Review of the Grand Strand Expressway Alternatives to the I-73 Extension

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INTRODUCTION

I-73 has been proposed as a new interstate highway in South Carolina, including a new highway corridor from I-95 to SC 22 near Conway/Myrtle Beach. Past studies, however, have indicated that improvements to existing highway corridors could provide the vast majority of I-73's projected benefits at a small fraction of its cost. This report updates one of those earlier reports, the *Grand Strand Expressway Report* (hereinafter *GSX Report*) prepared by Smart Mobility in March 2011. The *GSX Report* identified three options (Figure 1) in which improvements to existing roads (sometimes referred to as TSM measures) could serve as alternatives to the extension of I-73 as a four- to six-lane freeway from I-95 to SC 22 near Conway/Myrtle Beach:

1. The US 501/SC 38 corridor, 42 miles in length, extending from I-95 to SC 22 near Conway
2. The SC 9 corridor, consisting of 69 miles of SC 9. The corridor extends from I-95 near Dillon, SC to SC 31 in North Myrtle Beach
3. The "74 Connector" between US 74 in Whiteville in North Carolina and SC 22 in South Carolina, a distance of 38 miles

This report updates and provides further support for the options proposed in the *GSX Report* by:

1. Further detailing improvements to the three routes presented as alternatives to the construction of I-73 in the *GSX Report*
2. Updating the cost estimate for the three alternative concepts
3. Ascertaining the vehicular capacity and operating speed of the concepts

In summary, this report finds that the overall conclusions of the *GSX Report* remain valid. Improvements to the existing US 501/SC 38 corridor to create the Grand Strand Expressway would provide substantial benefits for future traffic flow to the Myrtle Beach area at a fraction of the cost of I-73. Upgrading SC 9 would allow for improved traffic flow patterns and increased visitation to the Grand Strand. Further, while not a stand-alone alternative, improvements to the "74 Connector" corridor could be paired with the US 501/SC 38 upgrades to provide a long-term transportation solution for the region.

All three alternatives could be accomplished for less money than extending I-73, but not all are needed to accomplish the purpose and need of I-73. US 501/SC 38 upgrades alone could accomplish the goal of the interstate proposal.

The Grand Strand Expressway alternatives remain technically sound and achievable. Suggested improvements to existing corridors would be expected to provide ample capacity for free-flowing traffic service for the year 2030 peak day traffic, at speeds approaching freeway levels. Given the exorbitant fiscal and environmental cost of I-73 in comparison to these upgrade alternatives, the Grand Strand Expressway undoubtedly remains the better choice.

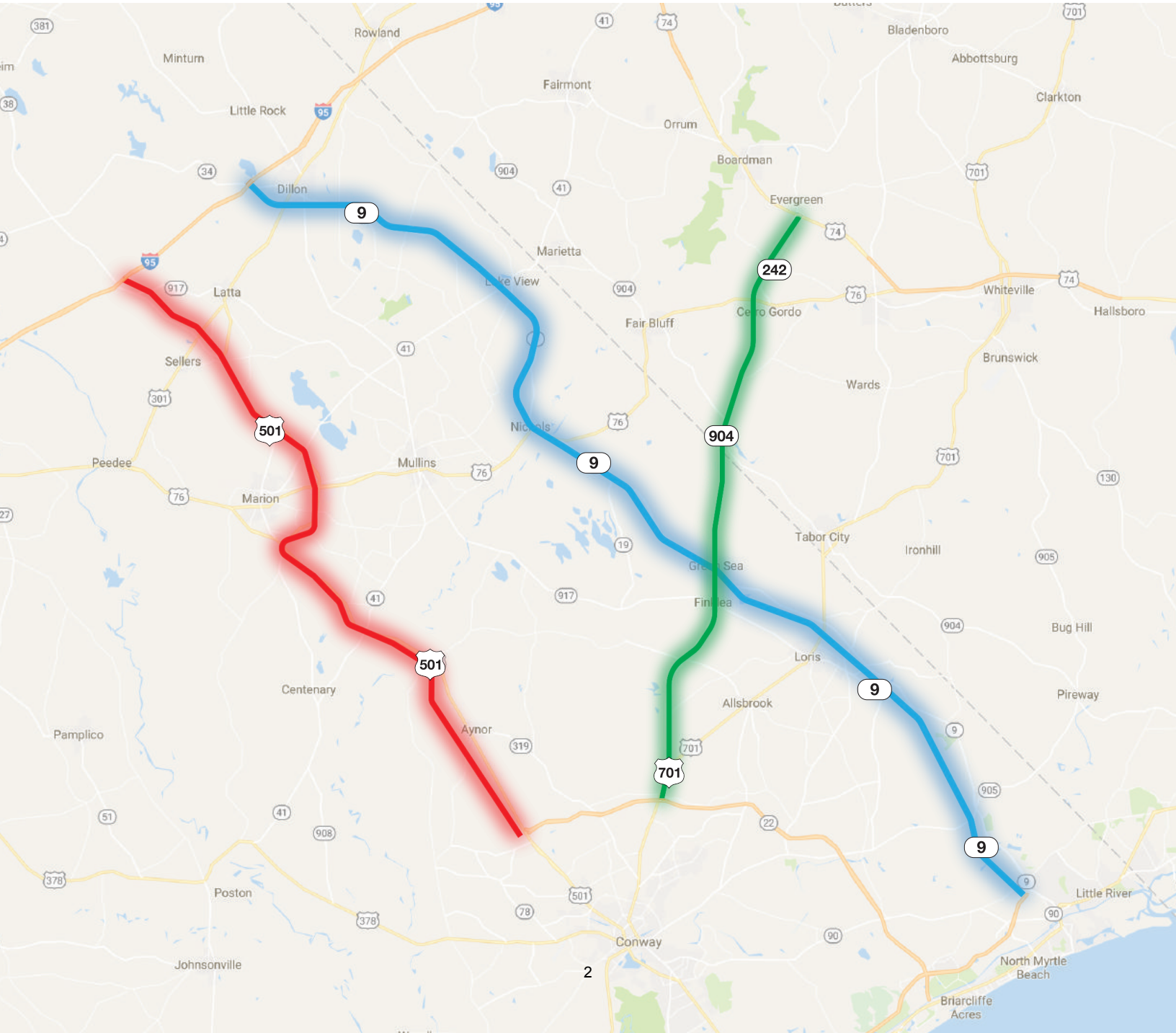
FIGURE 1

TRANSPORTATION SYSTEMS MANAGEMENT OPTIONS

US 501/SC 38 Option

SC 9 Option

74 Connector Option



UPDATE OF IMPROVEMENTS INCLUDED IN THE THREE GSX REPORT CORRIDORS

The US 501/SC38 Option

The *GSX Report* proposes the upgrading of the 42-mile US 501/SC 38 route between I-95 and SC 22 near Conway to an "expressway" as the first choice for an alternative to the proposed extension of I-73. This option is just as viable an alternative to the construction of I-73 today as it was in 2011.

The term "expressway," while often part of a road's name, is not rigorously defined by highway design nomenclature. This term, however, is generally defined, as in the *GSX Report*, as a road largely, but not entirely, free of traffic conflict due to cross streets and driveways. In traffic flow terms, the defining characteristic of an expressway is attainment, to as great an extent as possible, of "uninterrupted" traffic flow; i.e., traffic flow unhindered by traffic signals, STOP signs or other traffic control devices.

The US 501/SC 38 corridor already has important expressway-compatible features:

1. Eight grade-separated interchanges (I-95 and SC 22 termini included)
2. One grade-separated cross-road
3. Multi-lanes throughout (four-lane or five-lane cross section)
4. Divided roadway with generous median on around 30 miles (three-quarters) of the route
5. Extensive access management, through median spacing and auxiliary (left- and right-turn) lanes.

Further, US 501/SC 38 from I-95 to SC 22 could readily be brought up to expressway standards by addressing the following deficiencies:

1. At-grade signalized intersections at three locations. These locations "interrupt" the traffic flow on US 501/SC 38, contributing to delay and reduction in capacity.
2. Three segments, totaling around seven miles, of undivided road (i.e. without median). These segments, some of them already intersected by frequent driveways, have reduced speed limits and a perception by travelers of slowed traffic due to conflicting turning movements at many intersections.

The *GSX Report* identifies three specific categories of improvement – "superstreet" (more recently "synchronized street") segments, access management, and grade separation -- for transitioning the US501/ SC 38 corridor into an expressway. Figure 2, Table 1 and the following sections of this report identify detailed locations for these improvements.

FIGURE 2
US 501/SC 38 CORRIDOR (NORTH SEGMENT)

FIGURE 2, CONTINUED

US 501/SC 38 CORRIDOR (SOUTH SEGMENT)

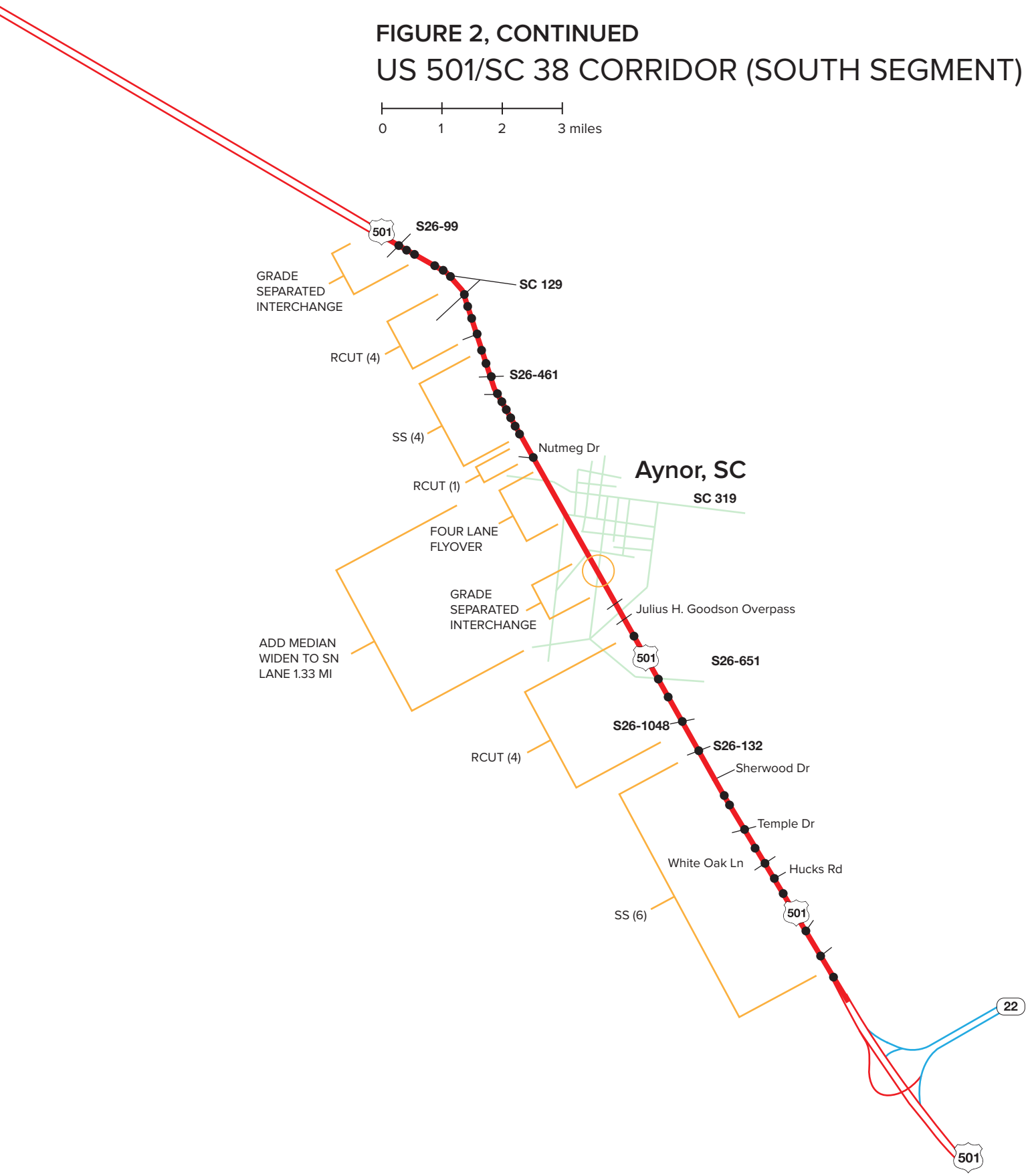


Table 1
US 501/SC 38 Option
Summary of Route Improvements

Route	***Segment***	***Upgrade 4L to 6L EXPY (miles)***	***Upgrade 4L or 5L to 4L EXPY (miles)***	***Synchro-nized Street Measures***		***New Grade Separated Interchanges***
				RCUT	***SS***	
SC 38	I-95 to US 501		0.80	5	7	
US 501	SC 38 to Ellerbe Rd			3		
US 501	Ellerbe Rd to E. Sellers Rd		2.65		6	
US 501	E. Sellers Rd to S 34-19			7	8	
US 501	Intersection with S 34-19					1
US 501	S 34-19 to S 34-204			8	8	
US 501	S 34-204 to Seegars Rd		2.82		6	
US 501	Seegars Rd to S 26-99					
US 501	S 26-99 intersection					1
US 501	S 26-99 to SC 319			5	4	
US 501	(Town of Aynor) SC 319 to Julius H. Goodson Overpass	1.33				1 interchange 1 flyover
US 501	Julius H. Goodson Overpass to SC 22			4	6	
Total	***US 501/SC 32 Route***	***1.33***	***6.27***	***32***	***45***	***3 interch. 1 flyover***

Notes:
RCUT – Restricted Crossing U-Turn intersection
SS – Synchronized Street, consisting of multiple adjoining RCUT intersections
EXPY - expressway

Synchronized Street Segments -- The "synchronized street" (updated term for "superstreet") was identified in the *GSX Report* as a potentially important element in upgrading US 501/SC 38. The synchronized street improves traffic flow and safety by converting the two most problematic movements at intersections (crossing the major road

and making a left turn onto it) into a sequence of merges and U-turns, significantly reducing conflict and hazard otherwise associated with crossings and left turns.

The basic building block of a synchronized street is the "Restricted Crossing U-Turn" (RCUT) intersection (Appendix A) prohibiting the crossing of the major road and left-turns into the major road from the intersecting road. These movements (crossing and left turns) are both accomplished with a right turn into the major road, quickly followed (within 800 – 1,000 feet) with a U-turn in the major road. The originally intended left turn is complete at this point, while the intended crossing is completed with a right turn onto the cross street.

The "synchronized street" or "SS" is a road segment with multiple adjacent segments of RCUT intersections, with their U-turns abutting "back-to-back".

At the time of the publication of the *GSX Report* in 2011, the synchronized street was seen as an innovative and promising but still somewhat untested measure. Recognizing the potential of this measure, the *GSX Report* identified it as having broad applicability to the US 501/SC 38 option.

In the six years since the publication of the *GSX Report*, the experience with installing synchronized streets throughout the US has been positive. One such installation on a highway with access patterns similar to US 501/SC 38 is the 12-mile segment of synchronized street in Rutherford County, North Carolina on US 221 between US 74 and the South Carolina state line. This recently completed synchronized street has been well-received by both industry professionals and the driving public.

All intersections along US 501/SC 38 can and should be considered candidates for the synchronized street measure. Even if not yet warranted by current traffic volume, their installation at the outset of the improvement of the US 501/ SC 38 route would provide immediate safety benefits for all users and conflict-free continuity and uninterrupted flow (no stops) for major-route travelers along the US 501/SC 38 corridor.

Grade Separations -- The *GSX Report* recommends grade-separated interchanges as a key component of the US 501/SC 38 improvements. Detailed analysis of the route indicates that the highest priority locations for grade separation are the existing three signalized intersections (two in Aynor and one near the I-95 interchange). At these locations, the traffic signal requirement for "green time" on the intersecting road significantly diminishes the capacity of the major road (i.e., US 501 or SC 38). When operating at "uninterrupted flow" (not stopped or slowed at a traffic signal, STOP sign, etc.) a lane of traffic on a multi-lane (four or more lanes) road can carry around 2,000 vehicles per hour. Operating at "interrupted" flow, a lane of traffic through a signalized intersection will carry 1,200 to 1,400 hourly vehicles, depending on the cross-street volume and the need for exclusive ("protected") signal phases for left-turning vehicles.

Two grade separations are recommended in Aynor: (1) a grade-separated interchange at US 501 with State Road S-26-24 (Jordanville Road) and (2) a four-lane flyover, carrying

four lanes of through traffic on US 501, extending from north of Elm Street (SC 319) to south of Main Street. Turning movements to/from US 501 will take place at the at-grade intersections (signalized if needed) beneath the flyover.

The intersection of US 501 and State Road S-26-99 is identified as a priority location for a grade separation in the near future.

It is recommended that the signalized intersection on SC 38 at Mill Branch Road just east of exit 181 on I-95 be replaced by a roundabout, with a large-radius design accommodating large trucks.

Cost of the US 501/SC 38 Option – The total cost of the US 501/SC 38 option is estimated at $183 million, or only 14 percent of the $1.3 billion cost of the I-73 extension. Around half of this cost ($88 million) comes from fitting existing highway segments with RCUT and synchronized street (SS) features. Approximately one-quarter of the total cost ($50 million) comes from grade separations, either interchanges or the flyover in Aynor.

Table 2
Cost Estimate
US 501/SC 38 Option

Item	***Quantity***	***Unit Cost ($ Millions)***	***Total Cost ($ Millions)***
RCUT intersections	32	1.13	36.2
SS intersections	45	1.16	52.2
Widen, 4 or 5 lane undivided To 4 lane divided	6.27 miles	5.03	31.5
Widen to 6-Lane divided (Aynor)	1.33 miles	6.48	8.6
4-lane flyover (Aynor)	1	9.78	9.8
Access management (Aynor)	1	2.20	2.2
Grade-separated interchanges	3	13.4	40.2
Large roundabout	1	2.40	2.4
Total, US 501/SC 38 Route			183.1

SC 9 Option

The *GSX Report* suggested that this corridor would consist of around 30 miles of "widening" existing four-lane roads to expressways, another 30 miles of widening existing two-lane roads to a four-lane expressway and around four miles of new expressway bypassing towns.

Updated SC 9 Option Improvements -- Advancing this concept from the *GSX Report* in further detail yields a plan (Figure 3 and Table 4) with 26.4 miles of upgrading (but not

widening) of existing four-lane roads to expressway, 30 miles (same as in *GSX Report*) of widening of two-lane roads to four-lane expressway and three bypass segments of four-lane limited access freeway totaling 8.1 miles.

The elements of expressway for the SC 9 option, patterned after those in the US 501/SC 38 corridor (above) are for a consistently four-lane divided cross section, intensive management of cross street and property access through RCUT intersections (some combined into synchronized street segments), auxiliary turn lanes, limited-access bypasses of towns and urban areas and grade-separated interchanges at junctions with major routes.

Table 3
SC 9 Option
Summary of Route Improvements

Route	***Segment***	***Upgrade, 2L to 4L EXPY***	***Upgrade, 4L to 4L EXPY***	***New 4L LA FWY***	***New Grade Separated Interchanges***
SC 34	I-95 –Dillon Bypass	2.5 miles			
New	Dillon Bypass			4.3 miles	4 interchanges
SC 9	Dillon Bypass-Lake View Bypass	10.4 miles			
New	Lake View Bypass			2.3 miles	3 interchanges
SC 9	Lake View Bypass-Nichols Bypass	5.9 miles			
New	Nichols Bypass			1.5 miles	2 interchanges
SC 9	Nichols Bypass – SC 410	11.2 miles			
SC 9	SC 410 – SC 31		26.4 miles		
New	(Unspecified, TBD)				3 interchanges
Total	***Route 9 Corridor***	***30.0 miles***	***26.4 miles***	***8.1 miles***	***12 interchanges***

2L – two lanes
4L – four lanes
LA FWY – limited access freeway

Cost Estimate, SC 9 Option – The total cost of the SC 9 option is $602 million (Table 4), less than half the cost of the I-73 extension. Over half this cost ($333 million) is for upgrading of 56 miles of road (30 miles currently two-lane and 26 miles four-lane) to expressway. Although key elements in the option, the three bypasses are expected to cost only $98.9 million, or around 15 percent of the total cost.

FIGURE 3
SC 9 CORRIDOR

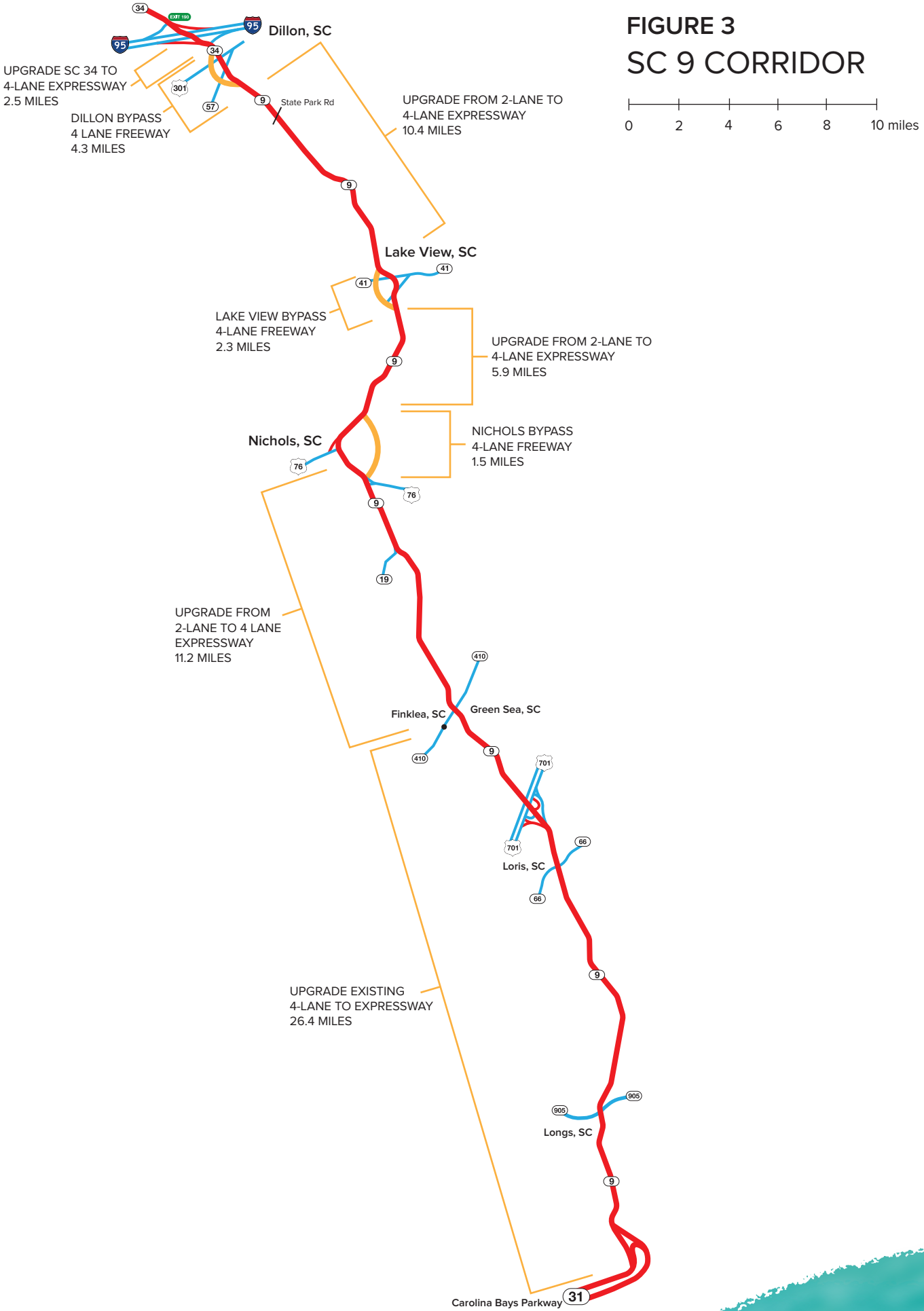


Table 4
Cost Estimate
SC 9 Option

Item	***Quantity***	***Unit Cost ($ Millions)***	***Total Cost ($ Millions)***
Upgrade, 2L to 4L EXPY	30.0	$ 7.35	$ 220.5
Upgrade, 4L to 4L EXPY	26.4	5.03	132.8
New 4L Limited Access Freeway	8.1	10.85	87.9
New grade separated interchange	12	13.4	160.8
Total, SC 9 Route			***$ 602.0***

2L – two lane
4L – four lane
EXPY – expressway

The 74 Connector Option

The purpose of the 74 Connector option differs fundamentally from the other two options (US 501/SC 38 and SC 9) considered as alternatives to the proposed extension of I-73.

The US 501/SC 38 and SC 9 options are Transportation Systems Management (TSM) alternatives to the proposed I-73 extension, accomplishing the entire purpose of that extension at a fraction of its environmental and dollar cost. These two TSM alternatives are mutually exclusive, in that only one of them needs to be implemented to meet the travel needs of the proposed I-73 corridor between I-95 and Myrtle Beach. Implementing just one of these alternatives accomplishes the goals of I-73, and it is not necessary to implement both. However, note that the proposed US 501/SC 38 upgrades and the SC 9 options can both be completed for some $500 million less than the cost of the I-73 extension.

The 74 Connector, in contrast to the above-mentioned options, would not likely substitute entirely for the proposed I-73 extension. Rather, it provides an attractive alternate for those Myrtle Beach visitors (at least 28 percent of the total) arriving on I-95 from the north. Given the close proximity between the 74 Connector and the SC 9 route, it would likely not be cost effective to implement both of these projects.

However, implementing the 74 Connector in combination with a modified version of the US 501/SC 38 option could be cost effective and therefore reasonable. While detailed analysis of such a combination is beyond the scope of this report, coupling the 74 Connector project with the US 501/SC 38 project could lead to overall cost reductions.

The 74 Connector project would also reduce traffic volumes on I-95 over the 30-mile segment between exit 181 (SC 38) in South Carolina and exit 13 (US 74) in North Carolina.

A significant benefit of a 74 Connector is the extension and increased connectivity of the multi-lane network, a long-standing goal of both NCDOT and SCDOT. Expanding and improving connectivity of this network helps avoid overloading the interstate highway system with short trips that are better served by more direct routing on a well-connected network of multi-lane roads.

The 74 Connector Route -- The *GSX Report* recommends a 74 Connector route joining US 74 (later to be I-74) at Whiteville, NC and then following US 701 southward through Tabor City, NC, and Loris, SC, to SC 22.

Detailed travel time and distance analysis suggest that a better route for the 74 Connector (Figure 4) would join US 74 at Evergreen, NC, and then follow a combination of NC 242, a 2.1-mile bypass around Cerro Gordo, NC 1352 and NC 904 to the South Carolina state line. In South Carolina, the 74 Connector route follows S-36-53, SC 410 and US 701 to SC 22 in the Myrtle Beach area.

The improvement suggested for almost the entire 74 Connector route is the upgrading of existing two-lane road to a four-lane divided cross section (Table 5). Grade-separated interchanges are recommended at three locations on the Cerro Gordo bypass, and on seven other intersections with arterial highways. Synchronized street treatment is recommended, as a part of the widening to four lanes, at all intersections other than the grade-separated interchanges.

Table 5
74 Connector Option
Summary of Route Improvements

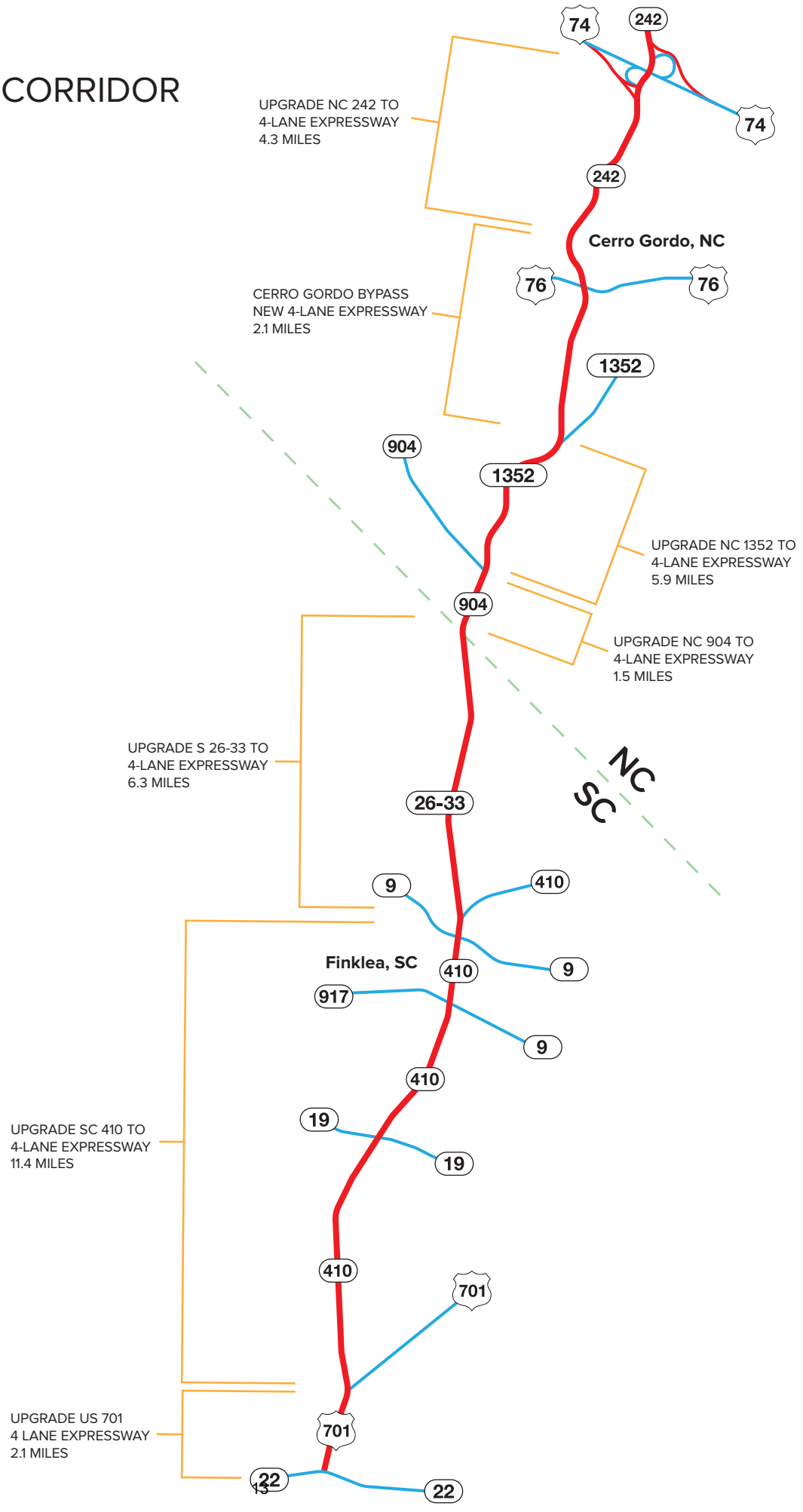
Route	***Segment***	***Upgrade, 2L to 4L EXPY***	***New 4L LA FWY***	***New Grade Separated Interchanges***
NC 242	US 74 to Cerro Gordo Bypass	4.3		
New	Cerro Gordo Bypass		2.1	3
NC 1352	Cerro Gordo Bypass to NC 904	5.9		1
NC 904	NC 1352 to SC State Line	1.5		
S 26-33	NC State Line to SC 410	6.3		1
SC 410	SC 26-33 to US 701	11.4		4
US 701	SC 410 to Carolina Bays Pkwy.	2.1		1
Total	***74 Connector Route***	***31.5***	***2.1***	***10***

2L – two lane
4L – four lane
EXPY – expressway
LA FWY – limited access freeway

FIGURE 4

74 CONNECTOR CORRIDOR

0 1 2 3 4 5 miles



Cost of the 74 Connector Option – The total cost of the 74 Connector option is $388.3 million (Table 6). Around two-thirds of this cost, or $231 million, is for upgrading 31.5 miles of two-lane road to a four-lane divided cross section. The 10 recommended grade-separated interchanges account for $134 million. Only around five percent of total cost comes from new roadway, all located in the Cerro Gordo bypass.

Table 6
Cost Estimate
74 Connector Option

Item	***Quantity***	***Unit Cost ($ Millions)***	***Total Cost ($ Millions)***
Upgrade, 2L to 4L EXPY	31.5 miles	7.35	231.5
New 4L limited access freeway	2.1 miles	10.85	22.8
New grade separated interchange	10	13.40	134.0
Total, 74 Connector Route			**388.3**

Other Options for Improving Access to Myrtle Beach

The bi-state project for the extension of the Carolina Bays Parkway (SC 31) from its current terminus at SC 9 to US 17 in North Carolina is similar to the 74 Connector option in that it improves an alternative route for Myrtle Beach visitors arriving from I-95 from the north (at least 28 percent of total visitors). Starting at I-95 near Benson, NC this alternative route would follow I-40 to Wilmington NC, then a combination of I-140 and US 421 to US 17 to the eastern end of the proposed Carolina Bays Parkway extension. Two planned improvements in North Carolina -- extension of I-140 southward to US 17 and widening of US 17 -- will reduce distance and travel time on this route.

With the Carolina Bays Parkway Extension and the other NCDOT improvements in place, the I-40/US 17 route could attract some, maybe many of the visitors to Myrtle Beach. The distance on this route to North Myrtle Beach (to the SC 31/SC 22 junction) is the same (around 150 miles) as the route on I-95 to US 501/SC 38 to SC 22. Travel time is longer, but the above-mentioned improvements will reduce this disadvantage. Significantly, traffic and truck volumes are far less on the I-40/US 17 route than on I-95.

TRAFFIC CAPACITY, LEVEL OF SERVICE, AND TRAVEL SPEEDS

The US 501/SC 38 and the SC 9 options both have adequate capacity to carry the year 2030 peak day traffic forecasts.

The travel demand on either of these options can be assumed to be that reported in the *Interstate 73 FEIS* for the US 501/SC 38 route under the "No Build" scenario (i.e., without the I-73 extension). This projected year 2030 peak day forecast ranges from 7,800 daily vehicles near SC 41 to 42,900 just to the north of SC 22.

In the year 2030 peak day, at their maximum-volume location (just north of SC 22) the US 501/SC 38 or SC 9 options would operate at Level of Service (LOS) “C”, characterized by smoothly flowing traffic, some degradation in ability to overtake (pass) freely and with average travel speeds maintained at the posted speed limit. At all other segments on these two options, traffic would flow at better levels of service.

Traffic capacity on the 74 Connector is a non-issue, with its capacity as a four-lane route with uninterrupted traffic flow far exceeding the likely traffic demand in the year 2030 peak day.

COMPARISON TO EXTENSION OF I-73

Table 7 below revises the table in the *GSX Report* comparing the three TSM options to the extension of I-73.

Table 7
Comparison of I-73 and TSM Options

	I-73 (South) as Proposed in FEIS	***Transportation System Management (TSM) Options***		
		US 501/SC 38	***SC 9***	***74 Connector***
Design	New 6-lane Interstate highway	Existing mostly 4-lane divided upgraded to 4-lane expressway	Existing 4-lane road (26 miles) and 2-lane road (30 miles) upgraded to expressway; 3 new bypasses (8 miles)	Existing 2-lane roads upgraded to expressway (32 miles). One new bypass (2 miles)
Length	44 miles	42 miles	62 miles	34 miles
Right of Way Width	About 300 feet	Around 50 feet at spot locations (U-turns)	Around 50 feet (existing 4-lane) or 100 feet (existing 2-lane)	Around 100 feet
Wetland Impact	Inflexible Interstate highway design criteria result in significant impact to wetlands areas. Proposed alignment requires crossing and/or fillings of major wetlands	Minimizes wetland impacts by upgrading existing roadways. Minimizes or eliminates need to cross wetlands with new alignments.		
Posted Speed Limit	65 – 70 mph	50 – 60 mph	50 – 60 mph	50 – 60 mph
Cost	$1,313 million	$183 million	$602 million	$388 million
Ability to phase construction	Limited. Route will not operate effectively until complete	Easily phased. Can proceed in stages, depending on traffic demand. Simple conventional MOT (Maintenance of Traffic) procedures only. Rerouting and detouring not required.		

*Note that the I-73 2017 cost estimate is from the *I-73 South Reevaluation* and is projected to increase to $2.093 billion by 2025.

CONCLUSIONS

Options are technically sound and attainable --Further detailing of the three options identified in the *GSX Report* confirms that they can be developed into technically sound and achievable Transportation System Management (TSM) alternatives to the I-73 Extension.

1. US 501/SC 38 – Intersection management measures supplemented by four grade separations, widening of one mile to six lanes and addition of medians on six miles will upgrade this 42-mile route, already a multi-lane (four or more lanes) highway to an expressway free of interruptions (traffic signals, STOP signs) to traffic flow. As an uninterrupted flow expressway, the US 501/SC 38 option will carry the year 2030 peak day traffic at better than acceptable levels of service. This option is a freestanding alternative to the extension of I-73, and would not require development of the other two options discussed in the GSX Report.
2. SC 9 – Widening 30 miles to four lanes, adding intersection management measures to these 30 miles and to 26 miles of existing four-lane road, bypassing three towns and adding interchanges at key locations will upgrade this 62-mile route to an expressway with uninterrupted traffic flow.
3. 74 Connector – Widening 32 miles of road to four lanes, adding two miles of bypass on new road and 10 grade-separated interchanges will upgrade this 34-mile corridor to an expressway providing an attractive route for Myrtle Beach visitors approaching on I-95 from the north.

The US 501/SC 38 Option is the clearly preferable choice for development – This option builds on existing features (interchanges, median sections, access management), provides ample capacity, is the least costly of the options considered, and maintains the current pattern of travel to Myrtle Beach.

Advanced intersection management measures are highly appropriate – The routes of all three options are ideal for upgrading through the "Restricted Crossing" family of advanced intersection management measures. Route characteristics supportive of these measures include the limited number of intersections, existing control of median openings on divided roads, and generally rural surroundings with low density of driveway access points. On the SC 9 route, SCDOT has already successfully installed several "Restricted Crossing" intersection management measures.

Traffic Capacity for all Options is Ample -- The US 501/SC 38 option as a free-standing improvement (i.e., no other option pursued) has ample capacity, enabling LOS "C" (free-flowing) service for the year 2030 peak day traffic.

If the SC 9 option were built in combination with the US 501/SC 38 option, the combined capacity of both options would have a capacity of more than double the year 2030 peak day traffic demand, most likely with traffic service at LOS "A" or "B" on both routes.

The 74 Connector option could attract a significant fraction (30 percent) of all traffic to Myrtle Beach by intercepting traffic approaching from the north on I-95, thereby reducing the demand on either of the other two options. As a four-lane divided highway with uninterrupted traffic flow, it would have over double the capacity needed to accommodate its likely share of projected year 2030 peak day traffic.

Travel Speeds Approaching Freeway Levels --All three options identified in the *GSX Report* and further developed in this report will provide year 2030 peak day traffic service that is unimpeded by traffic signals or congestion. All three options would maintain traffic speeds at posted limits of 50 mph to 60 mph.

State Highway Systems Development – All three options would advance the transportation planning goal of a well-connected multi-lane highway network. The I-73 extension, by contrast, adds enormous redundant capacity in a corridor already well served by a multi-lane highway.

Prepared for:

Southern Environmental Law Center

Charleston, SC

APPENDIX A

The following figures show various components of a Synchronized Streets, as currently installed on segments of US 221 in Forest City NC and SC 9 in Loris, SC:

- ***Figure A-1*** – Restricted crossing at a "T" intersection (U-turn not shown). Left turns into minor road permitted.
- ***Figure A***-2 – Restricted crossing at a four-way intersection. Left turns into minor road permitted. (U-turns not shown)
- ***Figure A***-3 – "No-Crossing" intersection (one of the two U-turns shown). The most restrictive of managed intersections. No direct left-turn into minor road.
- ***Figure A***-4 – U-turn median opening. Note bulge in southbound roadway to accommodate truck turning radius.
- ***Figure A***-5 – Back-to-back "U-turns, occurring where adjacent restricted crossing intersection are combined into a Synchronized Street.

Figure A-1

SYNCHRONIZED STREET
RESTRICTED CROSSING U-TURN INTERSECTION (RCUT)
AT “T” INTERTSECTION

LOCATION:
SC 9 E AT LIBERTY CHURCH ROAD
LORIS, SC

Figure A-2

SYNCHRONIZED STREET
RESTRICTED CROSSING (RCUT) INTERSECTION
AT FOUR-WAY INTERSECTION

Figure A-3

SYNCHRONIZED STREET
NO CROSSING U-TURN (NCUT) INTERSECTION AND U-TURN AT 4-WAY INTERSECTION

Figure A-4

SYNCHRONIZED STREET
SINGLE U-TURN SERVING FREE-STANDING RCUT
INTERSECTION (Not Shown)

Figure A-5

SYNCHRONIZED STREET
BACK-TO-BACK U-TURNS BETWEEN ADJACENT RCUT INTERSECTIONS