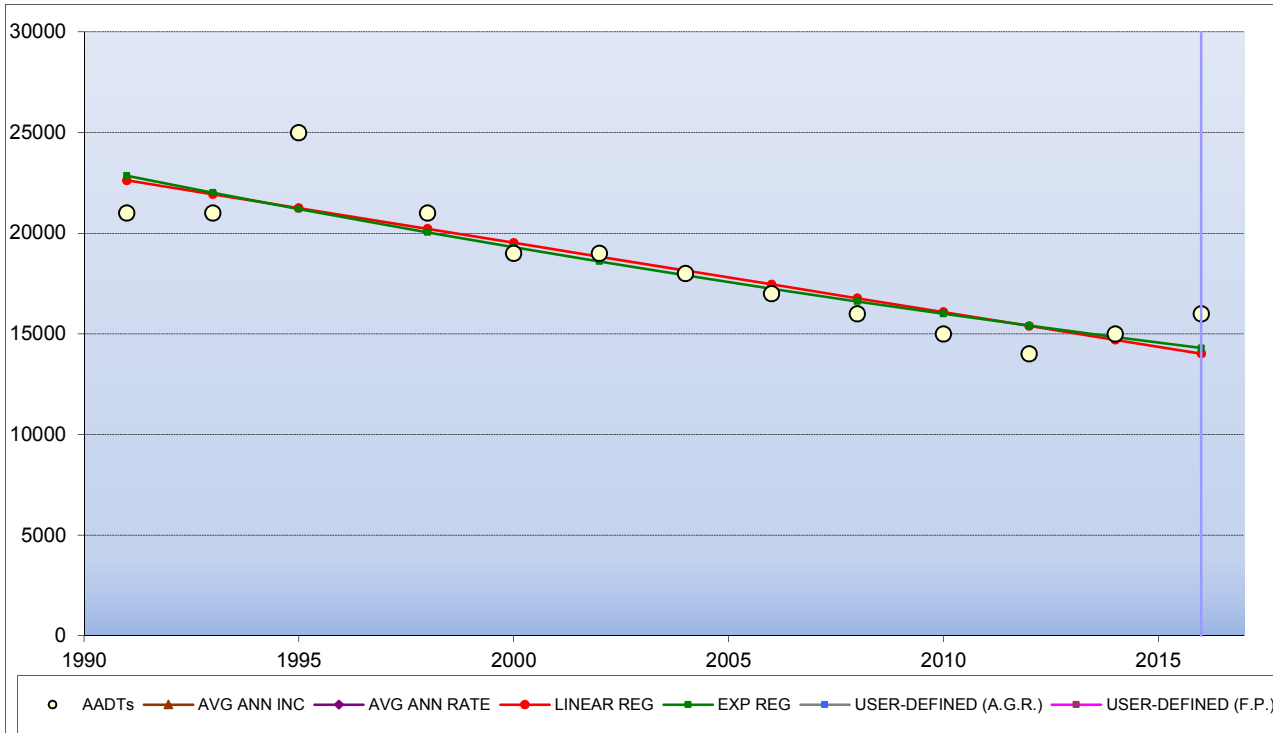
HISTORIC DATA		STATISTICAL RESULTS	
Year	AADT	LINEAR REG:	85.1
1991	9000	LINEAR %:	0.66%
1993	10000	EXPONENTIAL REG:	0.82%
1995	13000		
1998	16000		
2000	16000	<b>R-SQUARED</b>	
2002	13000	LINEAR:	0.1273
2004	14000	EXPONENTIAL:	0.1757
2006	13000		
2008	13000		
2010	13000	<b>NUMBER OF DATA POINTS:</b>	
2012	13000		13
2014	13000		
2016	14000		

SHOW HISTORIC DATA:	SHOW FUTURE DATA:	SHOW STATION #:
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		#3
		#4
		#5
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION / TRANSP. PLANNING BRANCH		<b>2016</b>
		<b>2024</b>
		<b>2025</b>
		<b>2030</b>
		<b>2035</b>
		<b>2040</b>

FUTURE PROJECTIONS:			
Avg Ann Inc	Avg Ann Rate	Linear Reg	Exp Reg
14000	14000	14117	14294
15600	16126	14798	15261
15800	16414	14883	15386
16800	17930	15308	16029
17800	19587	15734	16698
18800	21396	16159	17395

# AADT TREND ANALYSIS

## #3 -- US 29-74/NC 274 (FRANKLIN AVE) E OF S MARIETTA ST



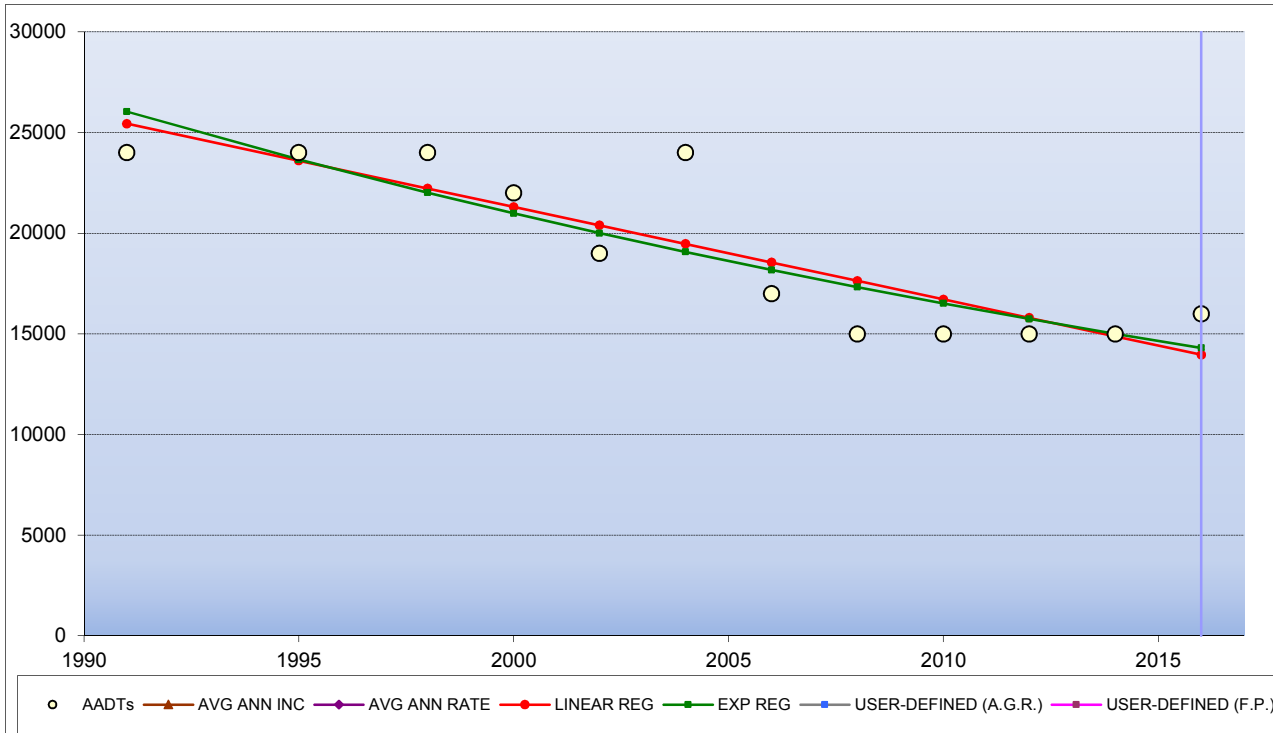
HISTORIC DATA		STATISTICAL RESULTS	
Year	AADT	LINEAR REG:	-344.6
1991	21000	LINEAR %:	-1.90%
1993	21000	EXPONENTIAL REG:	-1.86%
1995	25000		
1998	21000		
2000	19000	<b>R-SQUARED</b>	
2002	19000	LINEAR:	0.7799
2004	18000	EXPONENTIAL:	0.8054
2006	17000		
2008	16000		
2010	15000	<b>NUMBER OF DATA POINTS:</b>	
2012	14000		13
2014	15000		
2016	16000		

SHOW HISTORIC DATA:	SHOW FUTURE DATA:	SHOW STATION #:
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<input checked="" type="checkbox"/> EXPONENTIAL REGRESSION	<input type="checkbox"/> EXPONENTIAL REGRESSION	<b>FUT YRS:</b>
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<input checked="" type="checkbox"/> HISTORIC DATA	<input type="checkbox"/> USER-DEFINED (A.G.R.)	#2
		#3
		#4
		#5
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION / TRANSP. PLANNING BRANCH		<b>2016</b>
		<b>2024</b>
		<b>2025</b>
		<b>2030</b>
		<b>2035</b>
		<b>2040</b>

FUTURE PROJECTIONS:			
Avg Ann Inc	Avg Ann Rate	Linear Reg	Exp Reg
16000	16000	14017	14297
14400	14667	11260	12304
14200	14508	10916	12075
13200	13740	9193	10993
12200	13013	7470	10008
11200	12324	5747	9112

# AADT TREND ANALYSIS

## #4 -- US 29-74/NC 274 (FRANKLIN AVE) E OF N OAKLAND ST



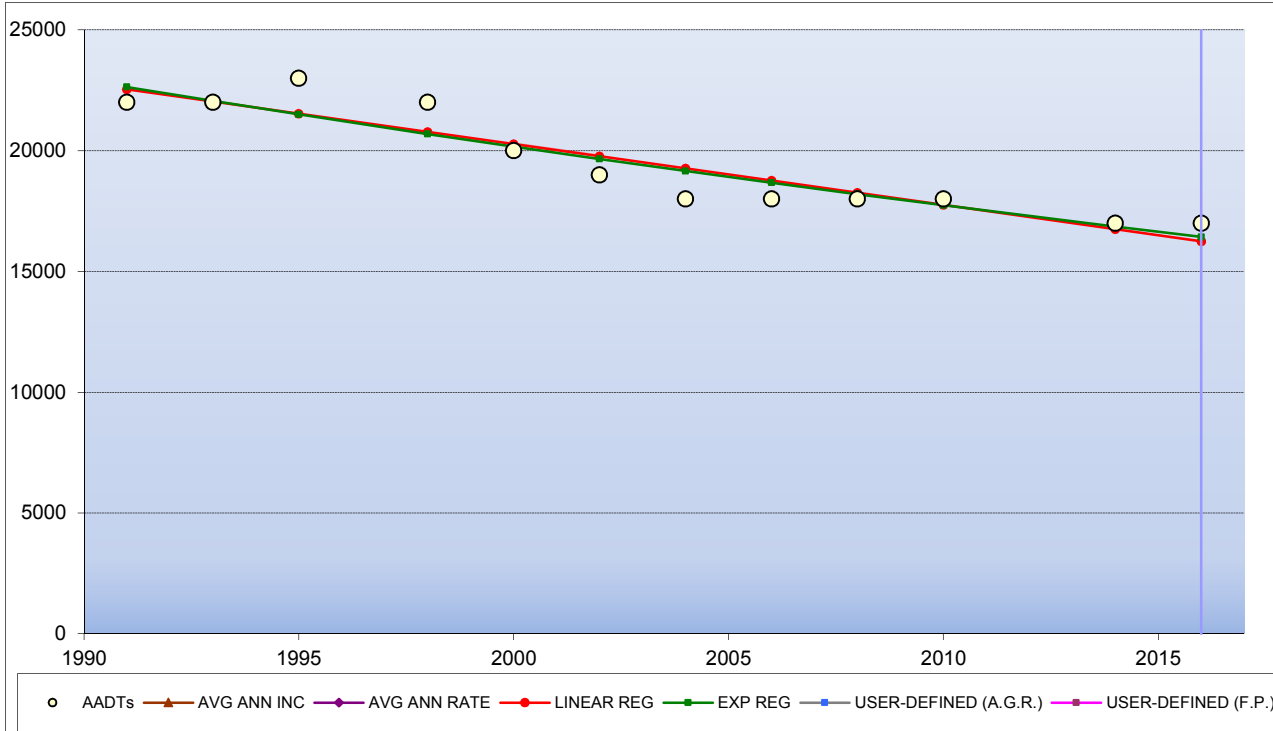
HISTORIC DATA		STATISTICAL RESULTS	
Year	AADT	LINEAR REG:	-459.4
1991	24000	LINEAR %:	-2.37%
1995	24000	EXPONENTIAL REG:	-2.37%
1998	24000		
2000	22000		
2002	19000	R-SQUARED	
2004	24000	LINEAR:	0.7555
2006	17000	EXPONENTIAL:	0.7587
2008	15000		
2010	15000		
2012	15000	NUMBER OF DATA POINTS:	
2014	15000		12
2016	16000		

SHOW HISTORIC DATA:	SHOW FUTURE DATA:	SHOW STATION #:
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<input checked="" type="checkbox"/> EXPONENTIAL REGRESSION	<input type="checkbox"/> EXPONENTIAL REGRESSION	FUT YRS:
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		#3
		#4
		#5
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION / TRANSP. PLANNING BRANCH		2016
		2024
		2025
		2030
		2035
		2040

FUTURE PROJECTIONS:			
Avg Ann Inc	Avg Ann Rate	Linear Reg	Exp Reg
16000	16000	13960	14303
13440	14053	10285	11807
13120	13827	9826	11527
11520	12750	7529	10225
9920	11757	5232	9070
8320	10841	2935	8046

# AADT TREND ANALYSIS

#5 -- US 29-74 (FRANKLIN AVE) E OF NC 274



HISTORIC DATA		STATISTICAL RESULTS	
Year	AADT	LINEAR REG:	-251.8
1991	22000	LINEAR %:	-1.30%
1993	22000	EXPONENTIAL REG:	-1.27%
1995	23000		
1998	22000		
2000	20000	R-SQUARED	
2002	19000	LINEAR:	0.8575
2004	18000	EXPONENTIAL:	0.8730
2006	18000		
2008	18000		
2010	18000	NUMBER OF DATA POINTS:	
2014	17000		12
2016	17000		

SHOW HISTORIC DATA:	SHOW FUTURE DATA:	SHOW STATION #:
<input checked="" type="checkbox"/> LINEAR REGRESSION	<input type="checkbox"/> LINEAR REGRESSION	5- US 29-74 (FRANKLIN AVE) E OF NC 274
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<input checked="" type="checkbox"/> HISTORIC DATA	<input type="checkbox"/> USER-DEFINED (A.G.R.)	#2
		#3
		#4
		#5
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION / TRANSP. PLANNING BRANCH		2016
		2024
		2025
		2030
		2035
		2040

FUTURE PROJECTIONS:			
Avg Ann Inc	Avg Ann Rate	Linear Reg	Exp Reg
17000	17000	16248	16429
15400	15654	14234	14827
15200	15493	13982	14638
14200	14714	12723	13729
13200	13975	11464	12876
12200	13273	10205	12076

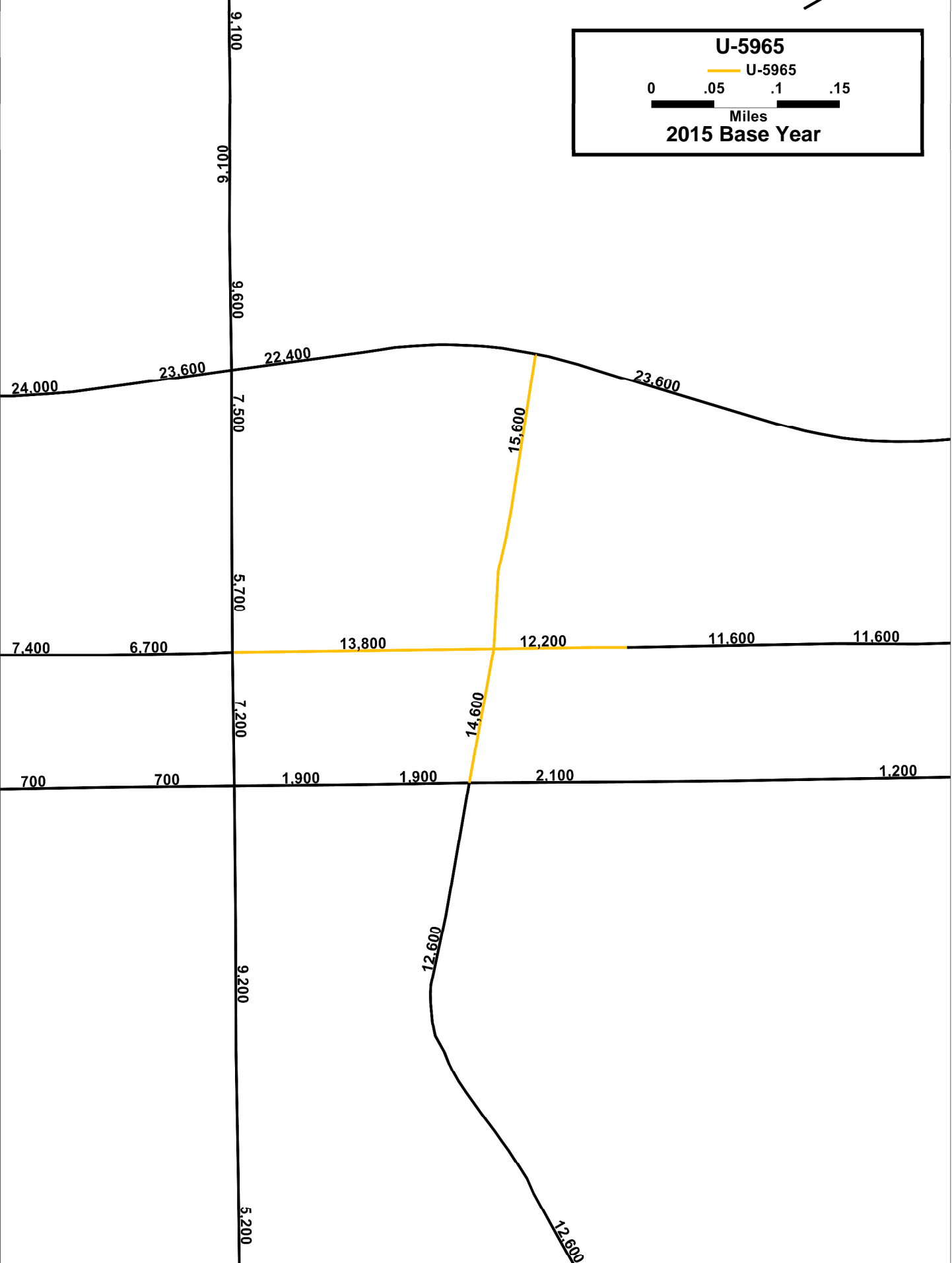
**U-5965**

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Miles

**2015 Base Year**



**U-5965**

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0   .05   .1   .15

Miles

**2045 Future Year**

