

SECTION E

SOUTH CAROLINA HIGHWAYS

As explained in the main Alliance Report, the specific highways determined to comprise the LATTs Strategic Highway System were identified using a series of criteria to help identify a network of highways which had the greatest significance regarding trade with Latin America. The 22,859-mile mainline LATTs Strategic Highway System shown in Exhibit E-1 is the result of this process.

About 4.5 percent of the mainline LATTs Strategic Highway System (1,029 miles) is located in South Carolina (Exhibit E-2). The South Carolina components¹ include the following:

- ▶ All of South Carolina's 829 miles of interstate highways, including:
 - I-26 from the North Carolina State Line south of Asheville to Charleston
 - I-20, a major east-west interstate linking Texas with Jackson, Birmingham, Atlanta, and Columbia
 - I-85, linking Montgomery with Atlanta, Charlotte, and Richmond
 - I-95, a major South-south interstate linking Washington D.C. with south Florida
 - Several shorter interstates, including routes I-126, I-185, I-385, I-526, and I-585
- ▶ 200 miles of non-interstate National Highway System (NHS) facilities
 - U.S. 76 from I-95 at Florence to the North Carolina State Line (41 miles), part of Corridor 13. This is a four-lane facility with partial access control for most of its length.
 - U.S. 1/52 from I-26 north of Charleston to the North Carolina State Line (159 miles), part of Corridor 19 (Maryland to Charleston, SC) and Congressional High Priority 5. This is the non-interstate portion of the future I-73 corridor, and is a mix of two and four-lane highways.
- ▶ LATTs connectors linking a LATTs Strategic Highway with a LATTs airport or waterport were included in the Strategic Highway System. However, because of database differences, it was not possible to analyze LATTs connectors in the same

¹ Mileage, number of lanes, pavement condition and other data reported herein were taken from the HPMS Database, as discussed subsequently, and may differ from information in other databases.

**Exhibit E-1
LATS STRATEGIC HIGHWAY SYSTEM**

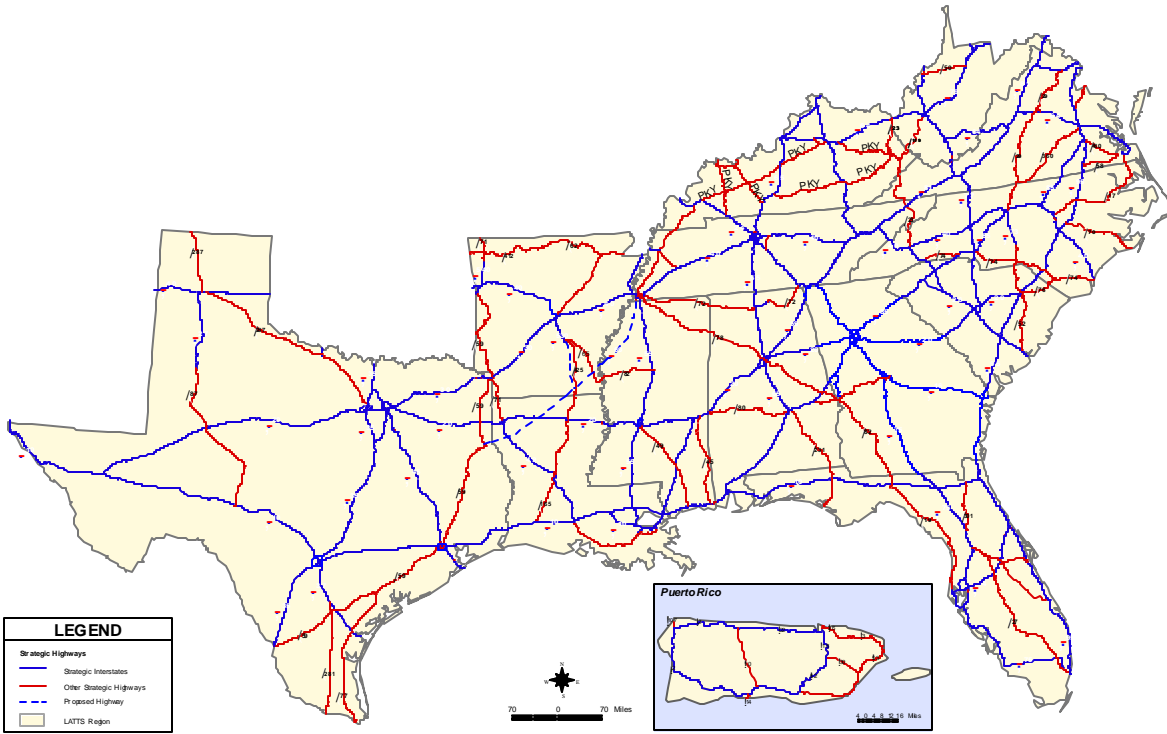
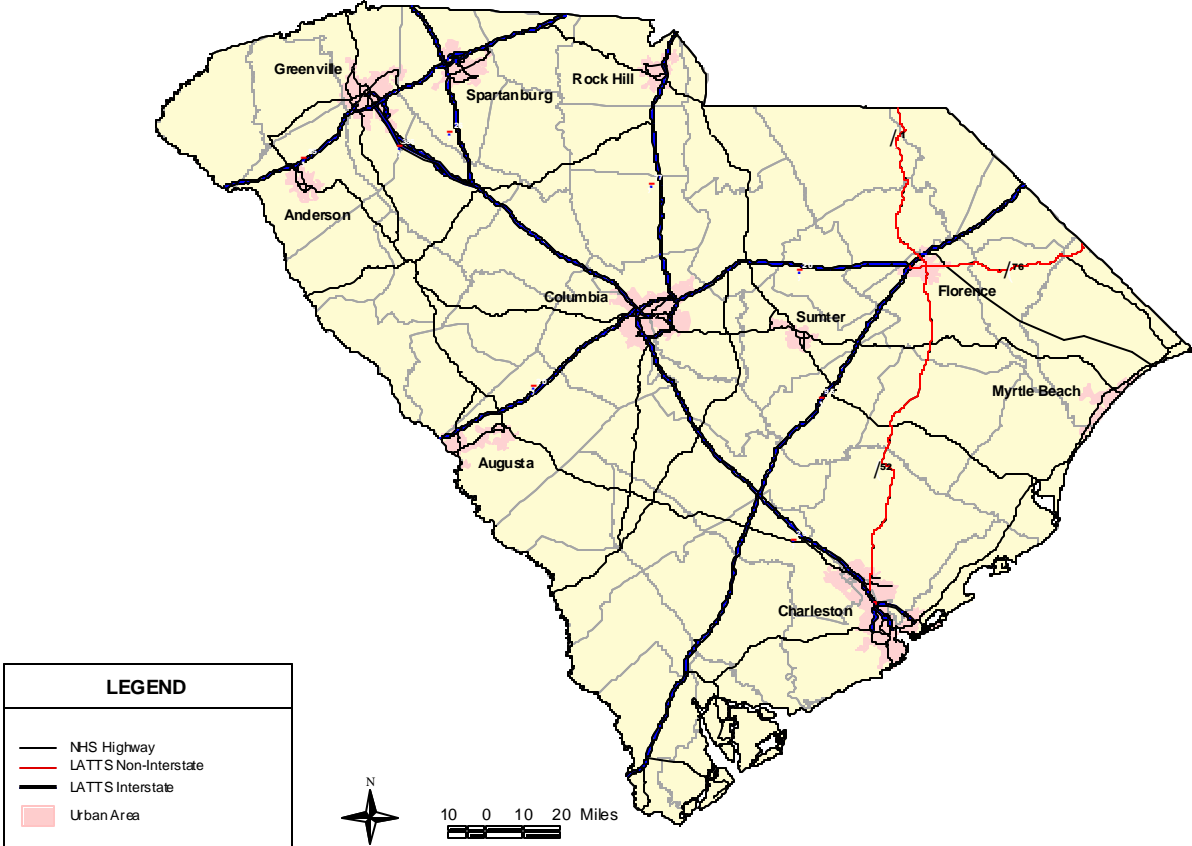


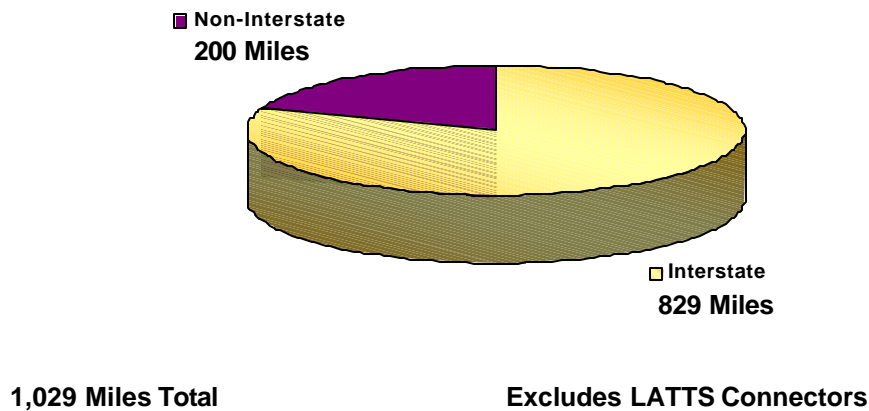
Exhibit E-2
SOUTH CAROLINA LATTTS HIGHWAY SYSTEM



manner and to the same level of detail as for mainline highways. LATTS connectors are discussed at the conclusion of Section E.

Exhibit E-3 displays the composition of South Carolina's portion of the LATTS highways by system.

Exhibit E-3
LATTS MAINLINE STRATEGIC HIGHWAY SYSTEM – SOUTH CAROLINA PORTION



LATTS HIGHWAYS VS. LATTS TRADE CORRIDORS

The 22,859 miles of “mainline” LATTS Strategic Highways were grouped into 25 LATTS Trade Corridors (Exhibit E-4). The Trade Corridors were established using logical origins/destinations and assigning each highway to only one corridor. Each corridor was assigned a number (1-25) and was referred to by the primary highway within the corridor (i.e., I-40). Portions of six LATTS Trade Corridors cross South Carolina, including:

- ▶ Corridor 1 (I-95) – South Florida to Washington, D.C.
- ▶ Corridor 2 (I-85) – West Alabama to Norfolk
- ▶ Corridor 4 (I-77/79) – Columbia, SC to Ohio and Pennsylvania
- ▶ Corridor 12 (I-26, U.S. 23) – Ohio to Charleston, SC
- ▶ Corridor 13 (I-20, U.S. 76) – El Paso to Wilmington
- ▶ Corridor 19 (I-73, U.S. 52/29) – Maryland to Charleston, SC

HIGHWAY DATABASES

Two main sources of data were used for the analysis of highway investment. The first one, the Highway Performance Monitoring System (HPMS), includes information about the characteristics and conditions of public highways. The second source of data was the LATTSS estimates of current and forecasts of future Latin America trade flows.

HPMS Database

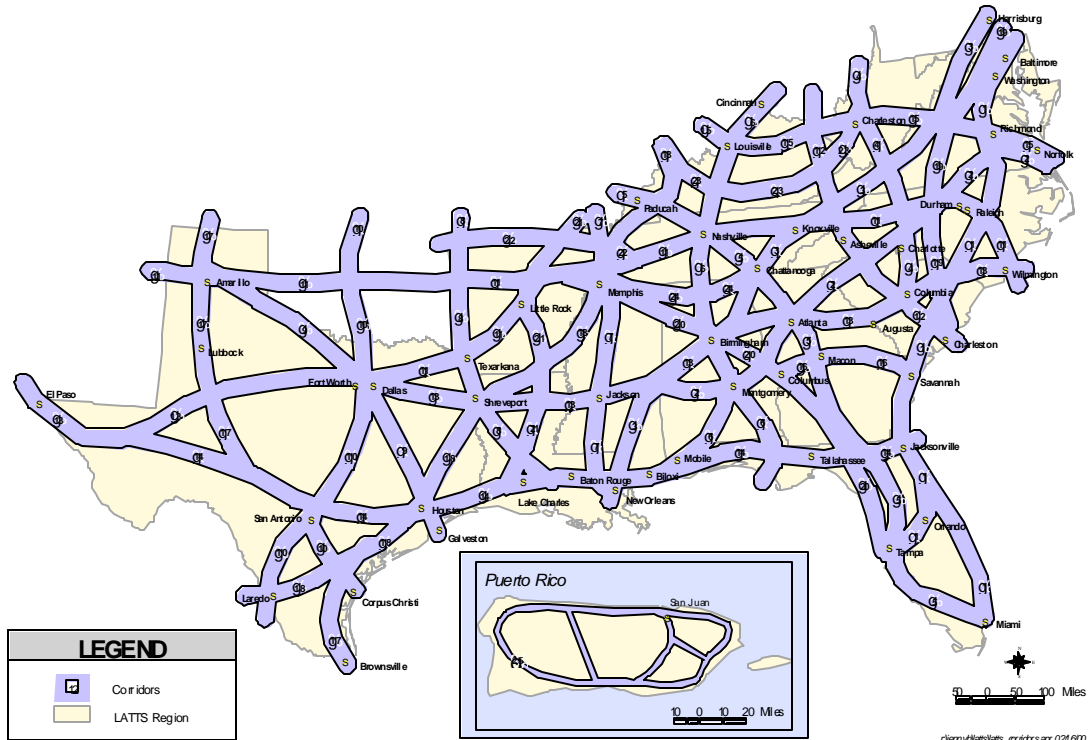
The HPMS database was selected for the LATTSS analyses of highway system investment needs because (1) it covered the entire Alliance Region, (2) it employs a consistent format and data definitions and (3) no additional primary data collection was necessary. Nevertheless, it was recognized that (1) the data is time sensitive (i.e., since the latest available information at the time of these analyses was for 1997, it is expected that improvements and additions will have occurred subsequently) (2) the HPMS database may have minor differences relative to other databases that individual Alliance members might use for their own planning and system management purposes and (3) information is not always available for every segment of the LATTSS Strategic Highway System.

For this study, only that portion of the HPMS database corresponding to the selected LATTSS Strategic Highway Network was utilized. For South Carolina, the LATTSS HPMS database consisted of 842 records describing 1,008 miles of highway on the LATTSS Strategic Highway Network.

Trade Flows

As explained in the main Alliance report, 1996 and expected 2020 trade volumes with Latin America were estimated and the portion of this trade that would be using highway facilities was translated into truck flows. The truck flows were then assigned to specific highway facilities using GIS generated shortest time paths. The LATTSS truck traffic assignment was then merged with the LATTSS HPMS database for further analysis.

Exhibit E-4 LATTS TRADE CORRIDORS



The LATTs procedure for assigning truck flows is appropriate for a macro-scale study such as LATTs. Nevertheless, it should be noted that the procedure produces approximations which may vary slightly from actual conditions. That is, an all-or-nothing assignment on the basis of shortest time paths favors high speed facilities and likely under estimates flows on facilities with lower speeds. In reality, a modest amount of truck flows could choose a lower speed path for a variety of unique reasons. Also, some LATTs trucks undoubtedly will travel on facilities other than those included in the LATTs Strategic Highway System (e.g., a local road to reach a warehouse or plant). Despite these circumstances, the LATTs procedure is deemed to be sufficiently valid for purposes of a regional transportation study.

As a result of this assignment methodology, 772 miles of the Strategic Highway Network in South Carolina were shown to carry LATTs truck traffic. All 772 miles are interstate highways.

LATTs TRUCK TRAFFIC IN SOUTH CAROLINA

The LATTs highway database was used to quantify the LATTs truck traffic in terms of annual Vehicle Miles of Travel (VMT) and to compare LATTs truck traffic to total truck traffic (LATTs and others). Results of this analysis by corridor for 1997 and 2020 are illustrated in Exhibit E-5. More detailed information is presented in Exhibit E-6.

**Exhibit E-5
LATTs ANNUAL TRUCK VMT IN SOUTH CAROLINA**

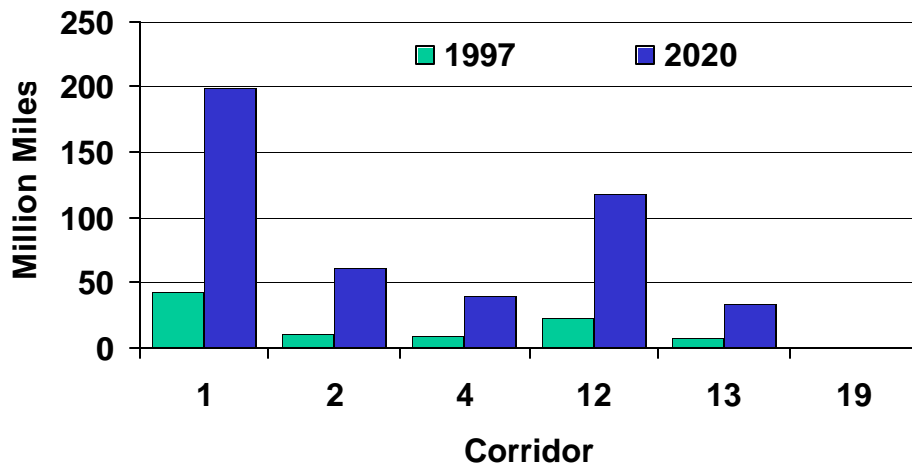


Exhibit E-6
SOUTH CAROLINA LATTS TRUCK TRAFFIC

Corridor/ Functional Class	Length (Miles)	1997 Annual Truck VMT (Million Miles)				2020 Annual Truck VMT (Million Miles)			
		All Trucks Full Network	All Trucks Part. Network(1)	LATTS Trucks Only	LATTS Percent (2)	All Trucks Full Network	All Trucks Part. Network(1)	LATTS Trucks Only	LATTS Percent (2)
1	I-95, I-4	South Florida to Washington, DC							
R.Interstate	196.07	482.86	414.00	41.73	10.1%	1,130.27	996.52	196.08	19.7%
U.Interstate	2.69	5.20	5.20	0.53	10.2%	12.85	12.85	2.49	19.4%
TOTAL	198.76	488.06	419.20	42.26	10.1%	1,143.12	1,009.37	198.57	19.7%
2	I-85	Montgomery, AL to Norfolk, VA							
R.Interstate	118.63	378.32	378.32	9.02	2.4%	829.77	829.77	50.92	6.1%
U.Interstate	35.04	86.62	81.73	1.90	2.3%	194.64	186.55	10.66	5.7%
TOTAL	153.67	464.93	460.05	10.92	2.4%	1,024.40	1,016.32	61.58	6.1%
4	I-77, I-79	Columbia, SC to Ohio and Pennsylvania							
R.Interstate	62.00	152.42	152.42	7.23	4.7%	393.76	393.76	35.06	8.9%
U.Interstate	29.05	69.04	44.97	1.07	2.4%	166.85	110.33	5.19	4.7%
TOTAL	91.05	221.47	197.39	8.31	4.2%	560.61	504.09	40.25	8.0%
12	I-26, US 23	Charleston, SC to Ohio							
R.Interstate	178.37	388.83	388.83	18.24	4.7%	950.89	950.89	95.08	10.0%
U.Interstate	65.52	197.11	164.00	4.32	2.6%	455.27	375.71	22.93	6.1%
TOTAL	243.89	585.93	552.83	22.55	4.1%	1,406.17	1,326.61	118.01	8.9%
13	I-20, US 76	El Paso, TX to Wilmington, NC							
R.Interstate	116.37	226.82	226.82	4.39	1.9%	536.73	536.73	22.16	4.1%
R.Other PA	30.26	12.16	-	-	0.0%	23.87	-	-	0.0%
U.Interstate	25.14	68.84	68.84	2.47	3.6%	169.20	169.20	12.29	7.3%
U.Other PA	10.79	3.31	-	-	0.0%	5.72	-	-	0.0%
TOTAL	182.56	311.13	295.66	6.86	2.3%	735.51	705.93	34.45	4.9%
19	I-73, US 52, US 29	Charleston, SC to Maryland							
R.Other PA	122.13	32.01	-	-	0.0%	62.89	-	-	0.0%
U.Other PA	16.35	7.62	-	-	0.0%	13.27	-	-	0.0%
TOTAL	138.48	39.63	-	-	0.0%	76.16	-	-	0.0%
ALL CORRIDORS									
R.Interstate	671.44	1,629.25	1,560.39	80.61	5.2%	3,841.42	3,707.67	399.30	10.8%
R.Other PA	152.39	44.17	-	-	0.0%	86.76	-	-	0.0%
U.Interstate	157.44	426.80	364.74	10.29	2.8%	998.81	854.65	53.55	6.3%
U.Other PA	27.14	10.93	-	-	0.0%	18.98	-	-	0.0%
TOTAL	1,008.41	2,111.15	1,925.13	90.90	4.7%	4,945.96	4,562.32	452.86	9.9%

Of the six LATTS corridors crossing South Carolina, only five were assigned LATTS truck traffic. Corridor 19 (I-73/U.S.52/U.S.29 from Charleston, SC to Maryland) was not assigned any LATTS traffic in South Carolina. It is comprised mostly of U.S. Routes as opposed to interstates.

Corridor 1 (I-95/I-4 from South Florida to Washington D.C.) and Corridor 12 (I-26/U.S.23 from Charleston, SC to Ohio) were assigned the most LATTS traffic in terms of VMT (199 and 118 million miles respectively in 2020). The highest volume of LATTS trucks is on Corridor 1 with 2020 average annual daily truck volume of 2,737.

Of LATTS truck traffic in South Carolina 88 percent operates on the rural interstate system and the rest on the urban interstate system. The percentage of LATTS trucks to total trucks is expected to grow from 5 percent in 1997 to 10 percent in 2020 on those highways carrying LATTS traffic (from 4 to 9 percent for the entire LATTS Strategic Network). This growth in LATTS share of total truck traffic is due to the fact that LATTS truck traffic is expected to increase 5 fold between 1997 and 2020 while overall truck traffic would increase by 2 fold only without LATTS trucks and 2.2 fold with LATTS trucks. LATTS truck share of total trucks varies from corridor to corridor. The highest

shares in South Carolina are 20 percent on Corridor 1 (I-95/I-4 from South Florida to Washington D.C.) and 9 percent on Corridor 12 (I-26/U.S.23 from Charleston, SC to Ohio).

IMPACT MEASURES

The purpose of the highway analysis portion of this study was to quantify the LATTs Strategic Network total investment needs and the incremental investment needs that could be attributed to LATTs truck traffic specifically. Because of the macro-scale nature of this study, the investment needs analysis focused on capacity and pavement resurfacing needs.

In order to identify needs due to expected traffic (cars and trucks) other than LATTs and needs specifically attributable to LATTs traffic, two sets of capacity and pavement needs were estimated. First, future needs were estimated based on the “normal” traffic as defined by the HPMS database which includes AADT, truck percentages, and growth rate. Future needs were estimated a second time with the same HPMS traffic plus the “additional” LATTs truck traffic above and beyond the traffic that would be estimated using the “normal” growth. The difference in needs between the two was considered the incremental needs due to growth in LATTs traffic.

Minimum tolerable conditions (MTCs) for both congestion (capacity) and pavement conditions were applied uniformly to all segments of the LATTs Strategic Highway System. These MTCs are described in more detail in the main Alliance report and are summarized below.

- ▶ Capacity needs were based on Level of Service (LOS) not exceeding:
 - LOS C for rural highways
 - LOS D for urban highways
- ▶ Pavement resurfacing needs were based on the following minimum pavement condition rating:
 - Interstate type facilities: PSR 3.0
 - Other facilities: PSR 2.5

The LATTs minimum tolerable conditions are in no way intended to replicate or replace values that individual members of the Alliance might consider to be more appropriate for their circumstances. The LATTs MTCs were established for this study so as to be consistent for all the Alliance members.

To price the identified capacity or pavement needs, the same unit costs were used consistently throughout the Alliance Region. These unit costs were provided by the FHWA and correspond to 1997 national averages. To maintain consistency throughout the Region, no attempt was made to tailor these unit costs to each state beyond the stratification provided by the FHWA.

CAPACITY NEEDS

A needs analysis model was developed to analyze capacity needs for 1997 and 2020. For the year 2020, capacity needs with and without the “additional” LATTs traffic were estimated. The model was then applied to every one of the HPMS records comprising the South Carolina LATTs highway database and the results were summarized. This model applied the same methodology, outlined in the main Alliance report, and found in the HPMS Analytical Package, to calculate capacity needs. The results reflect the information contained in the HPMS Database and do not consider any improvements that may have occurred subsequently or any planned improvements.

Detailed results for South Carolina are presented in Exhibit E-7. The total number of South Carolina LATTs Strategic Highway Network road miles with capacity deficiencies in 1997 and 2020 are shown in columns 4 through 6. For 2020, the amount of capacity deficiencies with and without the “additional” LATTs traffic is shown.

**Exhibit E-7
SOUTH CAROLINA CAPACITY INVESTMENT NEEDS**

Corridor/ Functional Class	Length (Miles)	Existing Lane Miles	Capacity Analysis								
			Deficient Mileage			2020 Needed Lane Miles		2020 Cost in \$Million			
			1997	2020 W/O LATTs Added Traffic	2020 With LATTs Added Traffic	Base	With LATTs Added Traffic	Base	With LATTs Added Traffic	% Increase Due to LATTs	
1	I-95, I-4		South Florida to Washington, DC								
R.Interstate	196.07	784.28	5.47	191.30	191.30	571.14	621.20	468	485	3.8%	
U.Interstate	2.69	10.76	-	2.69	2.69	9.44	9.44	33	33	0.0%	
TOTAL	198.76	795.04	5.47	193.99	193.99	580.58	630.64	501	518	3.5%	
2	I-85		Montgomery, AL to Norfolk, VA								
R.Interstate	118.63	501.46	65.49	118.63	118.63	440.44	461.36	351	359	2.2%	
U.Interstate	35.04	159.55	8.66	29.73	30.23	151.47	158.93	526	552	4.9%	
TOTAL	153.67	661.01	74.15	148.36	148.86	591.91	620.29	877	911	3.8%	
4	I-77, I-79		Columbia, SC to Ohio and Pennsylvania								
R.Interstate	62.00	258.15	5.70	62.00	62.00	159.73	159.73	153	153	0.0%	
U.Interstate	29.05	150.60	3.81	29.05	29.05	128.94	128.94	448	448	0.0%	
TOTAL	91.05	408.75	9.51	91.05	91.05	288.67	288.67	601	601	0.0%	
12	I-26, US 23		Charleston, SC to Ohio								
R.Interstate	178.37	713.48	29.39	172.38	172.38	505.04	590.18	436	468	7.3%	
U.Interstate	65.52	327.59	13.55	63.13	63.13	307.05	312.07	1,066	1,083	1.6%	
TOTAL	243.89	1,041.07	42.94	235.51	235.51	812.09	902.25	1,502	1,551	3.3%	
13	I-20, US 76		El Paso, TX to Wilmington, NC								
R.Interstate	116.37	470.54	8.55	116.37	116.37	291.18	291.18	284	284	0.0%	
R.Other PA	30.26	109.82	-	8.75	8.75	17.50	17.50	15	15	0.0%	
U.Interstate	25.14	130.32	2.03	25.14	25.14	116.20	122.98	403	427	5.8%	
U.Other PA	10.79	43.16	-	4.19	4.19	8.38	8.38	16	16	0.0%	
TOTAL	182.56	753.84	10.58	154.45	154.45	433.26	440.04	719	742	3.3%	
19	I-73, US 52, US 29		Charleston, SC to Maryland								
R.Other PA	122.13	356.84	25.43	77.50	77.50	165.44	165.44	135	135	0.0%	
U.Other PA	16.35	69.44	2.05	8.84	8.84	21.64	21.64	47	47	0.0%	
TOTAL	138.48	426.28	27.48	86.34	86.34	187.08	187.08	181	181	0.0%	
ALL CORRIDORS											
R.Interstate	671.44	2,727.91	114.60	660.68	660.68	1,967.53	2,123.65	1,692	1,750	3.4%	
R.Other PA	152.39	466.66	25.43	86.25	86.25	182.94	182.94	150	150	0.0%	
U.Interstate	157.44	778.82	28.05	149.74	150.24	713.10	732.36	2,475	2,542	2.7%	
U.Other PA	27.14	112.60	2.05	13.03	13.03	30.02	30.02	63	63	0.0%	
TOTAL	1,008.41	4,085.99	170.13	909.70	910.20	2,893.59	3,068.97	4,380	4,504	2.8%	

These analyses indicate that 170 of the LATTS roadway miles in South Carolina, or 17 percent of the South Carolina portion of the Strategic Network, have existing capacity problems. The analyses also show that the majority of the capacity deficiencies will occur in the next 20 years unless capacity is added.

With the expected “normal” growth (as defined by the HPMS database), a total of 910 road miles or 90 percent of the LATTS network will have congestion problems by 2020. The “additional” LATTS trucks are not expected to increase the total miles a significant degree as noted in Exhibit E-8. However, LATTS trucks will increase the number of needed lane miles by six percent. These analyses indicate that the majority of the congestion problems in South Carolina are not due solely to LATTS traffic but expected overall growth in total traffic. However, unless these capacity needs are met, LATTS truck traffic will be affected by these capacity deficiencies regardless of the source of traffic. As congestion increases, LATTS trucks like other traffic, will experience lower operating speeds, frequent speed changes, lower reliability, and increased operating costs.

Exhibit E-8
SOUTH CAROLINA 2020 CAPACITY NEEDS
LATTS Strategic Network

	<u>Deficient Miles</u>	<u>% of Total Miles</u>	<u>Needs (Billion)</u>
“Normal” Growth	910	90%	\$4.4
“Additional” LATTS Traffic	0.5	--%	\$0.1
Total	910	90%	\$4.5

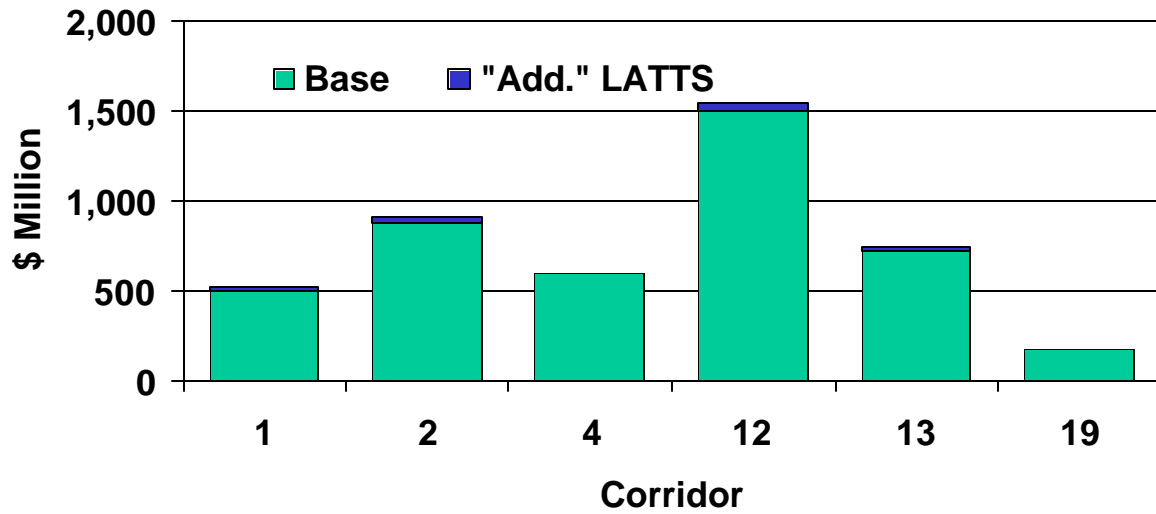
Based on the HPMS expected growth in traffic, nearly \$4.4 billion will be required in the next 20 years to address congestion problems on the South Carolina portion of the LATTS Strategic Network. The “additional” LATTS traffic will bring that total to \$4.5 billion, a 3 percent increase. The dollar increase in capacity needs due to LATTS traffic is lower than the corresponding increase in terms of needed lane miles because a majority of LATTS truck traffic occurs on rural highways which are less expensive to improve than urban highways.

Capacity needs by corridor are illustrated in Exhibit E-9. Total capacity needs by corridor are related to the total length of the corridor: the longer the corridor, the higher the needs. Corridor 12 (I-85 from Charleston, SC to Ohio), which is the longest in South Carolina, has the highest capacity needs (\$1.6 billion by 2020). However, in terms of average capacity needs per roadway mile, Corridor 2 (I-85 from Montgomery, AL to Norfolk, VA) and Corridor 4 (I-77/I-79 from Columbia, SC to Ohio and Pennsylvania) have higher capacity needs: \$ 5.9 and \$6.6 million per roadway mile along with Corridor 12 which averages \$ 6.4 million.

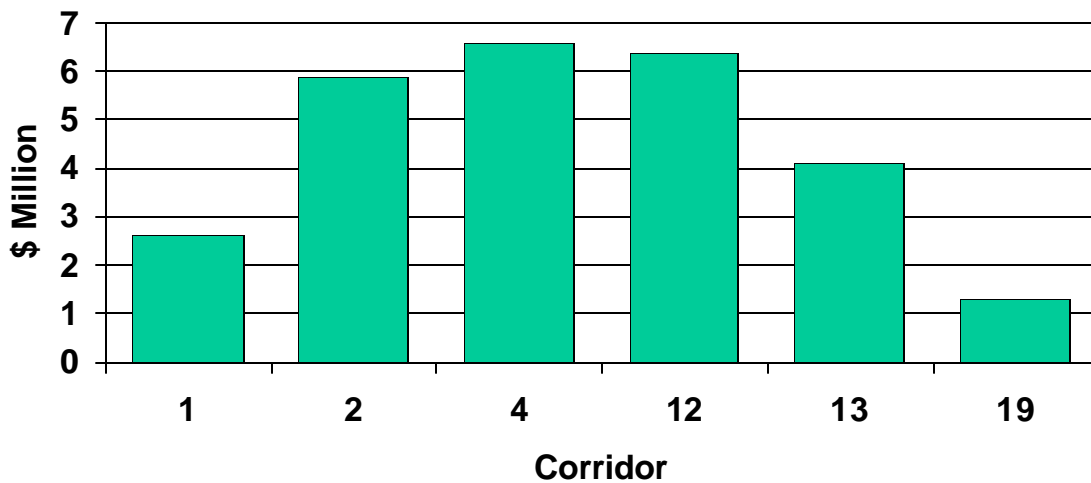
It should be noted that by 2020, at least 97 percent of Corridor 1 (I-95/I-4 from South Florida to Washington, D.C.), Corridor 2 (I-85 from Montgomery, AL to Norfolk, VA), Corridor 4 (I-85 from Montgomery, AL to Norfolk, VA), and Corridor 12 (I-85 from Charleston, SC to Ohio) will require capacity improvements in South Carolina.

**Exhibit E-9
SOUTH CAROLINA STRATEGIC HIGHWAY NETWORK
Capacity Needs by Corridor**

Total 2020 Capacity Needs



Average 2020 Capacity Needs per Mile



PAVEMENT NEEDS

For purposes of this study, average annual pavement needs in 2020 were estimated. The number of years it would take for the pavement to deteriorate from new in 2020 to a deficient PSR rating (as defined by the minimum tolerable conditions presented earlier) was calculated for each highway segment. As an indicator of the existing condition of the network, pavement deficiencies were identified for 1997.

Pavements typically are designed to last for a fairly long time. However, as they age and are subjected to traffic loads, they deteriorate. The pavement life measure used in these analyses is dependent on the amount of traffic using the highway and, more specifically, truck traffic (car traffic is a factor in the pavement deterioration rate but it has far less impact). The type of pavement (for example high flexible versus high rigid) is also an important factor affecting pavement deterioration rates. The pavement type on each highway segment, as indicated by the 1997 HPMS database, was used in the estimation of the deterioration rates. The number of lanes indicated for 1997 was used in the calculation of pavement deterioration rate and resurfacing costs. No attempt was made to measure the impact on pavement needs of adding lanes to address the congestion problems identified earlier. Finally, the HPMS-AP methodology for deteriorating pavement was applied in this study. It is based on the concept of 18Kip Equivalent Single Axle Loads. Weather condition or type of subsoil can also influence pavement deterioration rates but, for this study, no other factors beyond traffic and pavement type were used to differentiate pavement deterioration rates between sections.

Each highway segment pavement life was calculated twice. An initial calculation was made using the “base” car and truck traffic from the South Carolina HPMS database. The second calculation was made with the “additional” LATTS traffic added to it. The difference in the two pavement lives is a measure of the impact of LATTS traffic.

Results of South Carolina pavement needs for the LATTS Strategic Highway Network are presented in Exhibit E-10. Based on the HPMS data, only 7 percent, or 74 miles, of the South Carolina portion of the LATTS Strategic Highway Network had existing (1997) pavement deficiencies. The majority of these deficiencies is concentrated on non-interstate facilities which are little used by LATTS trucks.

**Exhibit E-10
SOUTH CAROLINA PAVEMENT RESURFACING INVESTMENT NEEDS**

Corridor/ Functional Class	Length (Miles)	Existing Lane Miles	Pavement Analysis					
			1997 Deficient Mileage	2020 Pavement Life (Years)		2020 Average Annual Cost (\$1,000)		
				W/O LATTS Added Traffic	With LATTS Added Traffic	W/O LATTS Added Traffic	With LATTS Added Traffic	% Increase Due to LATTS
1	I-95, I-4		South Florida to Washington, DC					
R.Interstate	196.07	784.28	0.41	4.4	4.0	19,889	21,650	8.9%
U.Interstate	2.69	10.76	-	3.6	3.6	600	604	0.7%
TOTAL	198.76	795.04	0.41	4.4	4.0	20,489	22,254	8.6%
2	I-85		Montgomery, AL to Norfolk, VA					
R.Interstate	118.63	501.46	3.03	3.8	3.8	13,970	14,032	0.4%
U.Interstate	35.04	159.55	7.47	3.7	3.7	8,741	8,766	0.3%
TOTAL	153.67	661.01	10.50	3.8	3.8	22,711	22,798	0.4%
4	I-77, I-79		Columbia, SC to Ohio and Pennsylvania					
R.Interstate	62.00	258.15	-	3.8	3.8	7,312	7,365	0.7%
U.Interstate	29.05	150.60	-	4.1	4.1	7,882	7,890	0.1%
TOTAL	91.05	408.75	-	3.9	3.9	15,194	15,255	0.4%
12	I-26, US 23		Charleston, SC to Ohio					
R.Interstate	178.37	713.48	0.14	4.0	3.9	19,660	19,856	1.0%
U.Interstate	65.52	327.59	1.52	3.6	3.6	18,420	18,467	0.3%
TOTAL	243.89	1,041.07	1.66	3.8	3.8	38,081	38,323	0.6%
13	I-20, US 76		El Paso, TX to Wilmington, NC					
R.Interstate	116.37	470.54	-	3.8	3.8	13,175	13,203	0.2%
R.Other PA	30.26	109.82	10.15	6.6	6.6	1,217	1,217	0.0%
U.Interstate	25.14	130.32	-	3.6	3.6	7,351	7,379	0.4%
U.Other PA	10.79	43.16	3.74	9.6	9.6	679	679	0.0%
TOTAL	182.56	753.84	13.89	4.5	4.5	22,424	22,479	0.2%
19	I-73, US 52, US 29		Charleston, SC to Maryland					
R.Other PA	122.13	356.84	42.76	8.5	8.5	3,334	3,334	0.0%
U.Other PA	16.35	69.44	4.91	8.3	8.3	1,231	1,231	0.0%
TOTAL	138.48	426.28	47.67	8.5	8.5	4,565	4,565	0.0%
ALL CORRIDORS								
R.Interstate	671.44	2,727.91	3.58	4.0	3.9	74,007	76,107	2.8%
R.Other PA	152.39	466.66	52.91	8.1	8.1	4,552	4,552	0.0%
U.Interstate	157.44	778.82	8.99	3.7	3.7	42,994	43,107	0.3%
U.Other PA	27.14	112.60	8.65	8.8	8.8	1,910	1,910	0.0%
TOTAL	1,008.41	4,085.99	74.13	4.6	4.5	123,463	125,675	1.8%

One would expect that the corridors with the highest concentration of LATTS truck traffic would show the largest impact from LATTS. Exhibit E-10 confirms this expectation. Corridor 1 (I-95/I-4 from South Florida to Washington, D.C.) which carries the majority of the LATTS truck traffic in South Carolina will experience the highest reduction in pavement life from 4.4 years to 4.0 years.

Total resurfacing costs are a function of the average pavement life and the length of the highways. Corridor 12 (I-26/U.S.23 from Charleston, SC to Ohio), the longest corridor in South Carolina, has the highest average annual resurfacing needs, more than \$ 38 million with LATTS traffic. With the largest reduction in average pavement life due to LATTS, Corridor 1 has the largest incremental resurfacing needs due to LATTS trucks, \$ 1.8 million annually or 8.6 percent.

Future (2020) pavement needs are summarized in Exhibit E-11. Pavement life for the South Carolina portion of the LATTS Strategic Highway Network will average 4.6 years in 2020 without the “additional” LATTS truck traffic and 4.5 years with it. The annual resurfacing costs for the South Carolina portion of the LATTS Strategic Highway

Network is estimated to exceed \$123 million without LATTS “additional” truck traffic and \$126 million with it, an increase of 1.8 percent.

Exhibit E-11
SOUTH CAROLINA 2020 PAVEMENT NEEDS
LATTS Strategic Network

	<u>Pavement Life (Years)</u>	<u>Annual Resurfacing Cost (\$Million)</u>
“Normal” Growth	4.6	\$123
With “Additional” LATTS Traffic	4.5	\$126

OPERATING SPEEDS

Truck operating speed was chosen as a key study performance measure for the LATTS Strategic Highway Network. Truck operating speeds were estimated for each LATTS roadway segment based on the conditions of the roadway, including roadway geometry and alignment, pavement condition, speed limit and traffic volumes. The operating speed calculation for each sample segment or link was based on the methodology of the HPMS Analytical Package used by FHWA to estimate highway needs.

Two types of operating speeds were calculated. One was the average daily operating speed and the other was the peak hour operating speed as defined by the peak hour factor or “K” factor for each road segment. Because it is not known when a truck would travel over a specific highway section during the peak hour, the peak hour operating speed assumed that every section was traveled during peak hour. As a result, the calculated peak hour speed and travel time for an entire corridor is probably somewhat overstated, as it is unlikely that a truck would travel every section during peak hour conditions.

Truck operating speeds were calculated for each LATTS roadway section. Operating speeds over a combination of segments were then calculated by adding travel time and distance for each segment and calculating the new speed.

Truck operating speeds on the South Carolina portion of the LATTS Strategic Highway Network are presented on Exhibit E-12. In this exhibit, South Carolina truck operating speeds estimates are presented by functional class. The total lengths of all the segments, which were used in the analysis of the corridor, are listed first. This is followed by items describing the characteristics of the segments, including average number of lanes, speed limit, and AADT. The purpose of listing these items is to facilitate better understanding of the calculated operating speeds. For example, two/three-lane highways have lower operating speeds than equivalent four-lane highways because of passing difficulties. Similarly, low speed limits will result in low operating speeds on facilities no matter what the road conditions are.

Average daily and peak period speeds/travel times for trucks also are presented for the base year (1997). Further, truck operating speeds are listed twice for year 2020. The first time, truck operating speeds were calculated assuming the base growth rate, i.e. the

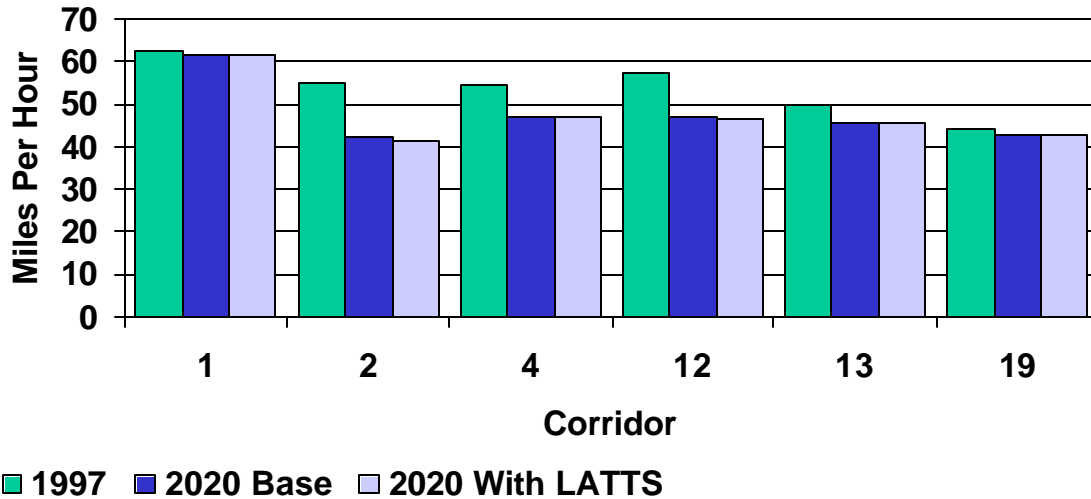
growth rate indicated by the HPMS database. The second time, truck operating speeds were calculated with the LATTS “additional” traffic. Overall results for the entire corridor within South Carolina are then listed, as well as the overall time required to travel the entire corridor. By comparing these speed and travel time values (based on present conditions), it is possible to determine which facilities are most efficient today, which facilities are going to experience deteriorating conditions due to traffic growth regardless of LATTS impact, and finally which facilities are going to be most affected by LATTS traffic.

Average daily truck operating speeds are summarized in Exhibit E-13. All corridors with a majority of interstate facilities (Corridors 1, 2, 4, 6, 12 and 13) had average daily operating speeds above 50 MPH in 1997. Corridor 19 had lower average daily speeds in the 40-45 MPH range because it is comprised of lower type facilities.

**Exhibit E-12
SOUTH CAROLINA TRUCK OPERATING SPEEDS**

Corridor/ Functional Class	Length (Miles)	Average No. Lane	Speed Limit (MPH)	Average 1997 AADT	1997 Truck Speed (MPH)		2020 Truck Speed (MPH) W/O Added LATTS Traffic		2020 Truck Speed (MPH) With Added LATTS Traffic	
					Daily Average	Peak Hour	Daily Average	Peak Hour	Daily Average	Peak Hour
1	I-95, I-4				South Florida to Washington, DC					
R.Interstate	196.10	4.0	65.0	30,669	62.7	61.3	61.8	29.3	61.6	28.6
U.Interstate	2.70	4.0	65.0	37,845	58.9	57.7	55.9	15.7	55.9	15.7
TOTAL Time (HR)	198.80	4.0	65.0	30,766	62.6	61.3	61.7	29.0	61.5	28.3
					3.2	3.2	3.2	6.9	3.2	7.0
2	I-85				Montgomery, AL to Norfolk, VA					
R.Interstate	118.60	4.2	62.2	39,714	57.3	46.7	46.0	27.3	44.8	27.3
U.Interstate	35.00	4.6	54.7	48,164	48.9	30.1	33.1	16.8	33.0	16.8
TOTAL Time (HR)	153.70	4.3	60.3	41,641	55.1	41.5	42.2	23.9	41.4	23.9
					2.8	3.7	3.6	6.4	3.7	6.4
4	I-77, I-79				Columbia, SC to Ohio and Pennsylvania					
R.Interstate	62.00	4.2	55.0	30,615	57.7	52.8	52.7	26.6	52.7	26.6
U.Interstate	29.00	5.2	56.8	46,511	49.1	37.4	37.9	15.4	37.9	15.4
TOTAL Time (HR)	91.00	4.5	55.6	35,687	54.7	46.7	46.9	21.6	46.9	21.6
					1.7	2.0	1.9	4.2	1.9	4.2
12	I-26, US 23				Charleston, SC to Ohio					
R.Interstate	178.40	4.0	64.8	27,147	60.4	58.2	56.4	30.5	55.6	30.3
U.Interstate	65.50	5.0	56.2	58,638	50.0	31.4	32.1	15.8	32.1	15.8
TOTAL Time (HR)	243.90	4.3	62.2	35,607	57.2	47.3	46.9	24.4	46.5	24.3
					4.3	5.2	5.2	10.0	5.2	10.0
13	I-20, US 76				El Paso, TX to Wilmington, NC					
R.Interstate	116.40	4.0	64.2	24,273	56.8	56.0	54.0	26.8	53.9	26.8
R.Other PA	30.30	3.6	51.6	13,760	47.2	46.3	46.8	44.6	46.8	44.6
U.Interstate	25.10	5.2	60.5	53,584	48.7	42.0	34.4	16.4	34.1	16.4
U.Other PA	10.80	4.0	36.7	16,829	23.4	23.4	23.4	17.9	23.4	17.9
TOTAL Time (HR)	182.60	4.1	58.7	26,127	49.8	48.2	45.7	25.5	45.6	25.5
					3.7	3.8	4.0	7.2	4.0	7.2
19	I-73, US 52, US 29				Charleston, SC to Maryland					
R.Other PA	122.10	2.9	54.1	9,003	47.9	45.1	46.3	37.8	46.3	37.8
U.Other PA	16.40	4.2	45.4	25,310	28.1	23.2	27.7	16.7	27.7	16.7
TOTAL Time (HR)	138.50	3.1	52.9	10,928	44.2	40.6	42.9	32.9	42.9	32.9
					3.1	3.4	3.2	4.2	3.2	4.2

Exhibit E-13
SOUTH CAROLINA STRATEGIC HIGHWAY NETWORK
Average Daily Truck Operating Speeds

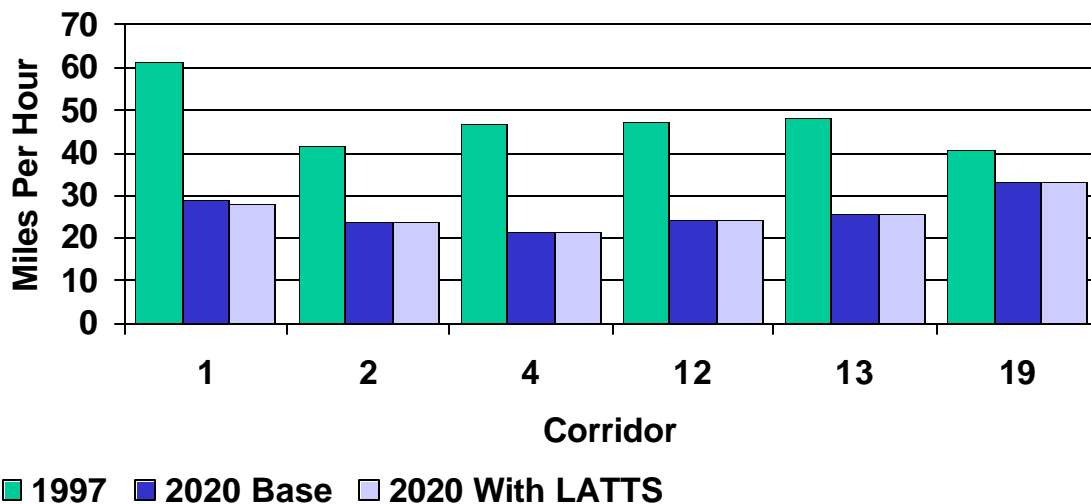


The projected growth in traffic between 1997 and 2020 will affect this measure of performance significantly. Unless additional capacity is provided, the average daily speed in many of South Carolina LATTS corridors will be reduced by 5 MPH or more. Corridor 2 (I-85 from Montgomery, AL to Norfolk, VA) will experience the most deterioration in average daily travel speeds, close to 13 MPH reduction, unless new capacity enhancement measures are undertaken. Corridor 12 (I-10 from West Texas to Jacksonville, FL) and Corridor 4 (I-77/I-79 from Columbia, SC to Ohio and Pennsylvania) could experience a reduction in average travel speed around 10 and 8 MPH, respectively.

Compared to the impact of the expected traffic growth between 1997 and 2020, the impact of the “additional” LATTS traffic on average daily truck travel speed appears minor at less than 1 MPH in all corridors.

As noted in Exhibit E-14, the expected traffic growth in South Carolina LATTS corridor will affect “peak hour” speeds even more significantly than it will average daily speed. A reduction up to 32 MPH for Corridor 1 (I-95/I-4 from South Florida to Washington D.C.) was estimated.

Exhibit E-14
SOUTH CAROLINA STRATEGIC HIGHWAY NETWORK
“Peak-Hour” Truck Operating Speeds



As mentioned earlier, these travel speeds are estimated assuming no change in capacity on any section of the LATTS highway network and traffic peaking patterns the same as they are today. This is unlikely given the severity of the estimated resulting congestion on some highways.

The impact of LATTS “additional traffic” is insignificant compared to the impact of overall growth in total traffic.

CONCLUSIONS FOR LATTS MAINLINE HIGHWAYS

- (1) LATTS truck traffic in South Carolina is expected to grow at a much higher rate than the rest of the traffic in the state. From 1997 to 2020, LATTS truck traffic will increase by 398 percent while all other traffic is expected to increase by 115 percent.
- (2) About 90 percent of the LATTS Strategic Highway Network in South Carolina will require additional capacity by 2020 at a cost of \$ 4.6 billion. More than 95 percent of these capacity needs are for the interstate system. The majority of these needs are due to expected growth in total traffic and not to LATTS trucks only.
- (3) LATTS truck traffic will have a modest impact on the state highway investment needs for the Strategic Highway Network. By 2020, LATTS “additional” truck traffic will have resulted in:
 - ▶ 6% more highway lane miles to address capacity deficiencies.
 - ▶ 3% additional costs to address these capacity needs.
 - ▶ 2% increase in annual pavement resurfacing costs.

- (4) In South Carolina, Corridor 1 (I-95/I-4 from South Florida to Washington D.C.) will be proportionally most affected by LATTs trucks because of the higher volume of LATTs traffic using this corridor.
- (5) If these investment needs are not met, the South Carolina portion of the LATTs Strategic Highway Network will experience significant deterioration in operating speeds especially during “peak hour.”

WATERPORT AND AIRPORT INTERMODAL CONNECTORS

The focus of the highway analysis was, appropriately, on the mainline portion of the LATTs Strategic Highway System. This is the portion of the highway network carrying the vast majority of truck travel (vehicle miles) and has “needs” that could be quantified using existing databases. Additionally, the portion of the highway system connecting the LATTs mainline system with the LATTs waterports and airports also were assessed. While these highway intermodal connectors sometimes are overlooked, their deficiencies can significantly impact the efficient movement of vehicles, especially large trucks.

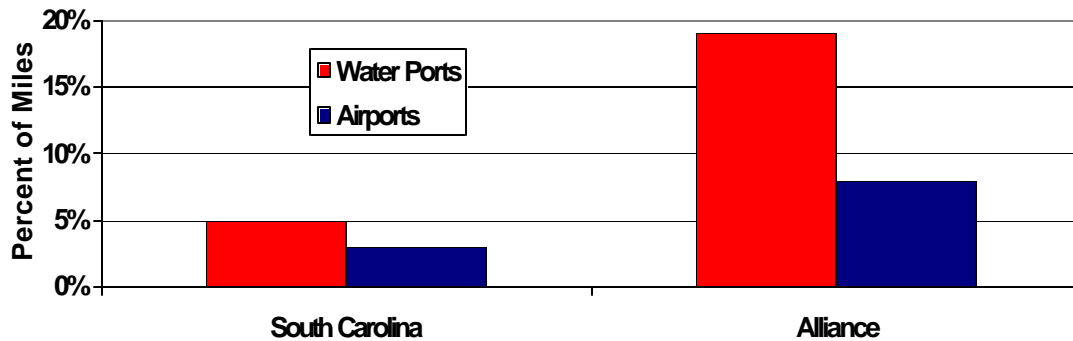
LATTs intermodal connectors are the highways that link the mainline LATTs Strategic System with LATTs intermodal facilities (waterports and airports). To avoid costly new data collection activities, a recently compiled database was used to conduct the connectors analysis. This database, the *NHS Connectors*, was populated by the state DOTs and compiled by the Federal Highway Administration. It includes a high quality sample of the LATTs intermodal connectors. However, it does not contain information for every LATTs intermodal connector. These analyses utilized information for those LATTs intermodal connectors for which information was available in the NHS connectors database at the time the analyzes were performed.

As noted in Exhibit E-15, South Carolina has six connectors for which information was available in the inventory database. Of those six connectors, South Carolina has partial jurisdiction of four and full jurisdiction of two.

**Exhibit E-15
LATTs INTERMODAL CONNECTORS**

FACILITY ID	FACILITY NAME	LINK MILES	RURAL/URBAN DESIGNATION	OWNERSHIP	AGENCY
SC10P	Columbus St/Union Pier Terminal	2.8	Urbanized (>200k)	State Highway-Municipal Highway	CHATS
SC11P	Port of Georgetown	0.6	Small Urban (5k to 49k)	State Highway	GSATS
SC2A	Greenville-Spartanburg Regional Airport	3	Rural	State Highway-County Highway	GRATS
SC3A	Columbia Metropolitan Airport	1.3	Urbanized (>200k)	State Highway-Other Local Agency	COATS
SC8P	North Charleston Terminal	2.7	Urbanized (>200k)	State Highway	CHATS
SC9P	Wando Terminal	0.8	Urbanized (>200k)	State Highway	CHATS

Exhibit E-16
CONNECTORS WITH PAVEMENT PROBLEMS
South Carolina vs. Alliance Local/Other



The following are the South Carolina facilities that have connectors for which information was not available in the inventory database:

- ▶ Charleston International Airport; SC1A
- ▶ Port Royal

Pavement Problems

South Carolina connectors fared well in this category, as noted in Exhibit E-16. Based upon the available information, both airport and waterport connector pavement deficiencies are below Alliance averages. Connector SC11P, serving the port at Georgetown, reported 50 percent of its 0.6 miles to be in poor condition.

Geometric/Physical Problems

Travelway and shoulder deficiencies were reported at SC9P, in Charleston. Another deficiency common to three connectors, (SC8P, SC9P, SC10P), was inadequate turning radii.

At-Grade Railroad Crossing Problems

The Columbus St. terminal connector, SC10P, and the North Charleston Terminal connector were reported to have rail crossing problems. Delays at crossings were common to each.

Traffic Operations and Safety Problems

Difficult turns, and lack of signals were common deficiencies reported for all the Charleston port connectors.

State Summary

The Charleston port connectors accounted for the majority of reported deficiencies in South Carolina. All other connectors were reported to be in good condition.

INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

While it is clear that improvements in highway infrastructure are required to achieve an economically efficient transportation system, truck operations also can be improved by the implementation of ITS. Transportation technologies help freight transport become more productive and more responsive to the needs of business enterprises, including those which are engaged in Latin American trade. Fortunately, a large portion of current work in the ITS arena is with commercial vehicle operations (CVO). Of significant relevance to LATTs is the Commercial Vehicle Information Systems and Networks (CVISN) that embodies a collection of information systems and communications networks that provide support to CVO.

The national ITS/CVO program encompasses numerous projects undertaken by the individual states. The national program is designed to encourage the development and implementation of technology to enhance the safe movement of commercial vehicles across the United States. There are four main areas within the national program and each of the individual states are striving to meet these goals:

- ▶ Safety Assurance – Programs and projects that are designed to assure the safety of commercial drivers, vehicles, and cargo.
- ▶ Credentials Administration – Programs and projects that are designed to improve the procedures and systems for managing motor carrier regulation.
- ▶ Electronic Screening – Programs and projects that are designed to facilitate the verification of size, weight, safety, and credentials information.
- ▶ Carrier Operations – Programs and projects that are designed to reduce congestion and manage the flow of commercial vehicle traffic.

Most of the Alliance member states have completed some type of ITS/CVO Business Plan. Many of these documents are living documents and are continually being updated and revised. Since state's ITS/CVO plans are changing frequently, the information contained below is only a snapshot of ITS information available in early 2001.

South Carolina ITS/CVO Plan

South Carolina is currently working under the guidance of the *South Carolina ITS/CVO Business Plan*. This document outlines the methodology that South Carolina proposes to use to work toward CVISN development and deployment. The plan itself is a long term visionary program, but the projects listed within focus on near term solutions. The plan will be updated on an annual basis and outlines the South Carolina Motor Carrier Program, which is the combination of projects that the State will undertake in order to implement CVISN deployment.

The ITS/CVO and CVISN/Mainstreaming Steering Committee developed the Business Plan and it was completed during May 1999. Members serving on this committee were

from the State Transport Police (currently the lead motor carrier agency), the Department of Transportation, FHWA, and the motor carrier industry.

As with many states, South Carolina has an existing CVO program, South Carolina Motor Carrier Program, which is responsible for commercial vehicle enforcement and regulation. This effort is lead by the Division of State Transport Police within the Department of Public Safety. Currently the program includes the following:

- ▶ Roadside and mobile vehicle monitoring facilities,
- ▶ Office of Motor Carrier Services,
- ▶ Commercial drivers licenses,
- ▶ OS/OW permits,
- ▶ Fuel tax collections and distributions, and
- ▶ Various other CVO activities.

The Business Plan outlines the mission of the South Carolina Motor Carrier Program, which is to reduce costs and increase productivity while continuing to improve safety². The program framework set forth within the Business Plan consists of seven goals that collectively work toward the mission stated above.

- ▶ Educate decision makers and stakeholders to obtain buy-in and support,
- ▶ Upgrade and modernize administrative processes,
- ▶ Upgrade and improve technical and communications infrastructure,
- ▶ Enable and enhance Electronic Data Exchange,
- ▶ Improve highway safety,
- ▶ Improve economic climate for motor carriers, and
- ▶ Streamline and improve operating efficiencies within the South Carolina Motor Carrier Program³

The projects as set forth by the Business Plan are within three of the four national program areas: Credentials Administration, Safety Assurance, and Electronic Screening. In addition, there is a set of programs that will be undertaken initially in order to pave the way for CVISN implementation. The projects are as follows:

- ▶ Mainstreaming/CVISN Projects
 - Carolina Forum on Commercial Vehicles and Highway Safety - This project will design a forum where all motor carrier issues can be resolved and discussed. In addition, the adoption of ITS technologies by the state will be handled and discussed here. While it was anticipated that the Forum would begin meeting in August of 1999, the current status of the Forum meetings has not been confirmed.
 - State Transport Police Motor Carrier Advisory Group – This program will allow for an Advisory Group to be formed that will advise the State Transport Police on policy and regulatory issues pertaining to the motor carrier industry.
 - CVISN Deployment Workshops: South Carolina Participation – This program will designate a CVISN team that will participate in CVISN Deployment Workshops in the hopes of developing a CVISN Project Plan for the State.

² *South Carolina ITS/CVO Business Plan*, ITS/CVO and CVIAN/Mainstreaming Steering Committee, May 1999

³ *South Carolina ITS/CVO Business Plan*, ITS/CVO and CVIAN/Mainstreaming Steering Committee, May 1999

▶ Credentials Administration

Phase I

- Upgrade Office of Motor Carrier Services Information Systems Technology – This project will allow for all the Motor Carrier Offices within South Carolina to be upgraded to include technology, which is necessary for data exchange among all offices. This project has a five-year plan (1999 – 2003).

Phase II

- Automate Administrative Processes: Electronic Credentialing Implementation Study and Electronic Data Exchange – South Carolina will complete a study that will examine the feasibility of creating an in-house system that allows all Motor Carrier Service programs to be administered from one location. This plan was to be used to obtain funding for the system in 1999.

▶ Roadside Safety Assurance

Phase I

- Upgrade Roadside Inspection Technology – This project will allow roadside laptop computers to be upgraded and allow for statewide roadside access to electronic data. This program is expected to be a five-year plan (2001 – 2005).

Phase II

- Statewide STP Information Systems Improvement Implementation Plan – This project would develop a statewide implementation plan that will determine the necessary systems, hardware, and equipment to facilitate the near real-time exchange of data to and from the various State agencies and roadside personnel. It is anticipated that this program will be completed by June 2001.

▶ Electronic Screening

- Commercial Vehicle Monitoring Facilities Infrastructure Improvements – This project will upgrade existing roadside facilities to include WIM and updated monitoring technologies. In addition, four new roadside facilities will be constructed and will also include updated technologies. Each of the facilities will be operational by 2003.