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NC Strategic Transportation Corridors: Vision Plan

Baseline and Future Year Mobility Conditions

NCDOT

April 2020

Corridor U: U.S. 74

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1. Overview and Project Background

This memorandum presents base and future year mobility analyses for Corridor U of the North Carolina Strategic Transportation Corridors (STC).

1.1. Overview of Strategic Transportation Corridors

In 2015, the North Carolina Department of Transportation (NCDOT) identified a network of key multimodal transportation corridors called Strategic Transportation Corridors to support smart planning, help set long-term investment decisions, and ensure that North Carolina's economic prosperity goals are achieved. The STCs are intended to promote transportation system connectivity, provide high levels of mobility, and improve access to important state and regional activity centers. A key element in the advancement of the STCs is the development of corridor master plans, to identify a high-level corridor mobility vision and associated corridor improvement action strategies.

The purpose of the master plan is to:

- identify a mobility vision and broad improvement strategies for an entire corridor,
- guide improvements and development in a manner that defines a long-term vision and performance level for the corridor, and
- help protect the corridor's key functions as defined in the corridor profiles.

1.2. Corridor Description

The 284-mile Corridor U – U.S. 74 serves southwest North Carolina from I-26 in Polk County (west of Gastonia) to U.S. 117 in Wilmington. U.S. 74 is the primary access to the Port of Wilmington, traversing the state's southern tier counties and the Charlotte metropolitan area. U.S. 74 carries high truck volumes for the entire length of the corridor and high passenger volumes from Shelby to Monroe. U.S. 74 overlaps Corridor H (Future I-74) for 91 miles from Rockingham to Columbus County. The corridor includes the CSX rail line from the state port at Wilmington through Charlotte to its junction with Corridor D (U.S. 321) in Rutherford County. The corridor is used as both a regional and statewide connection to major employment centers, airports, and health centers.

2. Highway Mobility

Highway Mobility was analyzed for U.S. 74 for existing and future conditions based on the relationship of travel speed, congestion, and travel time. Existing conditions data was based on NCDOT traffic count data, GIS data, and third-party data (Google Maps satellite and travel time data). Future conditions analysis was based on the NC Statewide Travel Demand Model (NCSTM), Regional and Small Area Travel Demand Models, the Statewide Transportation Improvement Program (STIP), and Transportation Plans for communities through the corridor.

2.1. Existing Conditions Analysis

Existing conditions analysis was completed using 2018 NCDOT Average Annual Daily Traffic (AADT) Segment Data, 2019 NCDOT Route Characteristics Data, the NCSTM, and third-party data, including Google Maps. This section presents the process of identifying corridor segments and preparing mobility measures.

2.1.1. Definition of Segments

To manage the analysis of the project corridor, the corridor was divided into mobility segments. These segments represent sections that are generally homogenous and/or represent a uniform cross-section of roadway. The process of identifying segments included the review of the following attributes along the corridor:

- Major changes in roadway characteristics (cross-section, facility type, lanes)
- NCDOT Divisional Boundaries
- Interstate Crossings
- Metropolitan Planning Organization (MPO) Model boundaries
- Urban/rural transition

Segment breaks were not created for every occurrence of these characteristics: for example, small segments were avoided unless it was justified based on the uniqueness of the roadway attributes in that section. Although speed limits were a consideration, other factors were considered more heavily due to the frequency of speed limit changes.

A total of 18 segments were identified for U.S. 74, as shown in **Table 1** and **Figure 1**. These segments varied in length from 2 miles to 39 miles. Analysis was completed for these segments based on AADT information, NCDOT systems level planning capacities, NCSTM analysis, and MPO model analysis.

Average 2018 AADT is based on NCDOT AADT segment data, which contains different segments than the mobility segments previously defined for U.S. 74. To determine the mobility segment's AADT, the 2018 NCDOT AADT data was averaged based on length of the AADT segments within each mobility segment. 2018 AADT ranges and average AADT are presented in **Table 1**.

Table 1. U.S. 74 Mobility Segments

Segment	From	To	Length (miles)	Division	2018 AADT Range	Average 2018 AADT
201	I-26	SR 1168/Mooresboro	31	12/13/14	14,500-26,500	98,220
202	SR 1168/Mooresboro	Bus 74/Shelby	7	12	20,000-37000	73,680
203	Bus 74/Shelby	Buffalo Creek/Shelby	7	12	29,500-44,500	39,860
204	Buffalo Creek/Shelby	I-85	10	12	36,000-40,500	18,800
205	I-85	I-485/Wilkinson Blvd	21	10/12	86,000-149,000	14,200
206	I-485/Wilkinson Blvd	I-77/I-277	6	10	25,000-40,000	22,910
207	I-77/I-277	I-277/U.S. 74	2	10	69,500-112,000	17,220
208	I-277/U.S. 74	U.S. 74 Bypass/Monroe	13	10	54,000-112,000	16,860
209	U.S. 74 Bypass/Monroe	Stegall Rd E of Marshville	22	10	18,000-70,500	16,690
210	Stegall Rd E of Marshville	Bus 74/Rockingham W	29	10	15,000-29,000	16,450
211	Bus 74/Rockingham W	Bus 74/Rockingham E	16	8	8,800-17,500	42,500
212	Bus 74/Rockingham E	Bus 74 Laurinburg W	10	8	20,500-26,000	38,950
213	Bus 74 Laurinburg W	SR 2220 Broadridge Road (E of I-95)	39	6/8	13,500-24,000	98,220
214	SR 2220 Broadridge Road (E of I-95)	N.C. 242	9	6	14,500-20,000	73,680
215	N.C. 242	Bus 74 E/Whiteville	16	6	13,500-20,000	39,860
216	Bus 74 E/Whiteville	Lanvale Rd/SR 4126 (E of I-140)	36	3/6	12,500-30,000	18,800
217	Lanvale Rd/SR 4126 (E of I-140)	23rd St/Wilmington	10	3	22,000-79,000	14,200
218	23rd St/Wilmington	U.S. 117/College Rd Wilmington	3	3	36,500-40,000	22,910

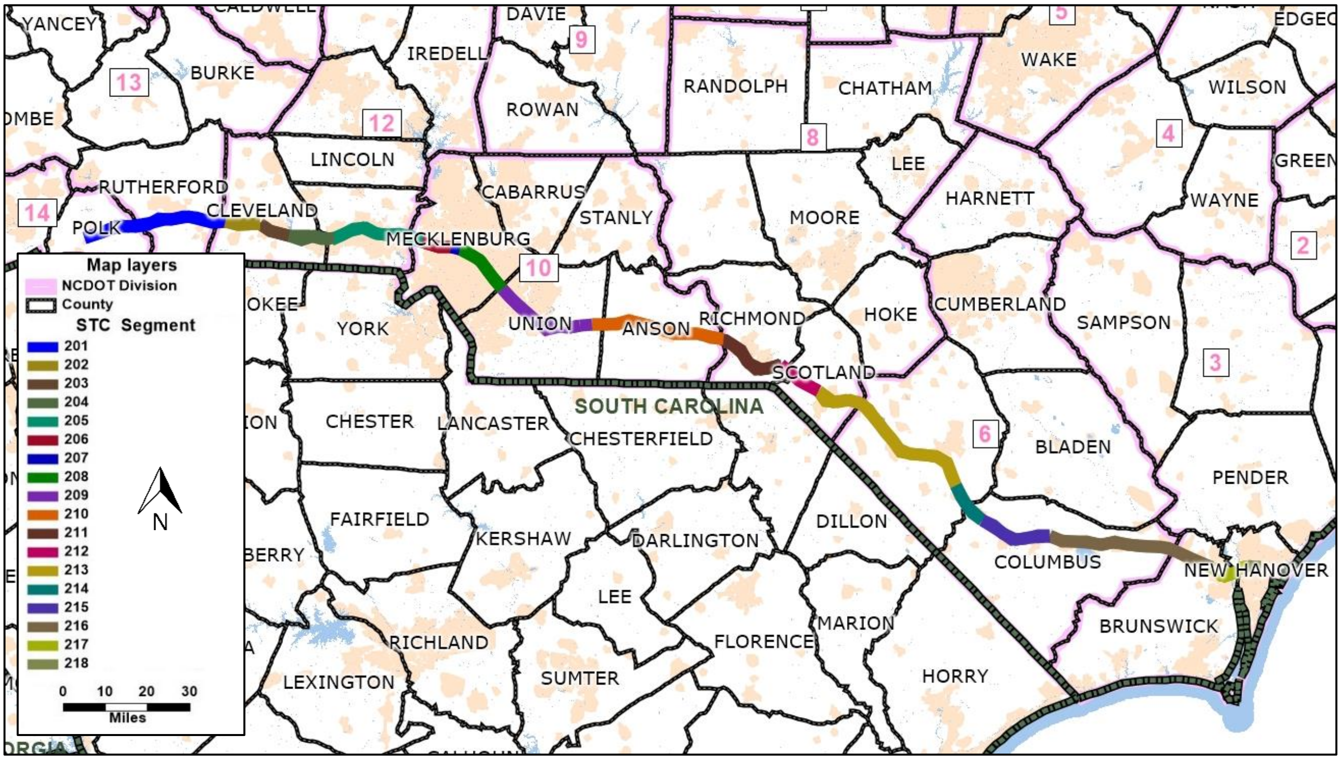

Figure 1. Corridor Segments

2.1.2. Segment Capacity and Travel Time

Typical planning-level highway capacity was developed for each segment along the corridor using the predominant cross-section representative of each segment. Capacities are based on NCDOT TPD's **Level of Service D Standards for Systems Level Planning**, updated 10/14/2011 as shown in **Appendix A**. Segment facility type, typical number of lanes, area type, percent trucks, terrain, and travel speed were used to identify the daily planning-level capacity for comparison against existing traffic. Segment capacities are shown in **Table 2**.

Travel times were calculated based on a weighted average of posted speeds for each segment (by length), existing volume-to-capacity ratios, and a volume-delay curve similar to what is used in the NCSTM. **Table 2** presents the travel time needed to fully utilize each segment. As a point of comparison, Google Maps travel times were identified for each segment to provide "observed" ranges based on third party data.

Table 2. Segment Capacities and Travel Times

Segment	Facility Type	Typical Speed	Lanes	Median Type	Area Type	Planning Capacity	Travel Time (Google Maps)	2018 Travel Time (Est.)
201	Expressway	65	4	Divided	Rural	54,800	26-30	29
202	Expressway	55	4	Divided	Suburban	55,800	8-12	8
203	Boulevard	45	4	Divided	Suburban	36,600	9-18	12
204	Expressway	65	4	Divided	Suburban	57,100	10	9
205	Freeway	65	6	Divided	Urban	106,320	18-22	22
206	Boulevard	45	6	Divided	Urban	42,800	12-30	10
207	Freeway	55	6	Divided	Urban	92,900	4-12	3
208	Boulevard	45	6	Divided	Urban	52,800	16-35	37
209	Boulevard	45	4	Divided	Suburban	36,600	28-55	44
210	Boulevard	55	4	Divided	Rural	45,200	30-40	34
211	Expressway	65	4	Divided	Suburban	53,300	12-16	14
212	Expressway	55	4	Divided	Rural	54,800	14-18	11
213	Expressway	65	4	Divided	Rural	56,100	30-40	36
214	Expressway	55	4	Divided	Rural	56,100	8-10	10
215	Expressway	65	4	Divided	Rural	56,100	14	15
216	Boulevard	55	4	Divided	Rural	49,000	35-40	41
217	Expressway	55	4	Divided	Suburban	57,100	10-14	11
218	Boulevard	55	6	Divided	Urban	64,900	3-6	3

2.2. Future Conditions Analysis

Future conditions analysis was completed using growth rates developed for the corridor based on historical count data, the NCSTM, and relevant regional, MPO, and small area models. Two future scenarios were analyzed:

- 2040 Existing plus Committed (E+C): Existing network plus committed (in the 2020-2029 STIP with either Right-of-Way/Construction funding) corridor projects
- 2040 Recommended (Metropolitan Transportation Plan [MTP]/Comprehensive Transportation Plan [CTP]): E+C plus recommended MTP/CTP projects

Typically, these projects are on the corridor itself; however, if the project is on a parallel facility and is of regional significance, it was included in the future conditions analysis. For each scenario, annual growth rates for each segment were prepared to project 2018 AADT to 2040. Using this information, future volume-to-capacity (V/C), travel time, average speed, vehicle-miles traveled (VMT), and vehicle-hours traveled (VHT) were calculated for each segment and the entire corridor.

2.2.1. Committed and Recommended (MTP/CTP) Projects

For the 2040 E+C scenario, committed projects are those which were programmed in the 2020-2029 STIP that are regional in nature. **Table 3** shows projects included in the 2040 E+C evaluation. In the 2040 NCSTM, these projects were included in the analysis, along with other projects statewide that were included in the 2040 E+C network.

Table 3. 2040 E+C Scenario Projects

STIP ID	Segment	Counties	Roadway	Location/Description
I-5719	205	Gaston	I-85	From N.C. 273 to U.S. 321. Widen to 8 Lanes.
U-2509	208	Mecklenburg	U.S. 74 (Independence Blvd)	From Idlewild Rd to I-485. Widen and add Express Lanes.
R-3329 / R-2559	n/a	Union	Monroe Bypass	From I-485 to U.S. 74. New 4 Lane divided toll facility (project complete).
R-5713	n/a - bypass takes over	Cleveland	U.S. 74	From U.S. 74 Bus to N.C. 226. Placement of directional crossovers and access management.
R-2707D	202/203	Cleveland	Shelby Bypass	From East of N.C. 150 to existing U.S. 74 west of SR 2238 (Long Branch Rd). Construct freeway on new location.
R-2707E	202/203	Cleveland	Shelby Bypass	From existing U.S. 74 west of SR 2238 (Long Branch Rd) to west of SR 1001 (Stony Point Rd). Construct freeway on new location.
R-2707C, F, G	202/203	Cleveland	Shelby Bypass	Sections C, F, G. Construct freeway on new location.
R-5878B	210	Anson	Wadesboro Bypass	U.S. 52 north of Wadesboro to U.S. 74 east of Wadesboro. Construct freeway on new location.
R-3421	n/a	Richmond	Rockingham Bypass	U.S. 74 to U.S. 220. Construct freeway on new location.

For the 2040 Recommended scenario, projects from area MTPs and CTPs were included in the project analysis. **Table 4** shows projects included for the 2040 Recommended scenario. Note: Some projects are consolidated/summarized where a group of individual grade separations/interchanges serve to convert a boulevard/expressway to interstate freeway standards.

Table 4. 2040 Recommended Scenario Projects

Plan	Segment	Counties	Roadway	Location/Description
MTP	210	Anson	Wadesboro Bypass	U.S. 74 west of Wadesboro to U.S. 52 N of Wadesboro. Construct freeway on new location.
MTP	202	Cleveland	U.S. 74	From Shelby Bypass to Mooresboro. Upgrade to controlled access from Shelby Bypass to Mooresboro with grade separation at SR 1168 (Lattimore Rd).
MTP	201	Cleveland	U.S. 74	From I-26 to U.S. 74 at Mooresboro. Upgrade freeway to interstate standards.
MTP	205	Gaston	I-85	From U.S. 321 to U.S. 74. Widen to 8 lanes.
MTP	205	Gaston	I-85	From Davison Ave/Tulip Dr to Fairview Dr. New interchange at I-85/Davidson Ave. New 2 lane alignment connecting Tulip Dr to Fairview Dr.
MTP	209	Union	U.S. 74	From Hanover Dr to Rocky River Rd. Widen from 4 lanes to 6 lanes with median, bike lanes, and sidewalks.
MTP	n/a	Mecklenburg	I-485	From I-85 to U.S. 74. Widen from 6 to 8 lanes including express lanes.
MTP	205	Mecklenburg	I-85	From Gaston County Line to Sam Wilson Rd. Widen roadway to additional westbound lane.
MTP	207	Mecklenburg	I-277 (Belk Fwy)	From Mint St to Independence Blvd (U.S. 74).
MTP	208	Mecklenburg	U.S. 74 (Independence Blvd)	From I-277 to Albemarle Rd (N.C. 24/N.C. 27). Add additional express lane in median.
MTP	209	Mecklenburg	U.S. 74 (Wilkinson Blvd)	From I-485 to Little Rock Rd. Widen from 4 lanes to 6 lanes with median, bike lanes, and sidewalks.
MTP	217	New Hanover	U.S. 74	From Wilmington Metropolitan Planning Organization (WMPO) Boundary to U.S. 17/74/76. Upgrade Interchange.
MTP	217	New Hanover	U.S. 74	Old Fayetteville Rd. Convert Grade Separation to interchange.
CTP	201	Rutherford	U.S. 74	From Polk County Line to Cleveland County Line. Upgrade to Interstate standards throughout County and obtain Interstate classification.
CTP	204	Cleveland	U.S. 74 (E Dixon Blvd)	From Proposed U.S. 74 Bypass to U.S. 74 Bus (Shelby Rd). Upgrade to Interstate standards.
CTP	202	Cleveland	U.S. 74	From Ellenboro Rd to U.S. 74 (W Dixon Blvd). Upgrade to Interstate standards.
CTP	n/a	Gaston	I-85	Wolfe Ln Ext, new freeway bypass without Shannon Bradley Rd, Fairview Dr, Belmont-Mt Holly Loop. Proposed Interchange.
CTP	n/a	Gaston	Northwest Bypass	New freeway bypass from I-85 near Bessemer City to U.S. 321 north of Dallas.
CTP	n/a	Gaston	Gaston Parkway	New freeway bypass from I-85 near Bessemer City to N.C. 279 (S New Hope Rd).

Plan	Segment	Counties	Roadway	Location/Description
CTP	208	Mecklenburg	U.S. 74	From I-277 to I-485. Widen, add managed lanes, convert existing intersections to interchanges.
CTP	209	Union	U.S. 74	I-485 to Roosevelt Blvd. Improvements and interchange conversions.
CTP	209	Union	U.S. 74	Proposed Marshville Bypass. New bypass.
CTP	210	Anson	U.S. 74	From Union County Line to Richmond County Line. Upgrade to interstate standards.
CTP	210	Anson	U.S. 74	Clinton Ave (Peachland), proposed N.C. 218 connector (Polkton), N.C. 145. Interchanges Recommended.
CTP	210	Anson	U.S. 74	From Old Prison Camp Rd (SR 1249) to west of Lilesville town limits. Upgrade to boulevard standards - convert from 5 lanes to 4-lane median divided.
CTP	210	Anson	U.S. 74	Proposed U.S. 52 Bypass. Interchange recommended.
CTP	211	Richmond	U.S. 74/Future I-74	From interchange of I-74/ U.S. 74 Bus to Scotland County Line. Upgrade to interstate standards.
CTP	211	Richmond	I-74	Proposed U.S. 220 Bypass, proposed U.S. 1 Bypass. Interchange recommended.
CTP	212	Scotland	U.S. 74/Future I-74	From Richmond County Line to Robeson County Line. Upgrade to interstate standards.
CTP	213	Robeson	U.S. 74	From N.C. 41 to east of Lumberton. Upgrade to interstate standards.
CTP	214/215	Robeson	U.S. 74	From Lumberton/County Planning Area Boundary (PAB) (east of Lumberton) to Columbus County Line (interchange locations TBD). Upgrade to 4-lane divided freeway.
CTP	216	Columbus	U.S. 74/76	From west of N.C. 11 to Brunswick County Line. New freeway south of existing alignment.
CTP	216	Columbus	U.S. 74/76	Robeson County to Brunswick County. Upgrade to interstate standards.
CTP	217	Brunswick	U.S. 74/76	From Columbus County Line to Wilmington MPO planning boundary. Upgrade to expressway standards.

2.2.2. Existing and Future Cross-Sections

With the buildout of committed and recommended projects, the characteristics of each segment along the corridor change over time, typically resulting in higher throughput capabilities and increased travel speeds. **Table 5** summarizes the facility type, lanes and typical posted speed for 2018, 2040 E+C and 2040 Recommended conditions (shaded grey fields indicate a change from 2018).

Table 5. Volume-to-Capacity Ratios by Scenario

Segment	2018 Conditions			2040 E+C Conditions			2040 Recommended Conditions		
	Facility Type	Typical Posted Speed	Lanes	Facility Type	Typical Posted Speed	Lanes	Facility Type	Typical Posted Speed	Lanes
201	Expressway	65	4	Expressway	65	4	Freeway	70	4
202	Expressway	55	4	Expressway	55	4	Freeway	65	4
203	Boulevard	45	4	Freeway	70	4	Freeway	70	4
204	Expressway	65	4	Expressway	65	4	Freeway	70	4
205	Freeway	65	6	Freeway	65	6	Freeway	65	8
206	Boulevard	45	6	Boulevard	45	6	Boulevard	45	6
207	Freeway	55	6	Freeway	55	6	Freeway	55	8
208	Boulevard	45	6	Expressway	55	8	Expressway	65	10
209	Boulevard	45	4	Boulevard	45	4	Boulevard	45	4
210	Boulevard	55	4	Boulevard	55	4	Freeway	65	4
211	Expressway	65	4	Expressway	65	4	Freeway	65	4
212	Expressway	55	4	Expressway	55	4	Freeway	65	4
213	Expressway	65	4	Expressway	65	4	Freeway	65	4
214	Expressway	55	4	Expressway	55	4	Freeway	65	4
215	Expressway	65	4	Expressway	65	4	Freeway	65	4
216	Boulevard	55	4	Boulevard	55	4	Freeway	65	4
217	Expressway	55	4	Expressway	55	4	Expressway	55	4
218	Boulevard	55	6	Boulevard	55	6	Boulevard	55	6

2.2.3. Travel Demand Model Analysis

Travel Demand Model Analysis was completed using the NCSTM, the Metrolina Regional Model (MRM), the Wilmington Model, and several small area models including Rutherford, Rockingham, Lumberton, Laurinburg, and Pembroke. Data from each of these models was used to calculate growth rates. **Table 6** presents an example of NCSTM model output from the 2015 and 2040 E+C network.

Table 6. 2015/2040 NCSTM E+C Comparison

Segment	2015 NCSTM Data				2040 E+C NCSTM Data			
	Average AADT*	Daily VMT**	Daily VHT***	Ave. Speed	Average AADT	Daily VMT	Daily VHT	Ave. Speed
201	21,000	654,700	10,700	61	31,000	979,000	18,400	53
202	36,000	260,100	5,200	50	54,000	124,000	4,000	31
203	40,000	269,000	5,600	48	32,000	468,300	6,900	68
204	44,000	451,000	9,300	49	54,000	550,200	15,400	36
205	106,000	2,235,100	52,900	42	133,000	2,790,000	89,400	31
206	34,000	218,100	5,900	37	44,000	286,100	9,200	31
207	59,000	119,800	2,400	51	76,000	154,900	4,500	34
208	71,000	916,300	30,900	30	110,000	1,710,200	52,400	33
209	22,000	485,100	11,200	43	32,000	720,000	18,500	39
210	23,000	658,600	13,100	50	31,000	893,200	19,200	47
211	14,000	218,300	3,300	66	21,000	337,300	5,200	65
212	14,000	140,600	2,600	53	20,000	199,000	3,700	53
213	12,000	452,800	7,000	65	15,000	604,200	9,300	65
214	10,000	93,200	1,600	58	15,000	139,300	2,400	58
215	11,000	177,500	2,800	63	15,000	237,000	3,800	63
216	13,000	464,100	8,400	55	16,000	567,600	10,300	55
217	32,000	324,600	5,900	55	46,000	463,100	9,000	51
218	23,000	64,700	1,300	50	28,000	79,300	1,600	50
Total	**28,000**	**8,203,600**	**180,100**	**46**	**38,000**	**11,302,700**	**283,200**	**40**

*AADT = Average Annual Daily Traffic
**VMT = Vehicle-Miles Traveled
***VHT = Vehicle-Hours Traveled

For the regional/MPO/local models, an E+C scenario was not evaluated; rather, the adopted MTPs were utilized for future year analysis. Information from these models was used to support development of growth rates to apply to each segment. **Table 7** shows a comparison of regional/MPO/local model data. When comparing growth data from the NCSTM and regional/MPO/local models, it should be noted that corridor segments may be represented in multiple local travel demand model models or only partially represented.

Table 7. Base Year (BY) and Future Year (FY) Conditions, MPO Model Output

Seg-ment	Travel Demand Model(s)	BY	FY	BY Data				FY Data			
				Ave. AADT	Daily VMT	Daily VHT	Ave. Speed	Ave. AADT	Daily VMT	Daily VHT	Ave. Speed
201	Rutherford	2013	2040	14,700	253,600	3,800	67	19,300	331,800	5,000	66
202	Metrolina Regional Model (MRM)	2015	2045	23,000	175,700	3,300	53	30,400	220,900	4,100	54
203	MRM	2015	2045	31,600	207,300	4,700	44	38,700	253,400	5,700	45
204	MRM	2015	2045	26,100	271,900	4,600	59	43,800	414,400	6,700	62
205	MRM	2015	2045	104,100	2,044,800	39,600	52	148,200	2,911,400	58,900	49
206	MRM	2015	2045	27,800	169,900	4,600	37	34,600	211,100	6,800	31
207	MRM	2015	2045	71,800	166,900	3,200	52	81,600	201,800	4,200	48
208	MRM	2015	2045	63,300	1,094,700	30,200	36	120,800	1,489,200	42,200	35
209	MRM	2015	2045	29,400	655,900	19,000	35	37,500	842,800	25,100	34
210	-	-	-	-	-	-	-	-	-	-	-
211	Rocking-ham	2010	2040	11,500	177,300	2,400	74	13,100	201,700	2,700	74
212	Laurinburg	2010	2040	18,700	113,200	2,200	51	22,200	134,500	2,000	69
213	Laurinburg	2010	2040	16,200	163,900	2,400	67	21,800	220,100	3,300	67
213	Lumberton	2014	2040	9,900	78,700	1,100	70	14,200	112,600	1,600	70
213	Pembroke*	2010	2040	5,100	40,500	-	-	5,700	45,600	-	-
214	-	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-
216	Wilmington*	2010	2040	16,100	146,000	-	-	30,400	275,100	-	-
217	Wilmington	2010	2040	37,500	334,500	-	-	46,400	413,700	-	-
218	Wilmington	2010	2040	34,900	99,000	-	-	56,900	161,400	-	-

*Daily VHT/Speed data not readily available from Pembroke and Wilmington Models

2.2.4. Projected Growth Rates

Projected growth rates were developed based on information from the NCSTM, MPO models, and relevant traffic forecasts by corridor segment. These growth rates were applied to 2018 segment AADT to determine future year AADT for each scenario for mobility analysis. **Table 8** shows the projected growth rate for each corridor segment.

Table 8. Projected Growth Rates by Segment

Segment	NCSTM		MPO	STC Growth Rate	
	Annual Growth Rate, 2015-2040 E+C	Annual Growth Rate, 2015-2040 Rec.	Annual Growth Rate	E+C, Selected	Recommended, Selected
201	1.6%	2.6%	1.0%	1.3%	2.0%
202	1.6%	2.3%	0.9%	1.3%	2.0%
203	-0.9%	-0.3%	0.7%	0.6%	0.8%
204	0.8%	1.6%	1.7%	1.2%	1.6%
205	0.9%	1.1%	1.2%	0.9%	1.1%
206	1.0%	0.9%	0.7%	0.8%	1.0%
207	1.0%	1.7%	0.4%	0.8%	1.5%
208	1.8%	3.0%	2.2%	2.2%	2.5%
209	1.5%	2.1%	0.8%	1.2%	1.5%
210	1.2%	3.4%	-	1.5%	2.5%
211	1.6%	3.9%	0.4%	1.5%	2.5%
212	1.4%	3.0%	0.6%	1.5%	2.5%
213	0.9%	2.5%	1.0%	1.0%	2.5%
214	1.6%	3.7%	-	1.0%	2.5%
215	1.2%	2.6%	-	1.0%	2.5%
216	0.8%	1.3%	2.1%	1.2%	1.5%
217	1.5%	1.7%	0.7%	1.5%	1.7%
218	0.8%	0.8%	1.6%	1.0%	1.0%

2.3. Mobility Measures

While there are many mobility measures that can be considered for each corridor based on quantitative and qualitative data, this mobility analysis is based on the relationship of travel speed, congestion, and travel time. For each scenario, a projected volume was compared against available capacity to estimate the travel time. VMT, VHT, and average speed are also presented for each scenario.

2.3.1. Volume-to-Capacity Ratio

Volume-to-Capacity (V/C) Ratio is a representation of a daily planning-level capacity versus an average daily traffic volume. It is not a measure of peak traffic or congestion, but rather an overall measure of the how well the roadway will function over the course of a day. Segments with a V/C exceeding 1.0 are considered LOS E in this analysis. **Table 9** presents V/C ratios by scenario. Shaded E+C and Recommended fields reflect increased capacities due to E+C/MTP/CTP projects.

Table 9. Volume-to-Capacity Ratios by Scenario

Segment	2018 Conditions			2040 E+C Conditions			2040 Recommended Conditions		
	Ave. Volume	Typical Capacity	Ave. V/C	Ave. Volume	Typical Capacity	Ave. V/C	Ave. Volume	Typical Capacity	Ave. V/C
201	18,220	54,800	0.33	24,210	54,800	0.44	28,170	59,300	0.48
202	26,270	55,800	0.47	34,900	55,800	0.63	40,610	58,500	0.69
203	36,000	36,600	0.98	41,060	58,500	0.70	42,900	58,500	0.73
204	37,870	57,100	0.66	49,230	55,800	0.88	53,700	58,500	0.92
205	105,500	106,320	0.99	128,490	106,320	1.21	134,210	120,000	1.12
206	30,680	42,800	0.72	36,560	42,800	0.85	38,190	42,800	0.89
207	98,220	92,900	1.06	117,040	92,900	1.26	136,290	125,800	1.08
208	73,680	52,800	1.40	118,920	95,000	1.25	126,850	158,100	0.80
209	39,860	36,600	1.09	51,820	36,600	1.42	55,310	36,600	1.51
210	18,800	45,200	0.42	26,090	45,200	0.58	32,370	59,300	0.55
211	14,200	53,300	0.27	19,700	53,300	0.37	24,450	57,200	0.43
212	22,910	54,800	0.42	31,790	54,800	0.58	39,440	59,300	0.67
213	17,220	56,100	0.31	21,430	56,100	0.38	29,650	59,300	0.50
214	16,860	56,100	0.30	20,990	56,100	0.37	29,030	64,700	0.45
215	16,690	56,100	0.30	20,770	56,100	0.37	28,730	64,700	0.44
216	16,450	49,000	0.34	21,390	49,000	0.44	22,830	64,700	0.35
217	42,500	57,100	0.74	58,970	57,100	1.03	61,580	57,100	1.08
218	38,950	64,900	0.60	48,480	64,900	0.75	48,480	64,900	0.75

2.3.2. Average Travel Time and Speed

Average travel time and speed are measures of the relationship between the V/C ratio of a segment and its typical travel speed. Volume-delay curves by facility type were used to estimate travel time and speed. These volume-delay curves, based on adjusted NCSTM volume-delay function (VDF) curves, represent the typical "congested" speed on a daily planning level. These travel times are not representative of any individual trip, since over the length of the entire corridor an individual traveler could pass through a segment at an off-peak or peak time. **Table 10** shows average travel time and speeds by scenario.

Table 10. Average Travel Speed and Travel Time by Scenario

Segment	2018 Conditions			2040 E+C Conditions			2040 Recommended Conditions		
	Typical Posted Speed (mph)	Average Travel Speed (miles per hour)	Ave. Travel Time (min)	Typical Posted Speed (miles per hour)	Average Travel Speed (miles per hour)	Ave. Travel Time (min)	Typical Posted Speed (miles per hour)	Average Travel Speed (miles per hour)	Ave. Travel Time (min)
201	65	65	29.0	65	65	29.0	70	70	26.9
202	55	55	8.0	55	55	3.3	65	65	2.8
203	45	33	12.3	70	69	13.0	70	69	13.0
204	65	65	9.4	65	62	9.9	70	65	9.3
205	65	57	22.1	65	40	31.9	65	48	26.1
206	45	38	10.1	45	36	10.8	45	35	11.0
207	55	45	2.7	55	29	4.2	55	43	2.8
208	45	21	37.0	55	29	26.5	65	63	12.1
209	45	30	44.2	45	20	66.7	45	17	81.8
210	55	51	33.7	55	49	35.0	65	65	26.7
211	65	65	14.5	65	65	14.5	65	65	14.5
212	55	55	10.7	55	55	10.7	65	65	9.1
213	65	65	36.2	65	65	36.2	65	65	36.2
214	55	55	10.3	55	55	10.3	65	65	8.7
215	65	65	14.5	65	65	14.5	65	65	14.5
216	55	52	41.4	55	51	42.3	65	65	33.1
217	55	54	11.2	55	46	13.1	55	44	13.9
218	55	49	3.5	55	46	3.7	55	46	3.7
Total Travel Time (min)			**351**			**376**			**346**

2.3.3. Vehicle-Miles and Vehicle-Hours Traveled

VMT and VHT represent overall demand on each segment for each scenario. **Table 11** shows a summary of VMT and VHT for each project scenario.

Table 11. VMT and VHT by Scenario

Segment	2018 Conditions		2040 E+C Conditions		2040 Recommended Conditions	
	VMT	VHT	VMT	VHT	VMT	VHT
201	572,600	8,800	760,900	11,700	885,300	12,700
202	192,300	3,500	104,700	1,900	121,800	1,900
203	243,600	7,400	615,900	8,900	643,500	9,300
204	384,500	5,900	499,900	8,100	545,300	8,300
205	2,218,100	38,800	2,701,500	68,400	2,821,800	58,400
206	198,800	5,200	236,900	6,600	247,500	7,000
207	199,900	4,400	238,300	8,200	277,400	6,400
208	946,000	45,400	1,526,800	52,600	1,628,600	25,700
209	894,900	29,400	1,163,400	57,600	1,297,000	75,400
210	539,000	10,500	748,000	15,200	934,600	14,400
211	222,900	3,400	309,200	4,800	383,800	5,900
212	224,300	4,100	311,200	5,700	386,100	6,000
213	674,800	10,400	839,800	12,900	1,161,900	17,900
214	159,400	2,900	198,500	3,600	274,500	4,200
215	263,000	4,000	327,200	5,000	452,700	7,000
216	589,800	11,400	767,000	15,100	818,600	12,600
217	430,300	7,900	597,000	12,900	623,500	14,300
218	110,800	2,300	137,800	3,000	137,800	3,000
Total	**9,065,000**	**205,700**	**12,084,000**	**302,200**	**13,641,700**	**290,400**

2.3.4. Highway Mobility Summary

Table 12 presents a summary of highway mobility measures for 2018, 2040 E+C, and 2040 Recommended scenarios. The table shows that in 2040, the recommended corridor projects serve more travelers at a higher speed with less delay. In the Recommended Scenario, a typical trip through the corridor in 2040 would take approximately the same time as today – with 50% more demand. **Figure 2** presents an infographic summary of key highway mobility measures.

Table 12. Highway Mobility Summary

Measure	2018	2040 E+C	2040 Recommended
Length (Miles)	288	292	293
Average Travel Time (Hours)	5.8	6.3	5.8
Vehicle-Miles Traveled	9,065,000	12,084,000	13,641,700
Vehicle-Hours Traveled	205,700	302,200	290,400
Average Annual Daily Volume	31,500	41,400	46,600
Average Speed (Miles per hour)	44	40	47

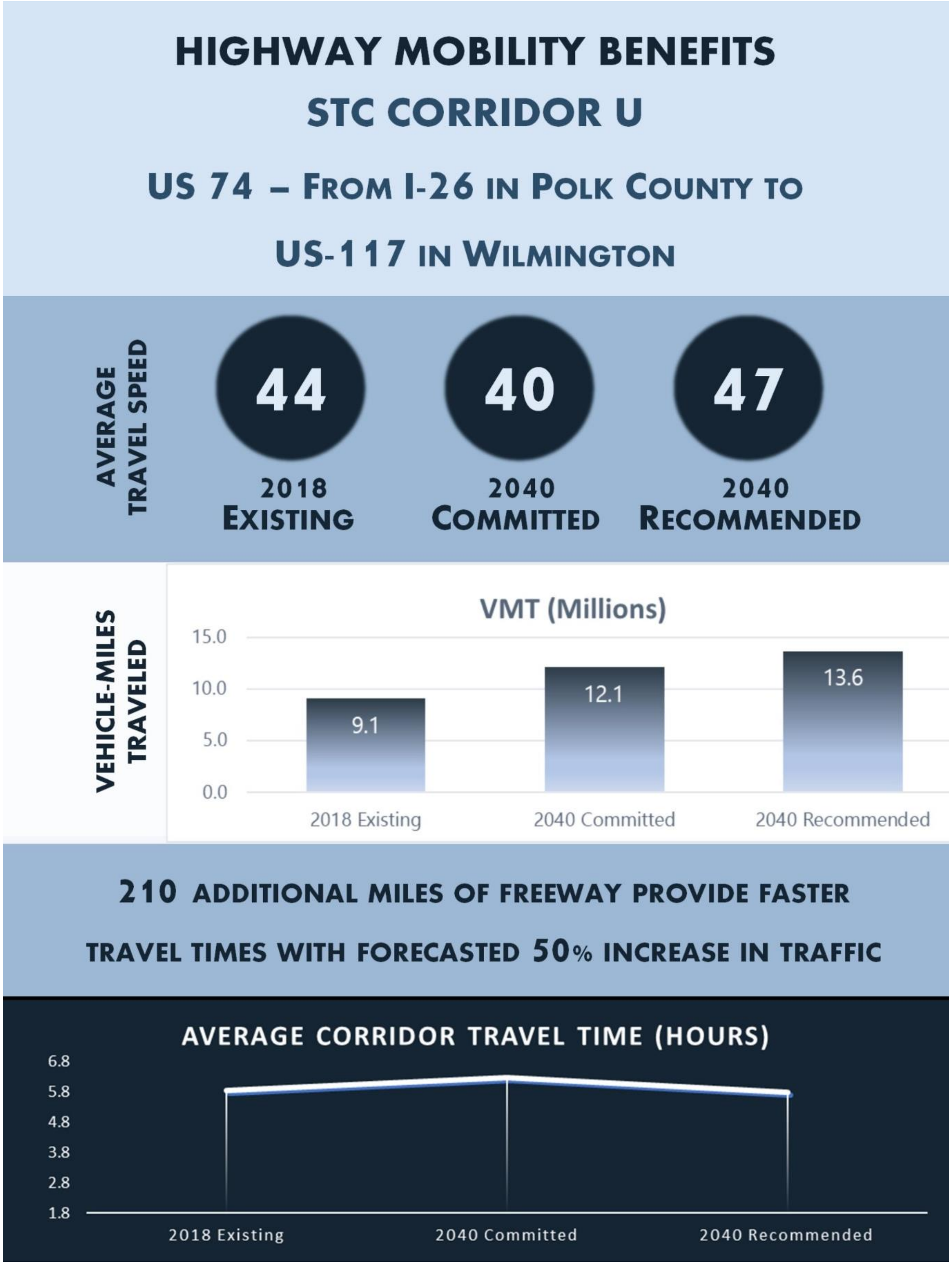

Figure 2. Highway Mobility Summary

3. Freight Mobility

U.S. 74 runs from U.S. 117 in Wilmington to I-26 in Polk County. It primarily consists of U.S. 74 and the CSX rail line as shown in **Figure 3**. Freight mobility into, out of, and within U.S. 74 was analyzed using freight flow data downloaded from the North Carolina Freight Flow tool. The freight flow data is presented as volume (tonnage) and value (dollars). It is based on the Federal Highway Administration's (FHWA) Freight Analysis Framework Version 4.1 (FAF4.1) with county-level disaggregation processed by Cambridge Systematics for 2012, 2015, and 2045, and it was forecasted to 2045 using FHWA's FAF4.1 origin-destination and commodity growth rates for rail flows[1].

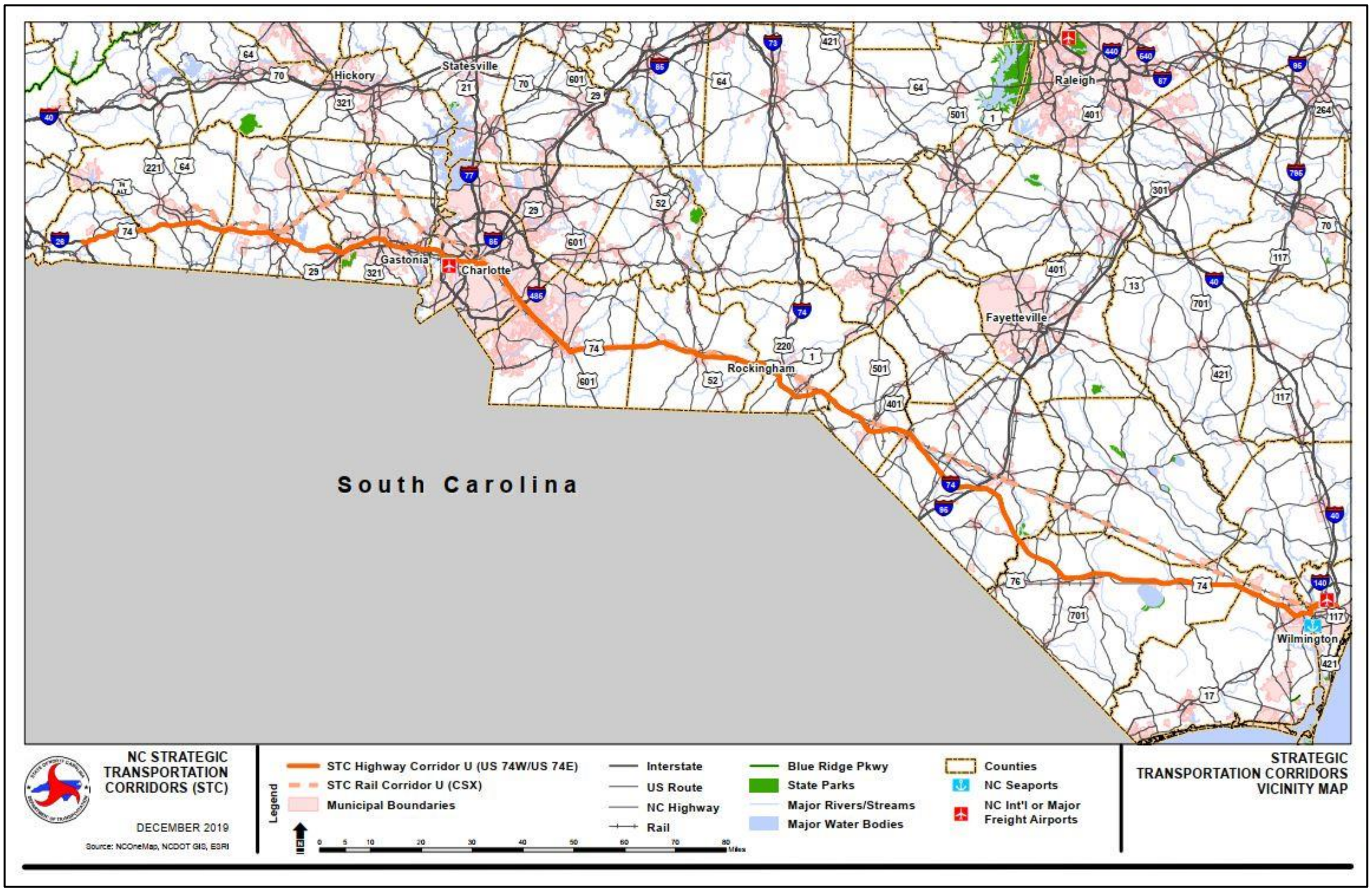

Figure 3. U.S. 74 and CSX line

Freight flow estimates for U.S. 74 include county totals for the 18 counties within the Wilmington, Lumber River, Metrolina, Gastonia, and Southern Foothills regions. These counties included: Anson, Bladen, Brunswick, Cabarrus, Cleveland, Columbus, Gaston, Lincoln, Mecklenburg, New Hanover, Pender, Polk, Richmond, Robeson, Rutherford, Scotland, Stanly, and Union. Results are presented for 12 different commodity groups and associated trade partners. Results by trade partners are presented regionally for the United States, at the county level for trade between the corridor and the rest of North Carolina, and at the FAF regional level for all other trade which includes states, large metropolitan areas, the remainder of states with large metropolitan area(s), and international regions for foreign freight flows.

[1] North Carolina Statewide Multimodal Freight Plan, Freight Flow Tool Reference Guide: https://connect.ncdot.gov/projects/planning/Statewide-Freight-Plan/Documents/Freight_Tool_User_Guide.pdf

3.1. Flow Type Totals

Freight flows to, from, and within the U.S. 74 counties (including domestic trade and the domestic leg of foreign trade) totaled an estimated 168.3 million tons worth $254.5 billion in 2015, shown in **Figure 4**. Inbound flows represented roughly 42-43 percent of the corridor's volume, while outbound flows accounted for a third of the total volume but almost half (45 percent) of the value. A quarter of the flows were internal to the corridor, but only accounted for 12 percent of the value. Flows were forecasted to increase to 237.6 million tons worth $487.6 billion in 2045 (an increase of roughly 41 and 92 percent, respectively).

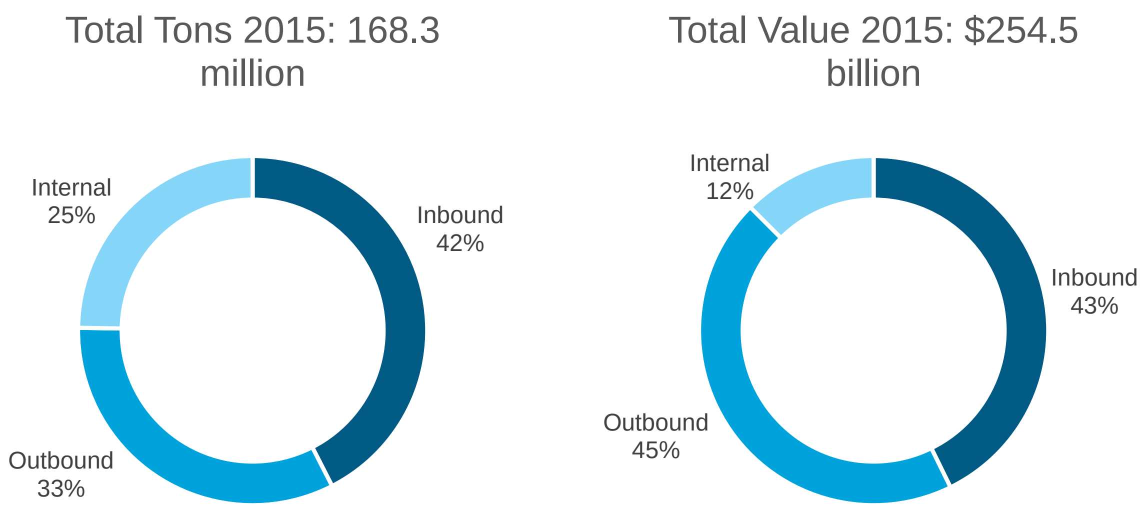

Figure 4. Freight Flow Totals, 2015

3.2. Modal Splits

Trucking dominates the market, moving over 82 percent of the corridor's freight and accounting for almost 72 percent of the total value, shown in **Figures 5** and **6**. Carload rail's roughly nine percent of volume translated to two percent of the value in 2015, while pipelines carried five percent of the total volume. Air cargo's minimal volume represented over three percent of the total value. Modal share forecasts for 2045 show little change in terms of volume, but trucking's share of the total value decreasing to 67 percent and air cargo's share increasing to eight percent.

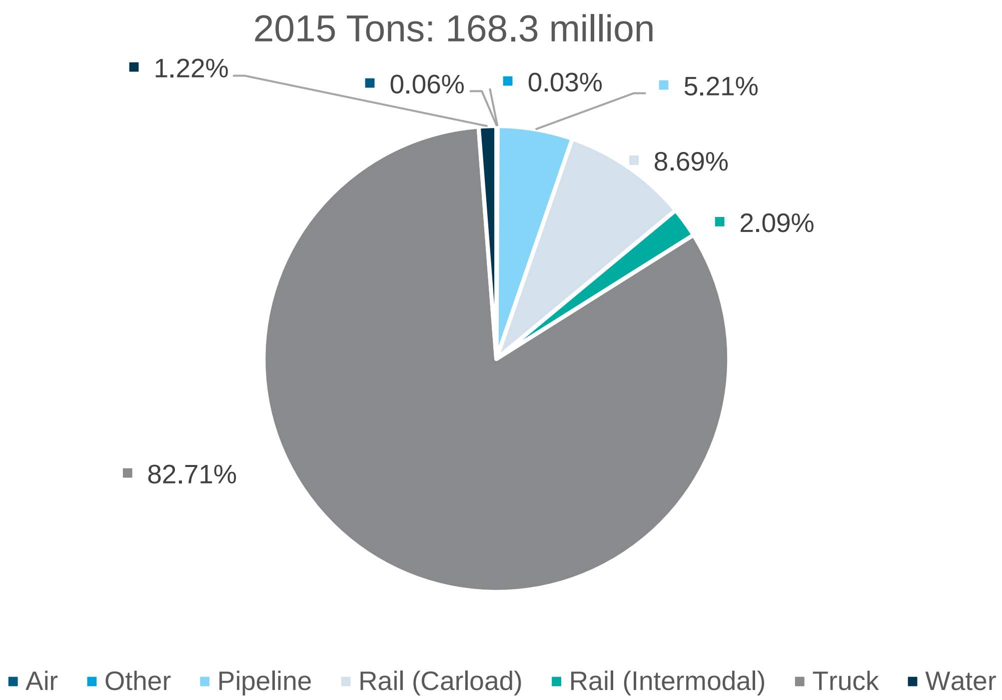

Figure 5. Modal Freight Flows by Volume, 2015

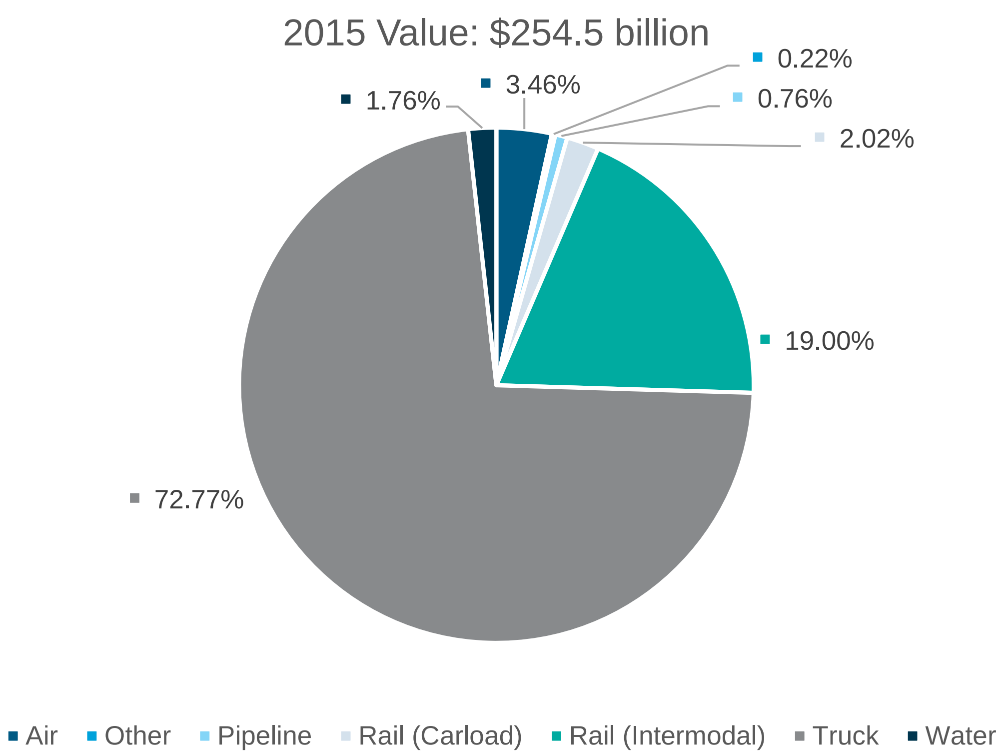

Figure 6. Modal Freight Flows by Value, 2015

3.3. Commodity Comparison, 2015 and 2045

Aggregates, with over 32 million tons, accounted for the largest volume of commodities moving to, from, and within the corridor, with roughly 42 percent moving internally within the region, shown in **Figure 7**. Energy Products, Raw and Finished Wood Products, and Nonmetallic Mineral and Base Metal Products all accounted for over 20 million tons in 2015. By 2045, flows of Machinery, Electric, and Precision Instruments are forecasted to increase by over 165 percent, growing from roughly 2.6 million tons to 7.06 million tons. Other commodity groups with high growth forecasts include Chemicals, Pharmaceuticals, Plastics, and Rubber (95 percent), Waste (86 percent), Mixed Freight (85 percent), and Food, Alcohol, and Tobacco (70 percent).

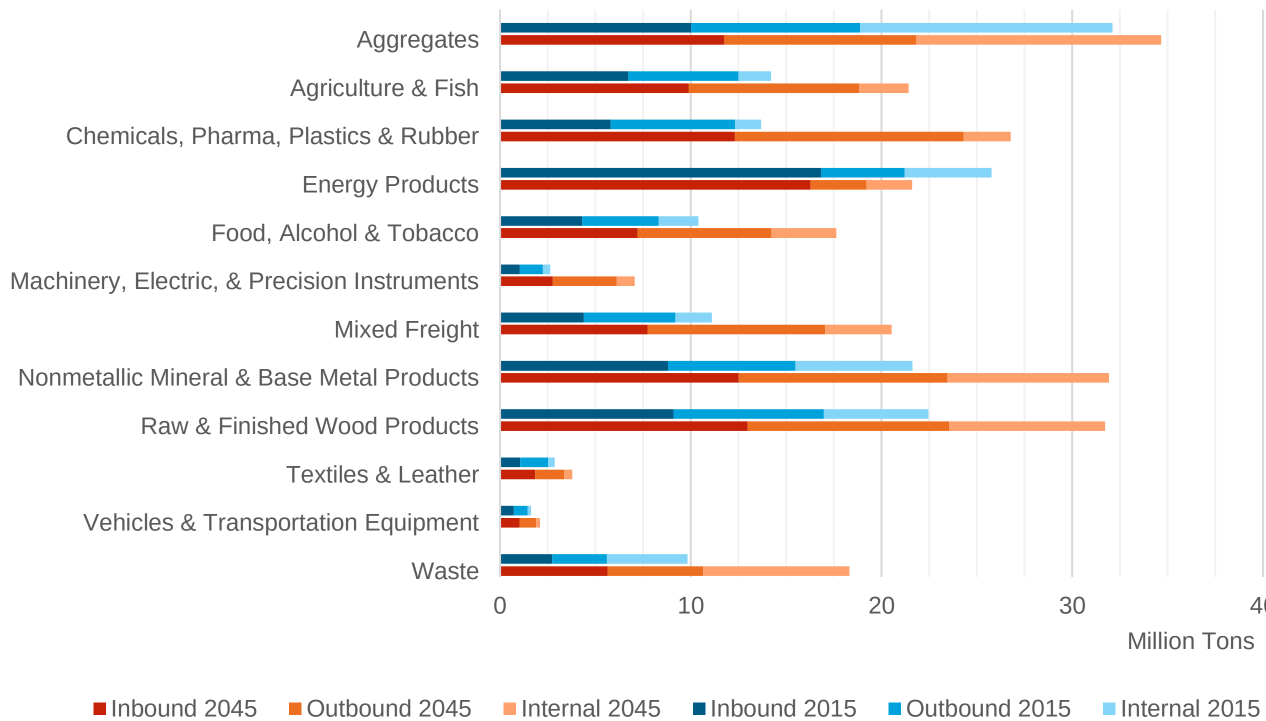

Figure 7. Commodity Volumes, 2015 and 2045

Mixed Freight's almost $75 billion accounted for the largest share of the flows by value in 2015, and its forecasted growth of 90 percent would increase its value to just under $140 billion by 2045. Machinery, Electric, and Precision Instruments are forecasted to more than double from $35 to $100 billion by 2045. Chemicals, Pharmaceuticals, Plastics, and Rubber are also expected to more than double in trade value from $40 billion in 2015 to $94 billion in 2045, as shown in **Figure 8**.

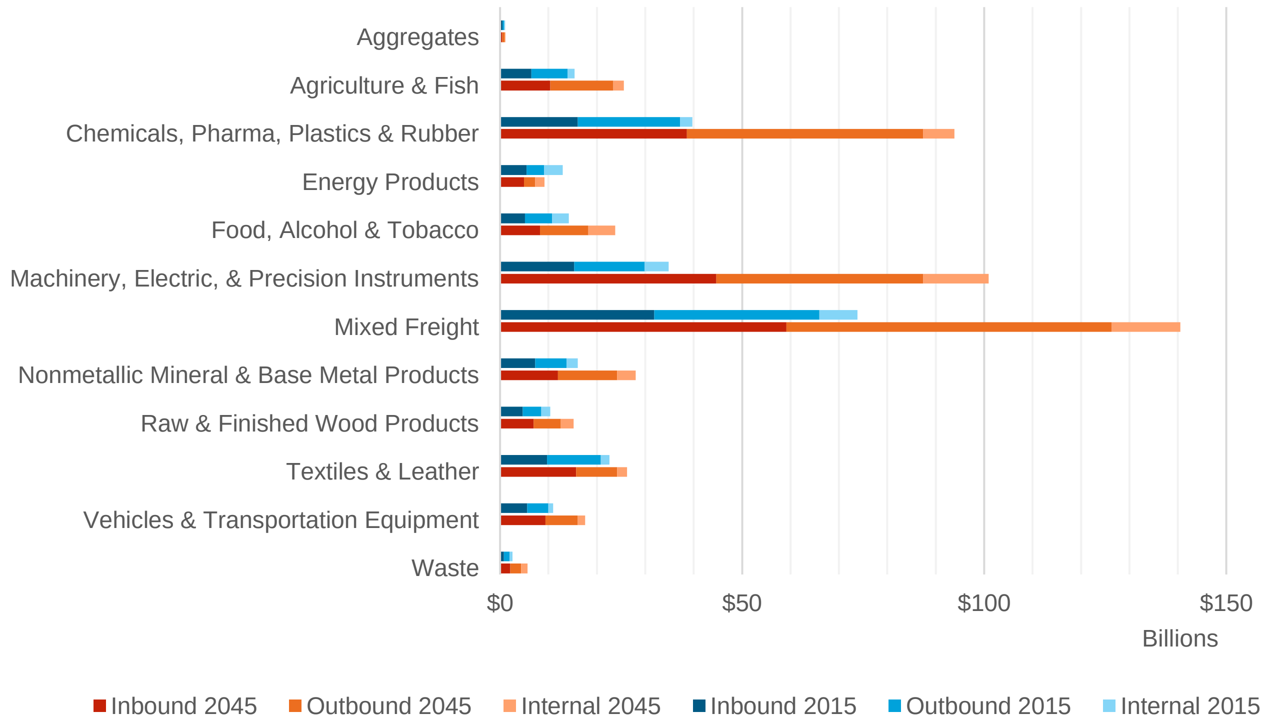

Figure 8. Commodity Values, 2015 and 2045

3.4. Top Trading Partners – by Volume and Value

The counties within U.S. 74 ship and receive the largest volume and value of goods within the Southeast region of the U.S. compared to all other U.S. regions. In 2015, this was estimated to be over 97 million tons valued at over $122 billion with forecasts showing more than 136 million tons worth $233 billion by 2045, shown in **Table 13**. The counties within the corridor traded more than 41 million tons of goods with one another valued at over $31 billion in 2015. By 2045, trade is forecasted to consist of more than 53 million tons worth more than $55 billion. The combined volume of trade with all the states west of the Mississippi River totaled only seven million tons in 2015, less than all other regions except for New England/New York, but was valued at $40 billion, more than all other regions besides the Southeast. These volumes are forecasted to almost double by 2045 while the value of those goods more than double. Each trading region is visualized in **Figure 9**.

Table 13. Top Regional Trading Partners

Region	Tonnage		Value	
	2015	2045	2015	2045
Internal (North Carolina)	41,646,994	53,100,798	$31,802,259,521	$55,478,372,844
Great Lakes	8,376,876	13,546,213	$25,197,991,962	$45,428,537,928
Mideast	12,005,378	17,050,147	$24,890,183,763	$46,420,231,325
New England/New York	1,794,373	3,695,702	$8,595,276,002	$19,929,308,150
Southeast	97,229,377	136,587,169	$122,025,396,617	$233,599,110,808
West of the Mississippi	7,275,107	13,574,304	$41,983,447,391	$86,779,208,312
TOTALS	**168,328,105**	**237,554,333**	**$254,494,555,257**	**$487,634,769,366**

Figure 9. Trading Regions

Shown in **Figure 10**, the Other South Carolina FAF region was the top trade partner by volume in 2015 with over 12.9 million tons (5.3 million inbound and 7.6 million outbound) and is forecasted to be just under 18 million tons by 2045, a roughly 40 percent increase. Trade with the Greenville, SC FAF region ranked second with 8 million tons in

2015, and was followed by two counties within North Carolina, Rowan and Iredell, with 6.6 and 5.1 million tons respectively. Trade volumes are forecasted to more than double for both the Charleston, SC and Chicago, IL regions, from 3.8 to 8.4 million tons and from 2.5 to 5.2 million tons, respectively.

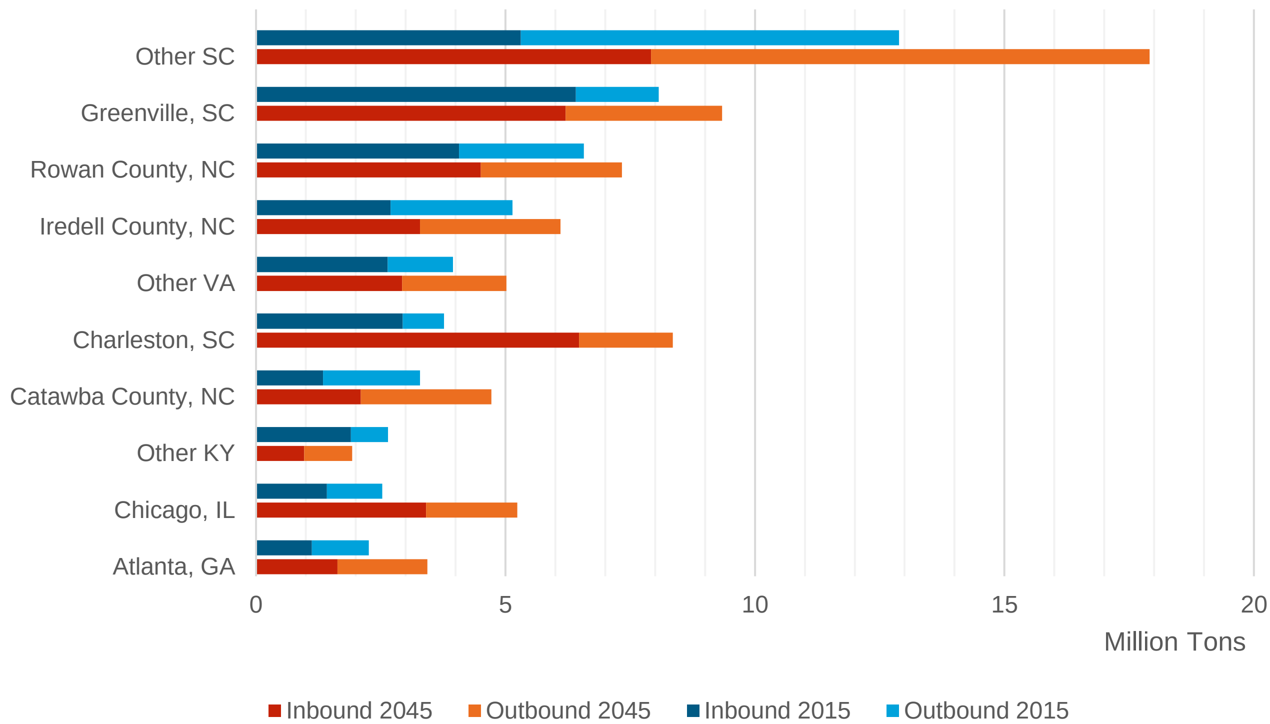

Figure 10. Top Trading Partners by Volume, 2015 and 2045[2]

The top three trade partners by value all accounted for over $11 billion in 2015 and included $11.7 billion with the Miami region and $11.3 billion with both Chicago and Atlanta. By 2045, trade is forecasted to top $25 billion with Miami, $21 billion with Chicago, $23.6 billion with Atlanta, and $22.7 with Los Angeles after more than doubling the value of trade in 2015 ($9.98 billion). Trade between U.S. 74 and the Charleston region is expected to triple from $6.4 to $19.4 billion, while trade with Savannah is forecasted to fall just short of tripling with $5.3 billion in 2015 and $15.4 billion in 2045, shown in **Figure 11**.

[2] "Other" FAF Regions refer to the remainder of a state trading region which does not include separately analyzed metropolitan areas. "Other SC" refers to the remainder of SC not including the Greenville and Charleston metros, "Other VA" refers to the remainder of VA not including the Washington, DC, Virginia Beach, and Richmond metros, and "Other KY" refers to the remainder of KY not including the Cincinnati and Louisville metros.

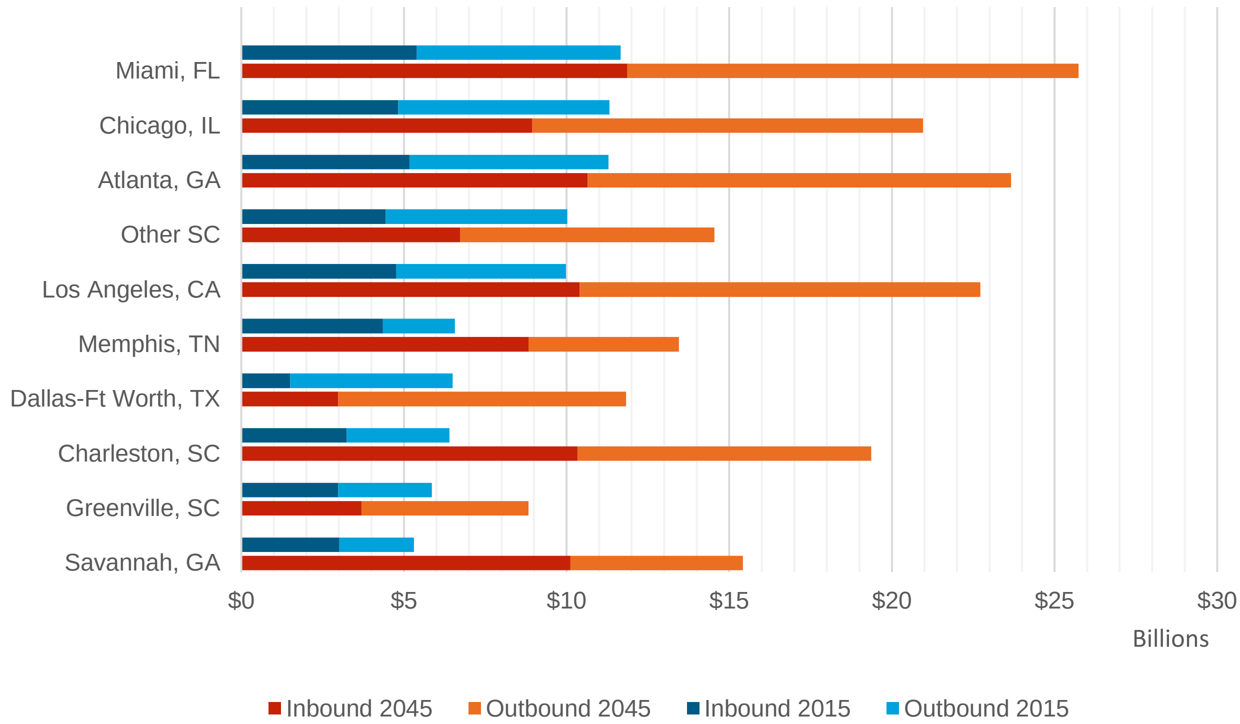

Figure 11. Top Trading Partners by Value, 2015 and 2045

3.5. Foreign Trade

Using 2015 volumes, foreign trade's 3.8 million tons only represented 2.3 percent of the corridor's total flows and is forecasted to more than double to five percent by 2045 when volumes will total 11.8 million tons. The $23.2 billion worth of foreign trade in 2015 is forecasted to grow to $92.5 billion by 2045. Foreign trade flows account for a higher percentage when comparing by value: 9.1 percent in 2015 and an estimated 19 percent in 2045.

Shown in **Figure 12**, tonnage of foreign trade is dominated by water with 66 percent of freight being moved on the water and trucking ranking second at 23 percent. Shown in **Figure 13**, modal shares of foreign trade by value are more evenly split with water accounting for 42 percent of the total, air 30 percent, and trucking 21 percent.

While little change in modal share by volume is forecasted between 2015 and 2045, notable changes in share by value are expected with water decreasing from 42 to 39 percent ($35.5 billion in 2045), trucking decreasing from 21 to 19 percent ($17.2 billion in 2045), and air increasing from 30 to 36 percent ($33.7 billion).

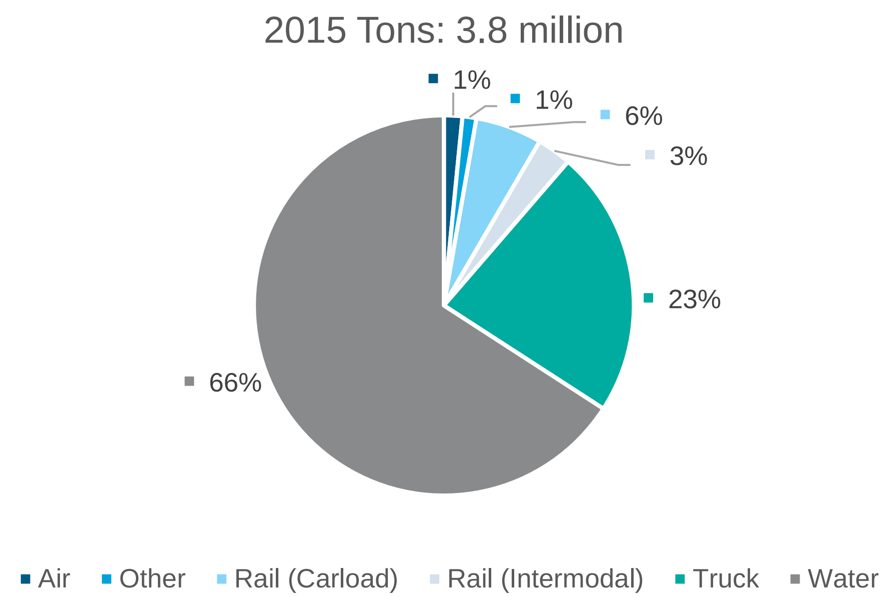

Figure 12. Foreign Trade Freight Flows by Mode and Volume, 2015

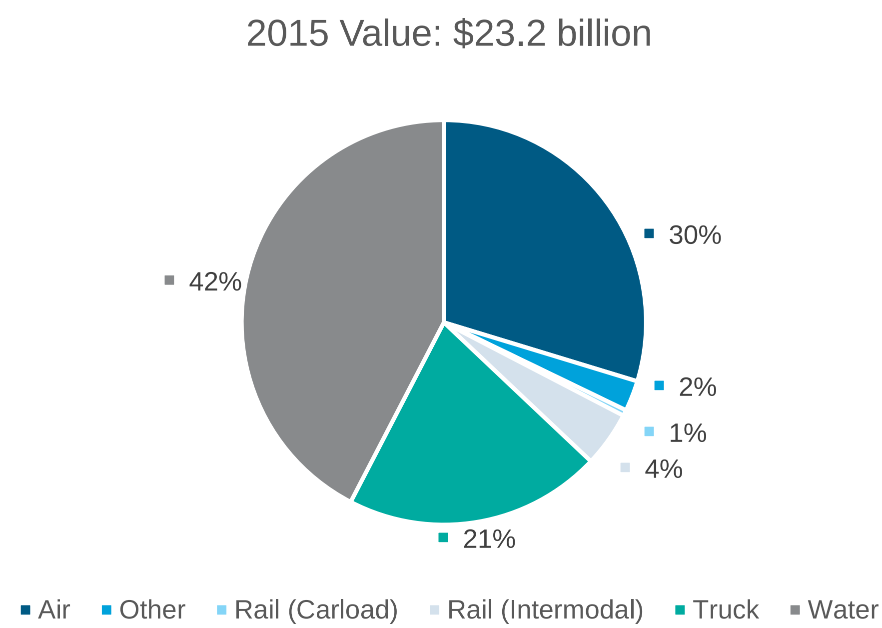

Figure 13. Foreign Trade Freight Flows by Mode and Value, 2015

Chemicals, Pharmaceuticals, Plastics and Rubber was the top foreign traded commodity group by volume in 2015 with almost 690,915 tons, which represented 18 percent of the total, shown in **Figure 14**. By 2045 it is forecasted to increase to over 2.5 million tons, which would be over 21 percent of the total. Also by 2045, Machinery, Electric, and Precision Instruments; Textiles and Leather; Raw and Finished Wood Products; Nonmetallic Mineral and Base Metal Products; Mixed Freight; and Agriculture and Fish are all forecasted to top one million tons.

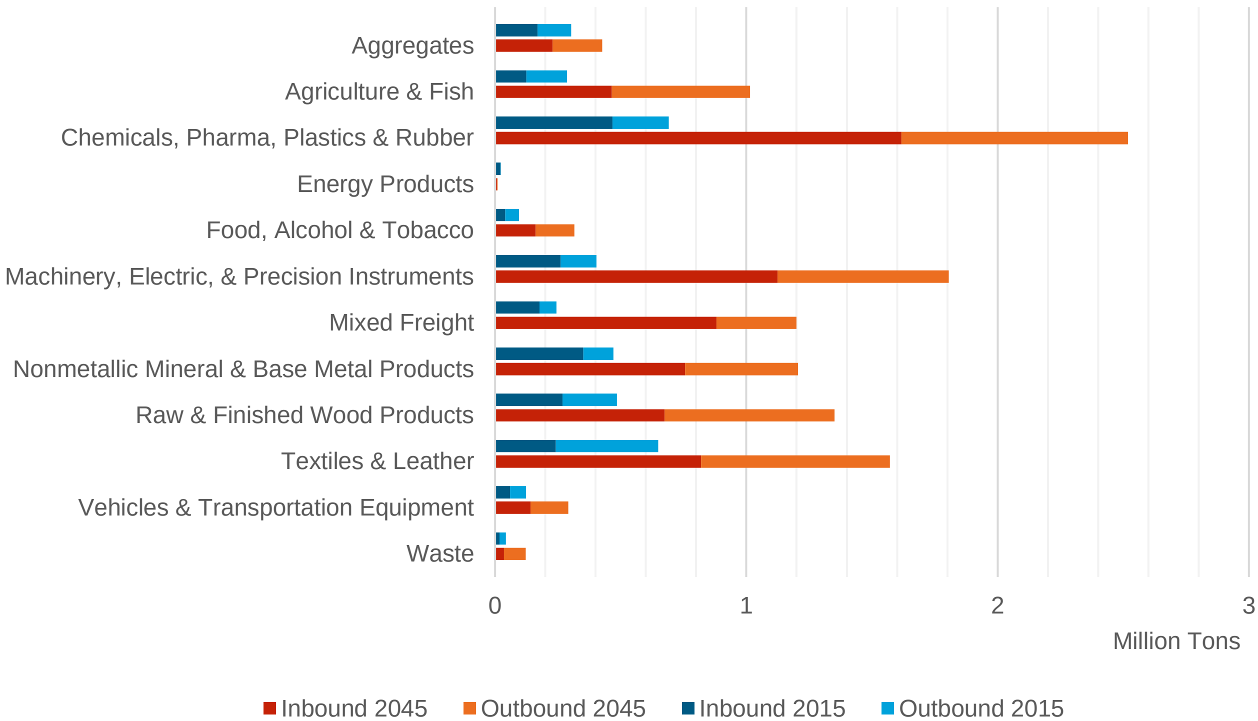

Figure 14. Foreign Trade Commodity Volumes, 2015 and 2045

By value, Machinery et al. accounted for over one-third of the total value with $8.3 billion in 2015. By 2045, the same commodity group is forecasted to account for 41 percent of the total value with over $38 billion. Chemicals et al. were valued at over $5 billion in foreign trade in 2015 with forecasts topping $22 billion in 2045 (22 and 24 percent, respectively). The corridor's foreign trade in 2015 was relatively balanced with 2.2 million tons of imported commodities versus 1.6 million tons of exported freight, with little change forecasted in 2045. On a value basis, imports accounted for 61 percent of the 2015 total ($14.2 billion), with forecasts showing a slight dip to 59 percent of the total in 2045, shown in **Figure 15**.

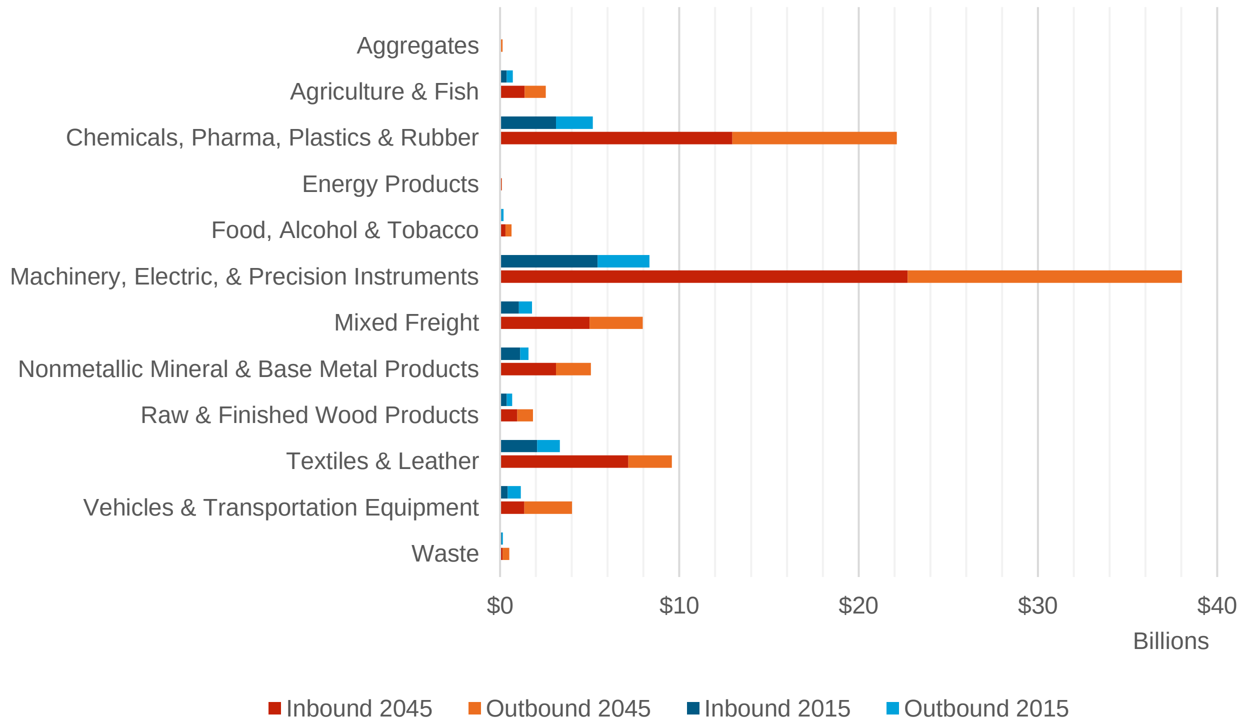

Figure 15. Foreign Trade Commodity Values, 2015 and 2045

Canada was the corridor's top foreign trade partner by volume in 2015 with roughly 925 thousand tons, a quarter of the total, shown in **Figure 16**. While Eastern Asia was ranked second in 2015 with 740 thousand tons, it is forecasted to be the top trade partner by volume in 2045 with over 2.57 to Canada's 2.496 million tons. The Rest of the Americas ranked third by volume with almost 676 thousand tons in 2015 and 1.94 million tons in 2045.

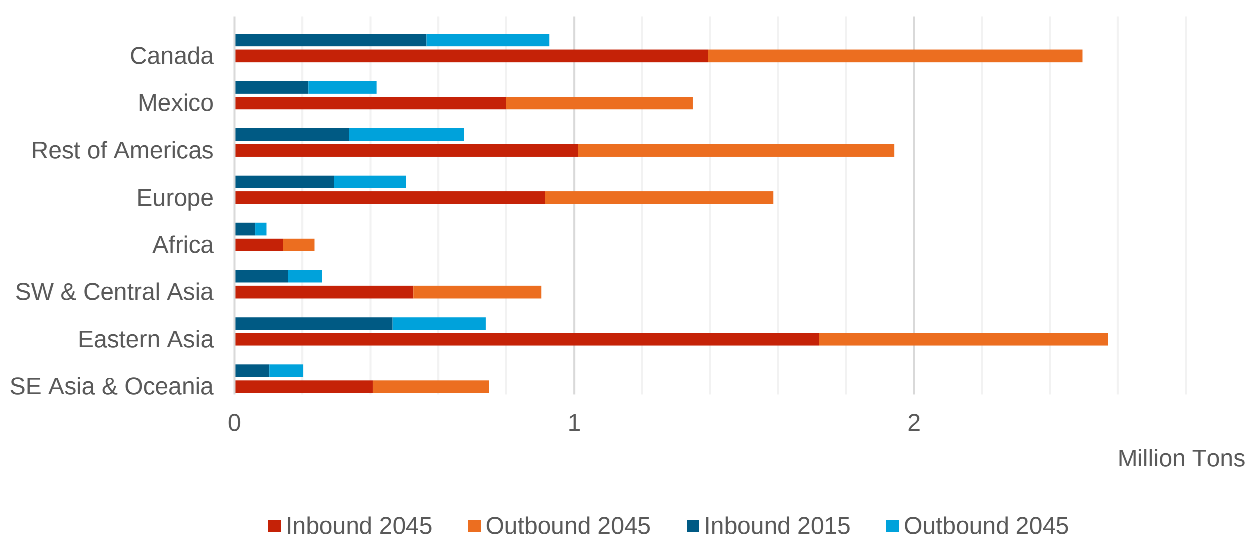

Figure 16. Foreign Trade Partners by Volume, 2015 and 2045

In 2015, Eastern Asia was the top ranked trade partner by value, followed by Europe, worth over $5.5 and $5.1 billion, respectively. By 2045, the same trade partners' value of goods is forecasted to grow to just under $25 billion for Eastern Asia and $17.7 billion for Europe. While Canada ranked first in terms of the volume of goods in 2015, it only ranked third in value, worth a total $3.145 billion. Trade with Canada is forecasted to be worth $11.1 billion in 2045, placing it fifth behind the Rest of Americas and Mexico, shown in **Figure 17**.

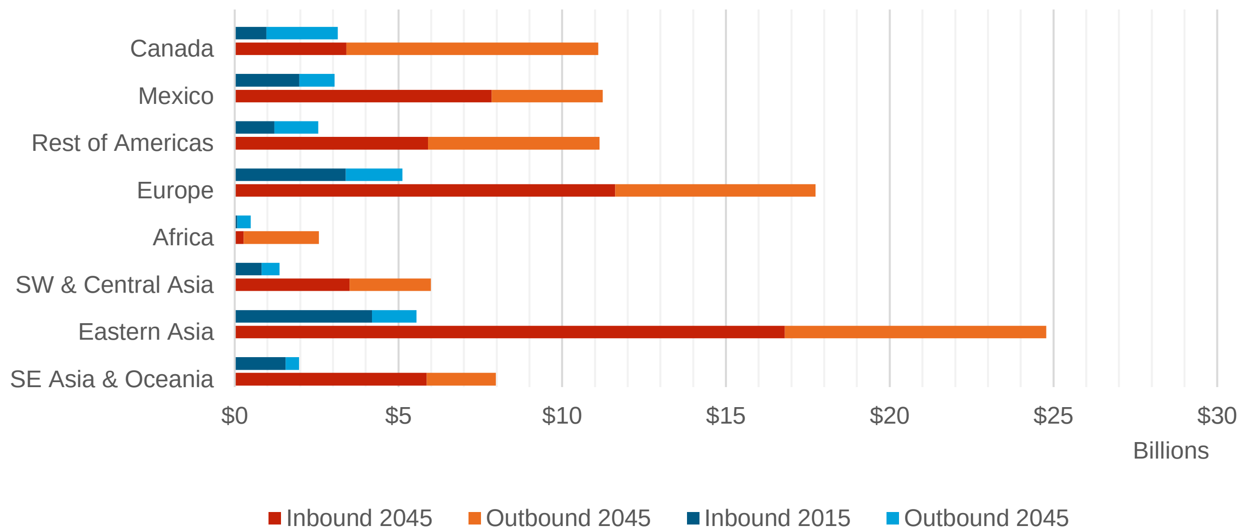

Figure 17. Foreign Trade Partners by Value, 2015 and 2045

Appendices

Appendix A. NCDOT Level of Service D Standards for Systems Level Planning

NCDOT TPB
TRANSPORTATION PLANNING BRANCH

Level of Service D Standards for Systems Level Planning

Updated 10/14/2011

Level of Service A

Driver Comfort: High

Maximum Density:

12 passenger cars per mile per lane

Level of Service B

Driver Comfort: High

Maximum Density:

20 passenger cars per mile per lane

Level of Service C

Driver Comfort: Some Tension

Maximum Density:

30 passenger cars per mile per lane

Level of Service D

Driver Comfort: Poor

Maximum Density:

42 passenger cars per mile per lane

Level of Service E

Driver Comfort: Extremely Poor

Maximum Density:

67 passenger cars per mile per lane

Level of Service F

Driver Comfort: The lowest

Maximum Density:

More than 67 passenger cars per mile per lane

General Disclaimer

The Level of Service D Standards for Systems Level Planning was derived from the 2005 North Carolina Level of Service (NCLOS) Version 2.1 Program developed by the Institute for Transportation Research and Education (ITRE) at North Carolina State University. The NCLOS Program is based on the 2000 Highway Capacity Manual, published by the Transportation Research Board (TRB).

These standards are intended for **systems level planning only**. Many assumptions are made and documented in the development of these standards.

CTP FACILITY TYPES

FREEWAYS represent a multi-lane divided facility with complete access control (interchanges only and no traffic signals).

EXPRESSWAYS represent a multi-lane divided facility with a high level of access control (interchanges, limited at-grade intersections, right-in/right out access, and no traffic signals).

BOULEVARDS represent a typically divided facility with moderate access control (at-grade intersections, right-in/right out access, and traffic signals at major intersections).

OTHER MAJOR THOROUGHFARES represent undivided facilities with four or more lanes (US and NC routes may have less than 4 lanes). These facilities typically have low access control (at-grade intersections, access to development, and traffic signals at major and some minor intersections).

MINOR THOROUGHFARES represent a 2-to-3 lane undivided facility that is not signed as a US or NC route. These facilities typically have low access control (at-grade intersections, access to development, and traffic signals at major and minor intersections).

NCLOS (HCM) FACILITY TYPES

FREEWAYS (Freeways) represent a multi-lane divided facility with complete access control (interchanges only and no traffic signals).

EXPRESSWAYS (Multi-lane Highways) represent a multi-lane divided facility with a high level of access control (interchanges, limited at-grade intersections, right-in/right out access, and no traffic signals).

BOULEVARDS (Arterials, 25-55 MPH) represent a typically divided facility with moderate access control (at-grade intersections, right-in/right out access, and traffic signals at major intersections).

OTHER MAJOR THOROUGHFARES (Arterials, 25-55 MPH) represent undivided facilities with four or more lanes (US and NC routes may have less than 4 lanes). These facilities typically have low access control (at-grade intersections, access to development, and traffic signals at major and some minor intersections). These facilities are typically within an urban or suburban area (e.g. within a municipality or ETJ).

MINOR THOROUGHFARES (Arterials 25-55 MPH) represent a 2-to-3 lane undivided facility that is not signed as a US or NC route. These facilities typically have low access control (at-grade intersections, access to development, and traffic signals at major and minor intersections). These facilities are typically within an urban or suburban area (e.g. within a municipality or ETJ).

RURAL 2-LANE HIGHWAY (Two-Lane Highway, 55 MPH ONLY) represents a 2-lane undivided facility outside of a municipality or ETJ. These facilities have a 55 MPH posted speed limit, have low access control with numerous driveways and no traffic signals. These facilities are classified in a CTP as **other major thoroughfares** if they are a **US or NC route** or **minor thoroughfares** if they are a **secondary or local** route.

AREA TYPE

RURAL represents an area outside a municipality or Extraterritorial Jurisdiction (ETJ).

SUBURBAN represents an area within a municipality or ETJ that is not within a Central Business District (CBD) or areas immediately surrounding a CBD.

URBAN represents an area that is within a CBD or areas immediately surrounding a CBD.

LEVEL OF SERVICE D VALUES

MINIMUM CAPACITY VALUES represents conditions/inputs that result in a worst-case Level of Service D for a given facility. This lower value represents worst-case conditions in available data for a given region (Higher K/D Factors, Lower Peak Hour Factor, poor road conditions, etc.).

STANDARD CAPACITY VALUES represents an average Level of Service D for a given facility. This default value is an average of available data for a given region.

MAXIMUM CAPACITY VALUES represents conditions/inputs that result in a best-case Level of Service D for a given facility. This higher value represents best-case conditions in available data for a given region (Lower K/D Factors, Higher Peak Hour Factor, etc.).

These assumptions may not pertain to all systems level planning work; therefore, separate analysis may need to be conducted on a case-by-case basis.

These standards are **not** intended for project specific or corridor analysis. Separate analysis would be required for these types of projects.

Volumes shown represent the point at which traffic transitions from LOS D to LOS E.

Level of Service D Standards for Freeways *

COASTAL	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**67400**	**66900**	**67900**	**102000**	**101300**	**101800**	**137300**	**136200**	**135700**
6-10% Trucks	**65700**	**65400**	**66200**	**99600**	**98900**	**99400**	**134000**	**133000**	**132500**
11-15% Trucks	**64200**	**63800**	**64700**	**97300**	**96600**	**97100**	**130900**	**129900**	**129400**
16-20% Trucks	**62800**	**62400**	**63200**	**95100**	**94400**	**94900**	**127900**	**126900**	**126500**
21-25% Trucks	**61400**	**61000**	**61800**	**9300**	**92300**	**92700**	**125100**	**124100**	**123700**
26-30% Trucks	**60000**	**59700**	**60500**	**90900**	**90300**	**90700**	**122400**	**121400**	**121000**
31-35% Trucks	**58800**	**58400**	**59200**	**89000**	**88400**	**88800**	**119800**	**118800**	**118400**

PIEDMONT	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**61700**	**61400**	**62200**	**93500**	**92900**	**93300**	**125800**	**124900**	**124400**
6-10% Trucks	**60300**	**59900**	**60700**	**91300**	**90700**	**91100**	**122800**	**121900**	**121500**
11-15% Trucks	**58900**	**58500**	**59300**	**89200**	**88600**	**89000**	**120000**	**119100**	**118600**
16-20% Trucks	**57500**	**57200**	**58000**	**87100**	**86500**	**87000**	**117300**	**116400**	**115900**
21-25% Trucks	**56300**	**55900**	**56700**	**85200**	**84600**	**85000**	**114700**	**113800**	**113400**
26-30% Trucks	**55000**	**54700**	**55400**	**83400**	**82800**	**83200**	**112200**	**111300**	**110900**
31-35% Trucks	**53900**	**53500**	**54300**	**81600**	**81000**	**81400**	**109800**	**108900**	**108500**

MOUNTAIN (Level Terrain)	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**56100**	**61400**	**62200**	**85000**	**92900**	**93300**	**114400**	**124900**	**124400**
6-10% Trucks	**54800**	**59900**	**60700**	**83000**	**90700**	**91100**	**111700**	**121900**	**121500**
11-15% Trucks	**53500**	**58500**	**59300**	**81100**	**88600**	**89000**	**109100**	**119100**	**118600**
16-20% Trucks	**52300**	**57200**	**58000**	**79200**	**86500**	**87000**	**106600**	**116400**	**115900**
21-25% Trucks	**51100**	**55900**	**56700**	**77500**	**84600**	**85000**	**104200**	**113800**	**113400**
26-30% Trucks	**50000**	**54700**	**55400**	**75800**	**82800**	**83200**	**102000**	**111300**	**110900**
31-35% Trucks	**49000**	**53500**	**54300**	**74200**	**81000**	**81400**	**99800**	**108900**	**108500**

MOUNTAIN (Rolling Terrian)	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**53500**	**58500**	**59300**	**81100**	**88600**	**89000**	**109100**	**119100**	**118600**
6-10% Trucks	**50000**	**54700**	**55400**	**75800**	**82800**	**83200**	**102000**	**111300**	**110900**
11-15% Trucks	**47000**	**51400**	**52100**	**71100**	**77700**	**78100**	**95700**	**104500**	**104100**
16-20% Trucks	**44300**	**48400**	**49000**	**67000**	**73200**	**73600**	**90200**	**98500**	**98100**
21-25% Trucks	**41800**	**45700**	**46400**	**63400**	**69200**	**69600**	**85300**	**93100**	**92700**
26-30% Trucks	**39700**	**43400**	**44000**	**60100**	**65700**	**66000**	**80900**	**88300**	**87900**
31-35% Trucks	**37700**	**41200**	**41800**	**57100**	**62400**	**62700**	**76900**	**83900**	**83600**

Uses "Freeways" Facility Type in NCLOS
*** Assumes Regional K and D Factor Averages**

See Appendix A1 for HCM 2000 Freeway Equations
Use Appendix A2: Coastal Freeway Inputs for adjustments
Use Appendix A3: Piedmont Freeway Inputs for adjustments
Use Appendix A4: Mountain (Level) Freeway Inputs for adjustments
Use Appendix A5: Mountain (Rolling) Freeway Inputs for adjustments

NOTE: Truck percentage occurs within the peak hour, not a daily truck percentage

Level of Service D Standards for Expressways *

COASTAL	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**47500**	**58500**	**58800**	**71200**	**87700**	**88300**	**95000**	**117000**	**117700**
6-10% Trucks	**46400**	**57100**	**57400**	**69500**	**85600**	**86200**	**92700**	**114200**	**114900**
11-15% Trucks	**45300**	**55800**	**56100**	**67900**	**83700**	**84200**	**90600**	**111500**	**112200**
16-20% Trucks	**44200**	**54500**	**54800**	**66400**	**81800**	**82200**	**88500**	**109000**	**109700**
21-25% Trucks	**43300**	**53300**	**53600**	**64900**	**79900**	**80400**	**86500**	**106600**	**107200**
26-30% Trucks	**42300**	**52100**	**52400**	**63500**	**78200**	**78700**	**84700**	**104300**	**104900**
31-35% Trucks	**41400**	**51000**	**51300**	**62100**	**76500**	**77000**	**82900**	**102100**	**102700**

PIEDMONT	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**47500**	**58500**	**58800**	**71200**	**87700**	**88300**	**95000**	**117000**	**117700**
6-10% Trucks	**46400**	**57100**	**57400**	**69500**	**85600**	**86200**	**92700**	**114200**	**114900**
11-15% Trucks	**45300**	**55800**	**56100**	**67900**	**83700**	**84200**	**90600**	**111500**	**112200**
16-20% Trucks	**44200**	**54500**	**54800**	**66400**	**81800**	**82200**	**88500**	**109000**	**109700**
21-25% Trucks	**43300**	**53300**	**53600**	**64900**	**79900**	**80400**	**86500**	**106600**	**107200**
26-30% Trucks	**42300**	**52100**	**52400**	**63500**	**78200**	**78700**	**84700**	**104300**	**104900**
31-35% Trucks	**41400**	**51000**	**51300**	**62100**	**76500**	**77000**	**82900**	**102100**	**102700**

MOUNTAIN (Level Terrain)	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**47500**	**53200**	**58800**	**71200**	**79800**	**88300**	**95000**	**106400**	**117700**
6-10% Trucks	**46400**	**51900**	**57400**	**69500**	**77900**	**86200**	**92700**	**103800**	**114900**
11-15% Trucks	**45300**	**50700**	**56100**	**67900**	**76100**	**84200**	**90600**	**101400**	**112200**
16-20% Trucks	**44200**	**49500**	**54800**	**66400**	**74300**	**82200**	**88500**	**99100**	**109700**
21-25% Trucks	**43300**	**48400**	**53600**	**64900**	**72700**	**80400**	**86500**	**96900**	**107200**
26-30% Trucks	**42300**	**47400**	**52400**	**63500**	**71100**	**78700**	**84700**	**94800**	**104900**
31-35% Trucks	**41400**	**46400**	**51300**	**62100**	**69600**	**77000**	**82900**	**92800**	**102700**

MOUNTAIN (Rolling Terrian)	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**41200**	**50700**	**56100**	**61700**	**76100**	**84200**	**82300**	**101400**	**112200**
6-10% Trucks	**38500**	**47400**	**52400**	**57700**	**71100**	**78700**	**77000**	**94800**	**110400**
11-15% Trucks	**36100**	**44500**	**49200**	**54200**	**66700**	**73900**	**72200**	**89000**	**98500**
16-20% Trucks	**34000**	**41900**	**46400**	**51100**	**62900**	**69600**	**68100**	**83900**	**92800**
21-25% Trucks	**32200**	**39600**	**43900**	**48300**	**59500**	**65800**	**64400**	**79300**	**87700**
26-30% Trucks	**30500**	**37600**	**41600**	**45800**	**56400**	**62400**	**61000**	**75200**	**83200**
31-35% Trucks	**29000**	**35700**	**39600**	**43500**	**53600**	**59300**	**58000**	**71500**	**79100**

Uses "Multi-lane Highways" Facility Type in NCLOS
*** Assumes Regional K and D Factor Averages**

See Appendix B1 for HCM 2000 Multi-lane Highway Equations
Use Appendix B2: Coastal Expressway Inputs for adjustments
Use Appendix B3: Piedmont Expressway Inputs for adjustments
Use Appendix B4: Mountain (Level) Expressway Inputs for adjustments
Use Appendix B5: Mountain (Rolling) Expressway Inputs for adjustments

NOTE: Truck percentage occurs within the peak hour, not a daily truck percentage

Level of Service D Standards for Boulevards *

COASTAL	1 Lane Per Direction				2 Lanes Per Direction				3 Lanes Per Direction		
	Urban	Suburban	Rural		Urban	Suburban	Rural		Urban	Suburban	Rural
55 MPH	**21600**	**21900**	**24500**		**43300**	**43900**	**49000**		**64900**	**65800**	**73500**
45 MPH	**18900**	**19800**	**23600**		**38100**	**39700**	**47200**		**57200**	**59600**	**70800**
35 MPH	**14000**	**16900**			**28100**	**34300**			**42200**	**51700**	
25 MPH	**12500**				**25400**				**38400**		

PIEDMONT	1 Lane Per Direction				2 Lanes Per Direction				3 Lanes Per Direction		
	Urban	Suburban	Rural		Urban	Suburban	Rural		Urban	Suburban	Rural
55 MPH	**19900**	**20200**	**22600**		**40000**	**40500**	**45200**		**59900**	**60700**	**67900**
45 MPH	**17500**	**18300**	**21800**		**35100**	**36600**	**43600**		**52800**	**55000**	**65400**
35 MPH	**14000**	**15600**			**28100**	**31600**			**42200**	**47700**	
25 MPH	**12500**				**25400**				**38400**		

MOUNTAIN	1 Lane Per Direction				2 Lanes Per Direction				3 Lanes Per Direction		
	Urban	Suburban	Rural		Urban	Suburban	Rural		Urban	Suburban	Rural
55 MPH	**21600**	**21900**	**22300**		**43300**	**43900**	**44500**		**64900**	**65800**	**66800**
45 MPH	**18900**	**20700**	**21400**		**38100**	**41400**	**42900**		**57200**	**62100**	**64400**
35 MPH	**14000**	**18500**			**28100**	**37400**			**42200**	**56400**	
25 MPH	**12500**				**25400**				**38400**		

Uses "Principal Arterials" Facility Type in NCLOS
*** Assumes Regional K and D Factor Averages**

See Appendix C1 for HCM Urban Arterial Equations
Use Appendix C2: Coastal Boulevard Inputs for adjustments
Use Appendix C3: Piedmont Boulevard Inputs for adjustments
Use Appendix C4: Mountain Boulevard Inputs for adjustments

NOTE: Inputs assume 12-foot lanes. To adjust lane-width downward, subtract 3.33% per foot of pavement and round to the nearest hundred

Coastal Level of Service D Standards for Other Major Thoroughfares *

55 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	15100	15800	16400		16600	17200	17800
11 foot lanes	14600	15300	15900		16100	16600	17200
10 foot lanes	14100	14700	15300		15500	16100	16600
9 foot lanes	13600	14200	14800		15000	15500	16000
45 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	13200	13800	14600		14500	14900	16000
11 foot lanes	12800	13300	14100		14000	14400	15500
10 foot lanes	12300	12900	13600		13500	13900	15000
9 foot lanes	11900	12420	13140		13050	13400	14400
35 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11100	12600			12700	14000	
11 foot lanes	10700	12200			12300	13500	
10 foot lanes	10400	11800			11900	13100	
9 foot lanes	10000	11300			11400	12600	
25 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11000				12700		
11 foot lanes	10600				12300		
10 foot lanes	10300				11900		
9 foot lanes	9900				11400		

Uses "Principal Arterials" Facility Type in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix D1 for HCM 2000 Urban Arterial Equations
Use Appendix D2: Coastal Major Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement and rounded to the nearest hundred

Coastal Level of Service D Standards for Other Major Thoroughfares *

55 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	30400	31600	32800		33300	34500	35700
11 foot lanes	29400	30600	31700		32200	33400	34500
10 foot lanes	29400	29500	30600		31100	32200	33300
9 foot lanes	27400	28400	29500		30000	31100	32100
45 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	26700	27600	29300		29000	29900	32000
11 foot lanes	25900	26700	28300		28000	28900	30900
10 foot lanes	25000	25800	27300		27100	27900	29900
9 foot lanes	24000	24800	26400		26100	26900	29000
35 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	22200	25500			24300	28100	
11 foot lanes	21500	24700			23500	27200	
10 foot lanes	20700	23800			22700	26200	
9 foot lanes	20000	23000			21900	25300	
25 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	22100				24200		
11 foot lanes	21400				23400		
10 foot lanes	20500				22600		
9 foot lanes	19900				21800		

Uses "Principal Arterials" Facility Type in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix D1 for HCM 2000 Urban Arterial Equations
Use Appendix D2: Coastal Major Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement and rounded to the nearest hundred

Piedmont Level of Service D Standards for Other Major Thoroughfares *

55 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	12900	14600	15100		14200	15900	16500
11 foot lanes	12500	14100	14600		13700	15400	16000
10 foot lanes	12000	13600	14100		13300	14800	15400
9 foot lanes	11600	13100	13600		12800	14300	14900
45 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	12200	12700	14600		13300	13800	16000
11 foot lanes	11800	12300	14100		12900	13300	15500
10 foot lanes	11400	11900	13600		12400	12900	14900
9 foot lanes	11000	11400	13100		12000	12400	14400
35 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11100	11600			12700	12900	
11 foot lanes	10700	11200			12300	12500	
10 foot lanes	10400	10800			11900	12000	
9 foot lanes	10000	10400			11400	11600	
25 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11000				12700		
11 foot lanes	10600				12300		
10 foot lanes	10300				11900		
9 foot lanes	9900				11400		

Uses "Principal Arterials" Facility Type in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix D1 for HCM 2000 Urban Arterial Equations
Use Appendix D3: Piedmont Major Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement

Piedmont Level of Service D Standards for Other Major Thoroughfares *

55 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	25800	29100	30200		28400	31800	33000
11 foot lanes	24900	28100	29200		27500	30800	31900
10 foot lanes	24100	27200	28200		26500	29700	30800
9 foot lanes	23200	26200	27200		25600	28600	29700
45 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	24600	25500	29300		26800	27600	32000
11 foot lanes	23800	24700	28300		25900	26700	31000
10 foot lanes	23000	23800	27300		25000	25800	29900
9 foot lanes	22100	23000	26400		24100	24800	28800
35 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	22200	23500			24300	26000	
11 foot lanes	21500	22700			23500	25100	
10 foot lanes	20700	21900			22700	24300	
9 foot lanes	20000	21200			21900	23400	
25 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	22100				24200		
11 foot lanes	21400				23400		
10 foot lanes	20600				22600		
9 foot lanes	19900				21800		

Uses "Principal Arterials" Facility Type in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix D1 for HCM 2000 Urban Arterial Equations
Use Appendix D3: Piedmont Major Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement and rounded to the nearest hundred

Mountain Level of Service D Standards for Other Major Thoroughfares *

55 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	14000	14600	15100		15300	15900	16500
11 foot lanes	13500	14100	14600		14800	15400	16000
10 foot lanes	13100	13600	14100		14300	14800	15400
9 foot lanes	12600	13100	13600		13800	14300	14900
45 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	12200	12700	14600		13300	13800	16000
11 foot lanes	11800	12300	14100		12900	13300	15500
10 foot lanes	11400	11900	13600		12400	12900	14900
9 foot lanes	11000	11400	13100		12000	12400	14400
35 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11000	11600			12700	12900	
11 foot lanes	10600	11200			12300	12500	
10 foot lanes	10300	10800			11900	12000	
9 foot lanes	9900	10400			11400	11600	
25 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11000				12700		
11 foot lanes	10600				12300		
10 foot lanes	10300				11900		
9 foot lanes	9900				11400		

Uses "Principal Arterials" Facility Type in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix D1 for HCM 2000 Urban Arterial Equations
Use Appendix D4: Mountains Major Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement and rounded to the nearest hundred

Mountain Level of Service D Standards
for Other Major Thoroughfares *

55 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	28000	29100	30200		30800	31800	33000
11 foot lanes	27100	28100	29200		29800	30800	31900
10 foot lanes	26100	27200	28200		28700	29700	30800
9 foot lanes	25200	26200	27200		27700	28600	29700
45 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	24600	25500	29300		26800	27600	32000
11 foot lanes	23800	24700	28300		25900	26700	30900
10 foot lanes	23000	23800	27300		25000	25800	29900
9 foot lanes	22100	23000	26400		24100	24800	28800
35 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	22200	23500			24300	26000	
11 foot lanes	21500	22700			23500	25400	
10 foot lanes	20700	21900			22700	24300	
9 foot lanes	20000	21200			21900	23400	
25 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	22100				24200		
11 foot lanes	21400				23400		
10 foot lanes	20600				22600		
9 foot lanes	19900				21800		

Uses "Principal Arterials" Facility Type in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix D1 for HCM 2000 Urban Arterial Equations
Use Appendix D4: Mountains Major Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement

Coastal Level of Service D Standards
for Minor Thoroughfares *

55 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	15100	15800	16400		16600	17200	17800
11 foot lanes	14600	15300	15900		16100	16600	17200
10 foot lanes	14100	14700	15300		15500	16100	16600
9 foot lanes	13600	14200	14800		14900	15500	16000

45 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	12700	13300	14600		14200	14300	16000
11 foot lanes	12300	12900	14100		13700	13800	15500
10 foot lanes	11900	12400	13600		13300	13300	14900
9 foot lanes	11400	12000	13100		12800	12900	14400

35 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	10500	11000			11500	13700	
11 foot lanes	10200	10600			11100	13300	
10 foot lanes	9800	10300			10700	12800	
9 foot lanes	9500	9900			10400	12300	

25 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	10000				11300		
11 foot lanes	9700				10900		
10 foot lanes	9300				10500		
9 foot lanes	9000				10200		

Uses "Principal Arterials" and "Minor Arterials" Facility Types in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix E1 for HCM 2000 Urban Arterial Equations
Use Appendix E2: Coastal Minor Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement

Piedmont Level of Service D Standards for Minor Thoroughfares *

55 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	12900	14600	15100		14200	15900	16500
11 foot lanes	12500	14100	14600		13700	15400	16000
10 foot lanes	12000	13600	14100		13300	14800	15400
9 foot lanes	11600	13100	13600		12800	14300	14900

45 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11700	12200	14600		13100	13200	16000
11 foot lanes	11300	11800	14100		12700	12800	15500
10 foot lanes	10900	11400	13600		12200	12300	14900
9 foot lanes	10500	11000	13100		11800	11900	14400

35 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	10200	10200			11700	12700	
11 foot lanes	9900	9900			11300	12300	
10 foot lanes	9500	9500			10900	11900	
9 foot lanes	9200	9200			10500	11400	

25 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	10000				11300		
11 foot lanes	9700				10900		
10 foot lanes	9300				10500		
9 foot lanes	9000				10200		

Uses "Principal Arterials" and "Minor Arterials" Facility Types in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix E1 for HCM 2000 Urban Arterial Equations
Use Appendix E3: Piedmont Minor Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement

Mountain Level of Service D Standards
for Minor Thoroughfares *

55 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	14000	14600	15100		15300	15900	16500
11 foot lanes	13500	14100	14600		14800	15400	16000
10 foot lanes	13100	13600	14100		14300	14800	15400
9 foot lanes	12600	13100	13600		13800	14300	14900

45 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11700	12200	14600		13100	13200	16000
11 foot lanes	11300	11800	14100		12700	12800	15500
10 foot lanes	10900	11400	13600		12200	12300	14900
9 foot lanes	10500	11000	13100		11800	11900	14400

35 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	10200	10200			11500	12700	
11 foot lanes	9900	9900			11100	12300	
10 foot lanes	9500	9500			10700	11900	
9 foot lanes	9200	9200			10400	11400	

25 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	10000				11300		
11 foot lanes	9700				10900		
10 foot lanes	9300				10500		
9 foot lanes	9000				10200		

Uses "Principal Arterials" and "Minor Arterials" Facility Types in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix E1 for HCM 2000 Urban Arterial Equations
Use Appendix E4: Mountain Minor Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement

Level of Service D Standards for Rural 2-Lane Highways

Coastal 2-Lane Highway Standard	COASTAL		
	Minimum	Standard	Maximum
12-Foot Lanes	10500	12700*	14700*#
11-Foot Lanes	10000		
10-Foot Lanes	9200	12000	
9-Foot Lanes	7700	10700	

Piedmont 2-Lane Highway Standard	PIEDMONT		
	Minimum	Standard	Maximum
12-Foot Lanes	10300	12400*	14300*#
11-Foot Lanes	9900		
10-Foot Lanes	9000	11800	
9-Foot Lanes	7500	10500	

Mountain 2-Lane Highway Standard	MOUNTAINS (Level)		
	Minimum	Standard	Maximum
12-Foot Lanes	10200	12100*	14000*#
11-Foot Lanes	9800		
10-Foot Lanes	8800	11700	
9-Foot Lanes	7400	10300	

Mountain 2-Lane Highway Standard	MOUNTAINS (Rolling)		
	Minimum	Standard	Maximum
12-Foot Lanes	9600	12100*	14000*#
11-Foot Lanes	9100		
10-Foot Lanes	8200	11100	
9-Foot Lanes	6300	9800	

Uses "2-Lane Highways" Facility Type in NCLOS

*** All capacities calculated based on HCM 2000 procedures using HCS software. Under some conditions, two-lane highway capacity is not affected by lane width. This occurs where capacity is governed by Percent Time Spent Following rather than by Average Travel Speed.**

**# Best-case/Maximum conditions are less likely to occur where lane widths are below 11 feet.
Use caution before selecting "Maximum" values for 9-ft or 10-ft lanes.**

**See Appendix F1 for HCM 2000 2-Lane Highway Equations
Use Appendix F2: Coastal Rural 2-Lane Highway Inputs for adjustments
Use Appendix F3: Piedmont Rural 2-Lane Highway Inputs for adjustments
Use Appendix F4: Mountain (Level) Rural 2-Lane Highway Inputs for adjustments
Use Appendix F5: Mountain (Rolling) Rural 2-Lane Highway Inputs for adjustments**

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