

Review of I-73 and Grand Strand Expressway Alternative Economic Studies

FINAL REPORT

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Prepared by Parsons Brinckerhoff for:

Grand Strand Business Alliance, Myrtle Beach South Carolina

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I. Purpose

The Grand Strand Business Alliance (GSBA) of Myrtle Beach South Carolina has contracted with Parsons Brinckerhoff to review previous economic studies and other materials related to the economic impacts of highway alternatives connecting I-95 to Myrtle Beach, including the I-73 Interstate Highway Project (I-73 Project) and an alternative SC 38/US 501 highway upgrade project.

This review report, which focuses exclusively on the segment from I-95 to Myrtle Beach, comprises a comprehensive review of the following recent impact studies:

- Economic Impact Study of I-73, for Northeastern Strategic Alliance (NESA Economic Study)¹
- Construction impact study, by Dr. Don Schunk (Schunk Study)²
- Grand Strand Expressway Study for the South Carolina Coastal Conservation League (Smart Mobility Report)³
- An Economic Analysis of I-73 and the Grand Strand Expressway, for the Coastal Conservation League (CCL Economic Study)⁴

Elements in the review include:

- Reasonableness of cost estimates based on order of magnitude analysis, but no engineering estimates.
- Reasonableness and inclusiveness of economic benefits included in the studies; consistency with best practices for analysis of economic impacts of highway projects based on the experience of the review team.
- Reasonableness and reliability of input data used to estimate benefits.
- Reasonableness and reliability of methodologies used and results derived.

This review report comprises the primary written deliverable for this assignment. In addition, and based on this review report, Parsons Brinckerhoff will prepare a Power Point presentation, highlighting the results of investigations contained here.

In accordance with our contract agreement with the GSBA this review report does not draw conclusions with respect to the ultimate merits and/or comparative ranking of the project alternatives on the basis of economic impacts or other criteria. However, this assessment is intended to provide sufficient

¹ Chmura Economics and Analytics, *Economic Impact of I-73 in South Carolina*, prepared for Northeastern Strategic Alliance (NESA), 3/22/2011.

² http://www.i73.com/job_creation.html

³ Smart Mobility, *The Grand Strand Expressway: An Alternative to the Proposed I-73 to Myrtle Beach, South Carolina*, prepared for South Carolina Coastal Conservation League (CCL), 3/25/2011

⁴ Miley Associates, *An Economic Analysis of I-73 and the Grand Strand Expressway (GSX) Alternative*, prepared for the Coastal Conservation League (CCL), 4/2012.

information for study recipients to understand the methods, assumptions and data, including limitations, and the meaning and validity of output measures derived in the studies under review.

While Parsons Brinckerhoff reviewed the Smart Mobility Report (one of the four reports included in the study agreement), that report includes no economic analysis or specific quantified economic assertions. Its content is limited to descriptions of possible non-Interstate links between I-95 and SC 22, including the SC 38/US 501 upgrade. It provides a discussion of the authors' opinions with respect to the comparative merits of that alternative, relative to the I-73 project, including views regarding cost, environmental impact, and congestion reduction. It also includes comments regarding the recently completed Environmental Impact studies. No analysis of a quantitative nature is provided in that report to support assertions of economic benefit or comparative performance.

The description of the SC 38/US 501 upgrade alternative in the Smart Mobility Report appears to be the basis for the CCL Economic Study. However, neither report provides sufficient documentation to determine whether common operational assumptions have been made in both concerning the SC 38/US 501 upgrade. The Smart Mobility Report presents its estimates of costs for the SC 38/US 501 upgrade at \$147 M, versus \$1,300 M for the I-73 project, "as proposed in the EIS."⁵ The report does not indicate in what year dollars the costs are expressed (e.g., year 2011 dollars, year of expenditure dollars, etc.) This makes validation of the cost estimates a matter of some guesswork. The Smart Mobility Report indicates that the costs are "planning level costs based on typical unit costs for projects in North and South Carolina, not based on site specific engineering analysis".⁶ A fuller discussion of the Smart Mobility Report cost estimates and their likely reliability is presented later in this review report.

Beyond estimated costs for the two projects, no further economic analysis is presented in the Smart Mobility Report, and accordingly is not considered further in this assessment.

In addition to the four studies which Parsons Brinckerhoff has agreed to review, the recently completed FEIS for the I-73 project also includes economic assessments.⁷ This review report *does not* review the economic assessments contained in the I-73 FEIS. The FEIS, which focused on Preferred Alternative 3, included a number of economic assessments covering several topic areas, but did not specifically conduct Benefit Cost analysis, and does not report a benefit cost ratio. However, this review report does take into consideration economic data either reported in the FEIS or which might have been assembled in support of the FEIS, in order to shed light or help verify information presented in both the NESAs Economic Study (of I-73) and the CCL

⁵ Smart Mobility Report, p. 11.

⁶ Ibid

⁷ South Carolina Department of Transportation, FEIS: *Economic Impact Technical Memorandum: From I-95 to the Myrtle Beach Region*.

Economic Study (of the SC 38/US 501 upgrade). Our review report cites those data as they specifically relate to the assessments in the NESAs and CCL studies.

II. Terminology

The following define key terms used in economic analysis of transportation projects, which are referenced in this assessment:

1. **Benefit Cost Analysis (BCA)** - BCA compares the economic benefits to society arising from an investment over the full life cycle of the investment, versus all of the costs that are incurred during that same period of time. A full BCA generally seeks a complete accounting of all societal benefits including public benefits such as passenger and freight travel time savings, reduced air emissions, reduced highway accidents, and productivity benefits directly attributable to the improvement, such as when workers can access higher productivity employment opportunities, or can do work while traveling. Most BCAs conducted for transportation projects, as reflected in the guidance for BCAs provided by the USDOT for TIGER grant applications⁸, exclude projected economic development benefits such as real estate benefits like developments around highway interchanges, tourism increases and spending, and other economic impacts which may entail shifting of impacts from one locale to another, or that can involve double counting. BCAs also exclude construction related job creation, which is a reflection of a project's cost, and any multiplier impacts.

Benefits and costs are adjusted in a BCA to account for the "time value of money" through a method known as "discounting". Discounting is done by reducing (discounting) the value of future benefits and costs by means of a discount rate. A typical time period for analysis of highway projects is 40-50 years or possibly longer.

2. **Discount Rate** – the percentage rate by which future costs and benefits are reduced to reflect the time value of money. The discount rate is a form of interest rate or interest hurdle rate, reflecting the interest that could be earned on an investment now at some point in the future. A real discount rate, which eliminates inflation as a factor, is usually used in a BCA. If inflation is expected to be 3% and projects are earning 5% face value in

⁸ USDOT TIGER IV Grant guidelines: Federal Register, Vol.77, p.4878.
U.S. Department of Transportation, Tiger Benefit-Cost Analysis (BCA) Resource Guide
http://www.dot.gov/tiger/docs/tiger-12_bca-resourceGuide.pdf

private risk free markets (e.g., for long term government bonds), then the real discount rate would be approximately equal to 2%.

3. **Benefit Cost Ratio (BCR)** – The BCR is a primary output of a BCA, and the metric most frequently used to support public sector decision making. It is the ratio of all discounted project benefits, as defined above, to discounted project costs over the complete life cycle, including initial construction and engineering, and ongoing annual maintenance costs. Salvage values may also be included.
4. **Net Present Value** – Another output of a BCA. The NPV is the difference between discounted benefits and costs. It measures the net discounted dollar value of a project. It is sometimes used instead of the BCR to assess the merits of competing projects.
5. **Payback period** – Another output of a BCA. It reflects the point in time after which a project's future discounted benefits equal (and thereafter exceed) its initial construction cost (the initial project investment).
6. **Economic Impact Analysis** – Economic impact analysis is often distinguished from BCA because the former can include estimates or forecasts of the impact of projects on employment during construction, as well as possible impacts on real estate development or regional economic competitiveness, business growth, and employment. Economic impact analysis provides important information about the potential local, regional, or state benefits of a project, but it is separate from formal BCA because economic impacts may reflect a shifting of benefits from one locale to another, or they may involve significant double counting, such as real estate value increases and travel time savings. In this case, real estate value increases are often thought to reflect how real estate values “capitalize” travel time or accessibility improvements into land value; adding both in a BCA would entail at least some double counting.
7. **Economic Multipliers/Multiplier Effects** – Regional economic models known as Input – Output Models (IO Models) are a well established tool used to estimate how much *initial* expenditures (such as for constructing transportation project, or increasing sales by local businesses) cycle through the economy and produces additional “secondary” economic impacts. Those impacts, frequently referred to as multiplier effects, are derived using economic multipliers which are obtained from IO models. **Direct** impacts represent new spending, hiring, and production by civil engineering construction companies to accommodate the demand for resources in order to complete the project. **Indirect** impacts

result from the increase in production of industries supplying intermediate goods and services to the civil engineering construction industry. **Induced** impacts stem from the re-spending of wages earned by workers/households benefitting from the direct and indirect activity. For example, if an increase in labor demand leads to earnings in a set of industries, workers in these industries will spend some proportion of their increased earnings at local retail shops, restaurants, and other places of commerce, further stimulating economic activity.

III. Summary of PB Findings

Table 1 below summarizes the categories of economic impact considered by each study. The table does not assess their validity. This assessment follows in Section IV.

Table 1. Economic Impacts to I-95 to Myrtle Beach Corridor Considered by Each Study

	Economic Impact Study of I-73, (NESA Economic Study)	Coastal Conservation League (CCL Economic Study)	Smart Mobility Report (CCL)	Schunk Study
<i>Construction related employment and other economic impacts</i>	No, only by reference to Schunk study	Yes	No	Not in report, but Schunk reports a Chmura estimate for I-73 of 22,347 jobs in South Carolina over 5 year period
<i>Benefit Cost Analysis</i>	No but payback period for entire I-73 in S. Carolina estimated at 4 years.	Yes	No	No
<i>Travel time/efficiency benefits</i>	Yes	Yes	No	No
<i>Tourism Benefits</i>	Yes, estimated for Myrtle Beach	No	No	No
<i>Hurricane Evacuation</i>	No	No	No	No
<i>Corridor Economic/Business Impacts</i>	Yes, for interchange development and increased tourism spending	Yes, very general, referred to as “spillover” impacts	No	No

Corridor/interchange business impacts	Yes (see above)	Not specifically	No	No
Fiscal Impacts	Tax revenue increases associated with tourism and travel benefits	No	No	No
Project Costs	Yes, but includes all of I-73 in S. Carolina from border to Myrtle Beach	Yes (figure cited for SC 38/US 501 upgrade)	Yes (figure cited for SC 38/US 501 upgrade)	Yes I-73 only

The Parsons Brinckerhoff review concludes the following:

- Parsons Brinckerhoff was not able to find the basis of the \$3.5 million dollar per mile cost to upgrade the SC 38/US 501 corridor as reported in the CCL Economic Study or the Smart Mobility Report.** The SC 38/US 501 corridor between I-95 and SC 22 is approximately 42 miles long and is four lanes along its entire length. The CCL implies the SC 38/US 501 route is essentially an expressway. However, the SC 38/US 501 corridor does not meet AASHTO’s expressway classification criteria. Parsons Brinckerhoff’s planning level cost per mile range for upgrading the existing arterial four lane divided highway corridor to an expressway is between \$4.5 million and \$5.5 million per mile. The total planning cost to upgrade the 42 miles of the corridor is between \$190 million and \$230 million, plus or minus ten percent.
- A four lane expressway would not be comparable in capacity or performance to a six lane interstate.** Accordingly, comparisons to a six lane arterial such as the I-73 project are not valid. Capacity is limited by both the physical space and time available for movements. The expressway will have interrupted flow due to limited accesses. This results in lost time for drivers by slowing traffic. It is the judgment of the Parsons Brinckerhoff traffic engineers who have observed the alternatives that a six lane facility would be needed to achieve the maximum hourly rate at which approximately the same number vehicles can reasonably be expected to traverse a section of roadway during the same period of time of a controlled access four lane facility of I-73.
- A planning level cost to upgrade the arterial four lane corridor to a six lane interstate corridor comparable to the I-73 Project is between \$1.3 billion and \$1.6 billion.**
- The CCL Economic Study presents a benefit cost ratio (BCR) for the US 501 project, and compares it with a Benefit Cost ratio for the I-73 Interstate Highway project.** The basis for the BC ratio presented in that study for the SC 38/US 501 upgrade is without substantial data source documentation with respect to both benefits and costs. The cost of the SC 38/US 501 upgrade, based on Parsons Brinckerhoff’s review of comparable completed

projects, appears to be underestimated (see above). At the same time, the benefits appear overestimated by a significant order of magnitude. As a result, **claims that the BC ratio for a US 501 upgrade exceed 1.0 are found by Parsons Brinckerhoff to be unsupported by credible data.**

- **While the NESAs study does not conduct a BCA, it concludes that the I-73 project will have a payback period of four years.** This reflects an implicit BCA (as payback period computations are derived from a BCA). **A four year payback period, using best practices for BCA would be improbable given project costs and annual estimated travel time savings from the FEIS.** The 4 year estimate reflects a combining and inclusion of benefits that should not be included in a formal BCA, such as multiplier impacts, expectations about increases in tourism spending, and economic gains from estimated new service business formations around I-73 Interchanges. While these are legitimate items to consider in economic impact analysis, they would not necessarily qualify as benefits for a formal BCA.
- **Both the CCL study and the NESAs study present arguments for and against economic development benefits. Both should be regarded as partial and non-rigorous, although the NESAs analysis is data based.** Specifically:
 - **The CCL study refers to “spillover” benefits citing a few academic studies in this area.** In this case, spillover benefits are asserted to generate negative economic impacts in the corridor by diverting business from traditional town centers and along the existing highways in the corridor to the I-73 corridor. This may occur to a degree, and is consistent with some economic studies of highways, but would not reflect the entire set of possible impacts. **The assessment appears highly selective on the negative side.**
 - **The NESAs study asserts substantial benefits from increased tourism in Myrtle Beach and from service business formations around I-73 interchanges.** The methodologies used by Chmura to make these planning estimates are interesting and backed by some good information such as surveys of Myrtle Beach visitors. However, while **these impacts may occur over time, they would be subject to many other factors not considered, and should be regarded as having a very wide margin of error and be viewed as illustrative rather than definitive.**
- **Neither study considers in the BCA or economic analysis the economic benefits of providing an enhanced hurricane evacuation route.** This should be assessed as part of a refined BCA of the I-73 project, and the benefits can be quantified and included in the BCA.
- Estimates of **construction employment** from highway projects can vary depending on assumptions about average construction wages and other variables. **Given this, Parsons Brinckerhoff finds that estimates by Schunk and Chmura) authors of the NESAs study) for the I-73 Project in South Carolina are within a credible range.**

- **By contrast, the estimates found in the CCL Economic Study for the SC 38/US 501 alternative appear misleading and inaccurate when stated as they are in comparison with the I-73 Project.** Based on the CCL’s own estimated project cost of \$147 million for the SC 38/US 501 project, **full time person years of employment for the SC 38/US 501 project would be only about 14 percent of the person years of employment for the I-73 project, or 76 percent lower.** This is in sharp contrast with the CCL report which concludes that the SC 38/US 501 project will generate only 30 percent less construction related employment than the I-73 project.

We note that while economic studies were also performed in the FEIS for the I-73 project (but not for an SC 38/US ~~501~~ option) the FEIS economic analysis did not derive a BC ratio or any other related BCA analysis metric – that is, no attempt is made to compare estimated economic benefits with project costs. Other economic analyses included in the FEIS, including a “User Benefits” analysis performed using the REMI model based on the impact of travel efficiencies, and another “strategic” economic analysis, utilizing EDGE, a relatively unknown tool not well recognized within the field of transportation economics. A strategic economic analysis is understood or appears to be a competitiveness/economic impact analysis. The Parsons Brinckerhoff scope of work does not include an assessment of the FEIS economic analyses.

IV. Detailed Findings

IV.1 Review of Cost Estimates

Parsons Brinckerhoff was not able to find the basis of the \$3.5 million dollar per mile cost to upgrade the SC 38/US 501 corridor as reported in the CCL Economic Study or the Smart Mobility Report. The SC 38/US 501 corridor between I-95 and SC 22 is approximately 42 miles long and is four lanes along its entire length. The CCL implies the SC 38/US 501 route is essentially an expressway. However, the SC 38/US 501 corridor does not meet AASHTO's expressway classification criteria. The report does recommend further study of the corridor to determine if additional improvements would be appropriate, such as:

- Construct modern superstreet arterial intersections where needed.
- Conduct access management improvements in areas of frequent curb cuts.
- Construct grade separated interchanges at high volume crossings if needed for traffic capacity.

The South Carolina Department of Transportation Trans Carolina Corridor Study reports the corridor between SC 576 and SC 22 currently operates at service Level F and needs major improvements to accommodate existing uses and future users.

Parsons Brinckerhoff's planning level cost per mile range for upgrading the existing arterial four lane divided highway corridor to an expressway is between \$4.5 million and \$5.5 million per mile. The total planning cost to upgrade the 42 miles of the corridor is between \$190 million and \$230 million, plus or minus ten percent. These planning unit costs are based on:

- applying the definition of an expressway to the corridor
- conducting a table top review of the corridor
- a review of recent regional construction costs.

The assumptions and associated costs are provided in the appendices. This upgrade would not bring the corridor to interstate standards.

Upgrading the existing four lanes divided highway corridor to an expressway would require:

- controlling access through right-of-way acquisition,
- consolidating driveways,
- consolidating at-grade intersections,
- constructing parallel service roads,
- constructing grade-separated interchanges at three intersections to,
- constructing a bypass around Aynor,
- replacing and widening bridges across the Great Pee River,
- widening shoulders and providing additional paved shoulders, and
- constructing an additional lane on the connecting ramp at SC 22 and US 501.

A planning level cost to upgrade the arterial four lane corridor to a six lane interstate corridor is between \$1.3 billion and \$1.6 billion. Existing interchanges flyovers, overpasses and bridges would need to be reconfigured along with the roadway for the additional lanes and shoulder widths. Access would further be restricted only to grade separated interchanges. Therefore additional parallel service roads and further consolidation of intersections would be needed. Utilities would also need to be relocated outside the right-of-way.

The American Association of State Highway and Transportation Officials (AASHTO) defines an expressway as a highly mobility low to moderate access facility with posted speed limit between 45 to 60 miles per hours. An expressway is further defined by the following criteria:

- Access is limited or partially controlled.
- Traffic signals are not allowed.
- Driveways are not allowed in limited controlled access areas and one driveway connection per parcel or a consolidated driveway between parcels are allowed in partial controlled access areas.
- Connection with major intersecting roadways are with grade separated interchanges and with minor intersecting roadways are with at-grade intersections without signals.
- Acceleration and deceleration lanes are used with at-grade intersections.
- Median area widths are typically 48 feet with crossovers allowed.
- Crossovers are placed no closer than 2,000 feet for speed limits greater than 45 miles per hour.
- A minimum cross-section of 4 lanes plus a median are typical.
- Right of way widths vary depending on speed but are typically between 150 and 200 feet.
- Fencing is provided along each side of the right of way where limit controlled access is provided.

A quick table top review of the SC 38/US 501 corridor identifies a number of curb cuts for commercial/retail and residential access as well as a number of at grade intersecting private, county and state roads. This is demonstrated by:

- the more than 150 curb cuts along the approximate four mile section of SC 38 Corridor between I-95 and US 501, and
- curb cuts along the 25.4 mile corridor from the intersection with US 501 and SC 576 southeast of Marion to SC 22 east of Aynor, including the Town of Aynor.

The 12.8 mile corridor between US 501 interchange and SC 576 interchange southeast of Marion has limited controlled access with only two identifiable curb cuts and approximately twenty median breaks which half are associated with at-grade intersecting roads.

There are several stop lights along the corridor, one near I-95 on SC 38, another on US 501 at Marion and one in Aynor. There are approximately sixteen state roads and thirty county roads which “T” intersects the corridor at-grade and twenty state roads and five county roads which cross the corridor at grade. There are seven interchanges, US 301, US 501, US 501 Business, SC 41, US 76, SC 576, SC 41

south east of Marion and SC 22. There are two roadway overpasses along the corridor, County Road 41 near Marion and the new overpass near Aynor and a couple of bridges over railroads.

Parsons Brinckerhoff reviewed seven local and state highway construction project costs for the purpose of verifying typical costs associated with roadway projects for the region. The North Carolina Department of Transportation fiscal year 2009 per mile planning costs were also considered.

IV.2 Review of Economic Benefits

1. Benefit Cost Analysis (BCA)

A key economic indicator of a proposed project's merit is the BC ratio. Only the CCL Economic Study specifically reports results of a BCA of any kind; the NESA Economic Study does *not* explicitly indicate that a formal BCA for the I-73 project was conducted.

CCL Economic Study: The following observations are made with respect to the CCL Study's BCA findings.

- a. Two BC ratios are reported in the CCL Economic Study – one for the SC 38/US 501 upgrade and another for the I-73 project. ***The former is reported to have achieved a BC ratio of 1.4 while the latter project is reported to have a BC ratio of 0.26.*** The CCL Economic Study indicates it utilized the TREDIS model, an economic software program frequently used in transportation economic studies, available on commercial terms from the Economic Development Research Group (EDRG) located in Boston. TREDIS is a computational tool that conducts BCA using standard methods and is one of many accepted tools within the industry for this purpose; the validity of TREDIS BCA results are however dependent and contingent on the comprehensiveness and validity of the input data supplied to the model, such as travel time and user cost savings on the benefits side, and project capital cost estimates on the cost side.
- b. Based on Parsons Brinckerhoff's reading of the report, the BCA appears to reflect only estimated travel time savings ("transportation efficiency savings" in the CCL Economic Study). Methodologically, this represents a very conservative approach to BCA, as it does not include a range of impacts normally included in transportation investment BCAs. However, it provides a reasonable benchmark against which to compare other alternatives, assuming all alternatives otherwise impact the environment, safety and other outcomes about equally.
- c. The CCL Economic Study estimates that annual travel time savings (VHT savings) for the year 2030 will be 976,924. (Table 2, p. 12)
- d. The travel time savings in the CCL Economic Study (see c above), which are the basis for user benefits (transportation efficiency benefits), could not be verified by any known source of information. PB reviewed the I-73 FEIS analysis, and found no similar travel time savings estimates, as the FEIS did not evaluate an alternative comparable to the SC 38/US 501 upgrade alternative. The FEIS **does** estimate travel time savings for the I-73 Preferred Alternative (Alternative 3); the FEIS estimates annual travel time savings of between 241,000 and 314,000 VHT, depending on whether an average AADT or a peak season AADT is used. FEIS estimated travel time savings should be

considered the best available source for travel time, as it is based on travel demand modeling and detailed traffic engineering.

- e. Based on the above, the travel time savings for the SC 38/US 501 alternative appear to be **significantly** overstated, especially given PB's assessment of the more limited operational improvements to be derived from the SC 38/US 501 upgrade relative to I-73.
- f. The CCL Economic study fails to report significant information about assumptions made in the derivation of their reported BC ratios. Essential information not reported are:
 - Discount rate
 - Analysis period for computing NPV of cost and benefits
 - Whether maintenance costs are included or excluded in the computations
 - What benefit categories beyond travel time savings are included, if any.
- g. The cost estimates utilized in the BCA analysis reported in the CCL Study appear to underestimate significantly the construction costs of the SC 38/US 501 upgrade (see previous section). Moreover, the costs associated with the SC 38/US 501 upgrade are believed to deliver levels of service not closely comparable to a fully controlled access highway such as I-73. This in turn suggests that estimates of travel time savings associated with SC 38/US 501 may be significantly overstated with respect to the operational parameters of a highway.

Key Conclusion: The CCL Economic Study's BCA and associated BCR for the SC 38/US 501 alternative should be considered flawed. Costs are understated, benefits appear greatly overstated, and the sources of information and methods poorly documented, unreliable, and unverifiable. The estimated BCRs reported in the CCL Economic Study for both projects are judged to be neither credible nor reliable. This finding is unrelated to the use of the TREDIS model, which is a standard and credible tool within the industry.

NESA Economic Study: The following observations are made with respect to the NESA Study's findings.

- a. The NESA Study does not present results of any formal BCA.
- b. The NESA Economic Study estimates a payback period for the I-73 project. While payback period is one of several possible metrics derived from a formal BCA, the benefits included in the payback period as reported in the NESA study are not validly combined and should not be included as additive within a **formal** BCA.
- c. While the NESA Study does not include a formal BCA analysis comparable in any way to the BCA results (i.e., the BCR) reported in the CCL Study, the NESA study estimates "Travel Efficiency and Cost Savings" for the year 2030. As noted above, the CCL BC ratios are simplified and reflect a simple comparison of the NPV of travel time savings vs. project costs.
- d. The NESA study estimates the dollar equivalent value of "travel efficiency and cost saving" for 2030. For the Southern segment (from I-95 to SC 22) the study reports an annual benefit of \$52.3 M. The methodology utilized to derive this estimate is not based on an analysis of traffic or travel efficiency, but on the basis of other studies of highway projects in Virginia and West Virginia that estimated travel efficiency and cost savings as a percentage of regional economic output. This is an inappropriate methodology for this purpose, since it bears no reasonable relationship to the actual

travel efficiencies in a given highway corridor, and appears unrelated to traffic conditions or highway design or capacity.

- e. While the methodology for estimating travel efficiencies in the NESAs study is deemed invalid, the estimate can be checked to determine if it may in this case be reasonable. It is possible to roughly estimate the equivalent VHT (travel time) savings associated with the \$52.3 M. Assuming that the \$52.3 M is in current dollars, and utilizing hourly value of travel time averages recommended by the USDOT for TIGER grant application BCAs (approximately \$20/hour per traveler), and assuming further an average vehicle occupancy of 1.5, the equivalent VHT savings would equal approximately 1.74 million annual VHT saved. That is dramatically higher than the VHT savings reported for I-73 in the FEIS. Allowing for some additional transportation efficiency and cost savings from reduced vehicle maintenance and operations (e.g., less motor fuel, reduced vehicle maintenance and depreciation), the travel efficiency benefits estimated in the NESAs study still appear substantially overstated relative to the FEIS analysis.⁹
- f. While the NESAs study does not conduct a BCA, it concludes that the I-73 project will have a payback period of four years. This reflects an implicit BCA (as payback period computations are derived from a BCA). A four year payback period, using best practices for BCA would be improbable given project costs and annual estimated travel time savings from the FEIS. The 4 year estimate reflects a combining and inclusion of benefits that should not be included in a formal BCA, such as multiplier impacts, expectations about increases in tourism spending, and economic gains from estimated new service business formations around I-73 Interchanges. While these are legitimate items to consider in economic impact analysis, they would not necessarily qualify as benefits for a formal BCA.

Key Conclusion: While the NESAs study does not attempt to derive a BC ratio for the I-73 project, its estimates of travel efficiency appear unrealistically overstated, and are derived from methodologies that are inappropriate. This inaccuracy may be regarded as of relatively minor consequence, as the NESAs study does not focus on this aspect of economic benefit, but rather focuses on the impacts of I-73 on regional economic competitiveness and tourism, new business formations, and regional employment and income.

2. Construction Related Employment

The following table summarizes what Parsons Brinckerhoff has determined with respect to estimates of employment from construction. It is important to note that construction employment (including multiplier impacts) is always reported in terms of “person years” of work, rather than as “jobs”, since projects can have different construction phasing and duration, and also because construction jobs are time limited by the period of construction – i.e., they are not permanent jobs in the sense that they do not continue indefinitely.

⁹ By further comparison, the CCL Study estimate of VHT savings for I-73 relative to a no-build for 2030 is 1.3 million VHT

In the table, a fourth column to the right is given as a benchmark, reflecting industry rules of thumb for construction related employment recommended in various sources, including the FHWA. The FHWA estimates about 27,000 jobs per dollar of federal highway spending¹⁰; given a federal matching rate of 80%, that figure translates to about 35,000 jobs per total dollar of highway spending. For this, we utilize an average of about 30,000 jobs per billion dollars of construction spending, including direct and multiplier impacts.

Table 2. Summary of construction related employment impacts

	NESA (Chmura)	CCL		Schunk	Industry average
	I-73	I-73	SC 38/US 501	I-73	I-73
<i>Person years per billion dollars of construction spending</i>	17,190	12,153	14,571	29,692	30,000
<i>Average annual person years</i>	4,469	3,160	2,142 (assuming one year for construction)	7,720	7,800
<i>Total person years over the construction period</i>	22,347	15,800	2,142	38,600	39,000

Conclusion:

1. Estimates of construction employment from highway projects can vary depending on assumptions about average construction wages and other variables. Given this, Parsons Brinckerhoff finds that estimates by Schunk and Chmura (authors of the NESA study) for the I-73 Project in South Carolina are within a credible range.
2. By contrast, the estimates found in the CCL Economic Study for the SC 38/US 501 alternative appear misleading and inaccurate when stated as they are in comparison with the I-73 Project. Based on the CCL’s own estimated project cost of \$147 million for the SC 38/US 501 project, full time person

¹⁰ <http://www.fhwa.dot.gov/policy/otps/pubs/impacts/index.htm>

years of employment should be in the range of 2,000 to 2,500. The CCL estimate of 2,142 jobs “over the life of the project” (p. 15) is reasonable when understood as person years of employment. However, in the CCL study, that figure is compared to the I-73 estimate of 3,160 jobs *per year* reported in that study. That latter figure, however, should be multiplied by 5 in order to arrive at total person years of employment over the five year construction duration as indicated. Thus, total jobs (i.e., total person years of employment) for the I-73 project would be in the range of 15,800 using the annual figure (3,160) cited in the CCL report (and considerably higher using industry benchmarks). Therefore, the statement made in the CCL study, that for the SC 38/US 501 “total employment over the life of the project is 30 percent lower” than the I-73 project is inaccurate and misleading. In fact, total person years of employment for the SC 38/US 501 project would be only about 14 percent of the person years of employment for the I-73 project, or 76 percent lower.

3. Economic Impacts: Tourism, Interchange and Corridor Development Impacts

Both the CCL study and the NESAs study present arguments for and against economic development benefits. Both should be regarded as partial and non-rigorous, although the NESAs analysis is data based. Specifically:

- The CCL study refers to “spillover” benefits citing a few academic studies in this area. In this case, spillover benefits are asserted to generate negative economic impacts in the corridor by diverting business from traditional town centers and along the existing highways in the corridor to the I-73 corridor. This may occur to a degree, and is consistent with some economic studies of highways, but would not reflect the entire set of possible impacts. The assessment appears highly selective on the negative side.
- The NESAs study asserts substantial benefits from increased tourism in Myrtle Beach and from service business formations around I-73 interchanges. The methodologies used by Chmura to make these planning estimates are interesting and backed by some good information such as surveys of Myrtle Beach visitors. However, while these impacts may occur over time, they would be subject to many other factors not considered, and should be regarded as having a very wide margin of error and be viewed as illustrative rather than definitive.

4. Other Economic Impacts

Neither study considers in the BCA or economic analysis the economic benefits of providing an enhanced hurricane evacuation route. This should be assessed as part of a refined BCA of the I-73 project, and the benefits can be quantified and included in the BCA.

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APPENDIX

PLANNING COST ESTIMATE:

To estimate a planning level of cost associated with this approximate 42 miles of divide highway, the following has been assumed using NCDOT cost per mile tables with assumptions on right-of-way:

Controlled Access Right-of-Way	\$4.6M
Limited Access Right-of-Way	\$1.3M
Partial Access Right-of-Way	\$0.08M
Shoulder Widening	\$52.9M
Road Closures and Reconnections	\$5.6M
Three Interchanges	\$50.9M
Three Miles of Bypass	\$74M
1650LF of Bridge replacements	\$13.2M
Additional Lane on SC 22 Ramp	\$7.6M
	\$2 10.2M

Assumptions:

Acquire controlled access on 20% of the mileage, 8.4 miles (90'x5280'/43560sf/acre)=91.6 acresX\$50,000/acre = **\$4.6M** or \$0.55M/mi. This per acre cost assumes acquiring improved property.

Acquire limited access on 50% of the mileage, 21 miles (20'X5280'/43560sf/acre)=50.9 acresX\$25,000 per acre=**\$1.3M**.

Acquire partial access on 10% of the millage, 4.2 miles (10'X5280'/43560sf/acre)=5.1 acresX\$15,000 per acre=**\$0.08M**.

We assume 20% of the right-of-way is adequately controlled.

Improve shoulders on 60% of the mileage to adequate clear zones, 25.2 miles x \$1.4M/miX1.5=**\$52.9.0M**. The 1.5 factor is 30% for miscellaneous factor and another 15% for federal road factor all times the cost of construction following NCDOT methodology or 1.3X1.15.

Closure of five state roads and ten county roads which intersect by "tee"= 15X\$250,000X1.5= **\$5.6M**.

Three simple flyover interchanges, 3X\$8.1MX2.093=**\$50.9M**. The 2.093 factor is based on a 30% for misc., 40% for right-of-way factor and another 15% for federal roadway factor all times the cost of construction following NCDOT methodology or 1.3X1.4 ROWX1.15.

Three miles of new expressway to bypass Aynor, 3 milesX\$6.2MX2.093=\$38.9M plus full interchange \$23.4MX1.5=**\$74M**.

The Pee Dee River bridges to be replaced in one travel way, 1650lfX51'wideX\$105/sfX1.5=**\$13.2M**.

The SC 22 connection to add an additional lane – 3000 lfX16'wideX105/sfX1.5 = **\$7.6M**

The sum of the above planning level cost is approximately \$210.2M to bring the existing facilities to expressway/freeway standards.

Interstate is defined a network of freeways which connect states and is part of the national highway system. A freeway is defined as a highly mobility low access facility with posted speed limit 55 miles per hour or greater. The facility has full control access which no traffic signals or driveways are allowed. Connecting roadways are connected with grade-separated interchanges or crossovers. Median area widths range between 48 to 80 feet and u-turns in the median for use by authorized vehicles only when justified. The minimum cross-section will be 4 lanes and a median. Right of way widths will vary on speed but typically between 150 and 300 feet. Fencing is provided along each side of the right of way to deter animal and pedestrian access and crossing.

Finally to compare Interstate to Interstate, widen from 4 lanes to 6 lanes for interstate level, plus replacing the other travel way bridges within the Pee Dee River, plus replace three over passes, plus the above improvements we obtain as cost of approximately \$1,429M, ((42 milesX\$13.7X2.093 [widen from 4 to 6 lanes]) +\$13.2M (the other Great Pee Dee bridge replacements) + (3X\$2.1X1.5 [3 additional interchanges]) + \$202.6M [expressway improvements]).

REVIEWED REGIONAL COSTS:

Parsons Brinckerhoff reviewed planning and engineering, right of way, utility and construction costs provided by South Carolina Department of Transportation for four Horry County Sales Tax Transportation program. The four projects included the widening of SC 544 from a two lane to a five lane arterial, new four lane divided parkway, minor road over US 501 at Aynor, and a major grade-separated interchange project at US 17 and SC 707. These costs are presented below in Tables 1.

TABLE 1 - HORRY COUNTY RIDE PROGRAM INDIVIDUAL PROJECT COSTS							
(Millions)							
Project	Miles	PE Cost	ROW Cost	Utility Cost	Construction Cost	Total Cost	Cost per Mile
SC 544- US 501 to Socastee Bridge Widening (2 lane to 5 lane)	9.6mi	1.5M	\$8.4M \$0.875M/mi	\$2M \$0.2M/mi	\$31.1M \$3.24M/mi	\$43.0M	\$4.5M/mi
Carolina Bays Parkway 501/544 New 4-land divided Arterial	5.1mi	2.1M	\$37M \$7.26M/ mi	\$2.6M \$0.51M/mi	\$71.6M \$14.04M/mi	\$113.3M	\$22.2M/mi
Aynor Overpass US 501 (2 lane) (2011)	2.0mi (mainline)	2.9M	\$1.1M \$0.55M/mi	\$200K \$0.1M/mi	\$12M \$6.0M/mi	\$16.2M	\$8.1M/mi
Back Gate US 17 & SC 707 Interchange (4 lane) (2012)	1.466mi (mainline)	4.7M	\$17.8M \$12.14M/mi	\$4.8M \$3.27M/mi	\$92.3M \$62.96M/mi	\$119.6M	\$81.6M/mi

M = million dollars, Mi = mile
Source: SCDOT RPG

Additionally, three other South Carolina Department of Highways construction projects in the Dillon and Marion county areas. These are the US 501 flyover SC 38, The overpass over US 76 and twin bridges over the Great Pee Dee River, and the recent two lane reconstruction of US 378. These costs are presented below in Table 2.

TABLE 2			
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION INDIVIDUAL CONSTRUCTION PROJECT COSTS			
Project	Miles	Construction Cost	Cost per Mile
SC 38/US 501 (2004)	12.885 miles of roadwork two lane to four land roadway	\$22.0M	\$1.7M/mi
US 301/US 76 Bridge Replacement (2004)	150' over pass and twin 180 foot flat slab bridges over the Great PEE DEE with 1.065 miles of roadway	\$6.05M	\$5.7M/mi

TABLE 2 SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION INDIVIDUAL CONSTRUCTION PROJECT COSTS			
Project	Miles	Construction Cost	Cost per Mile
US 378 Bridge and Roadway (2009)	Reconstruction 6.396 miles of 2 lane facility with bridges	\$26.5M	\$4.1M/mi
M = million dollars, Mi = mile Source: SCDOT Bid Tab			

The State of North Carolina 2009 spread sheet, www.ncdot.gov/download/performance/CostEstimateGuide.xls, for preparing construction cost estimates using cost per mile table includes the following, which represents 2008 costs:

<u>New Location 4-Lane Shoulder Section W/Median Freeway</u>	\$6.20M per mile
<u>Widen Existing 2-Lane Shoulder Section to:</u>	
4-Lane Shoulder Section W/Median (Freeway)	\$5.00M per mile
<u>Widen Existing 4 Lane w/median to 6 Lane Interstate Section</u>	\$13.70M per mile
<u>Widen Existing 18' to 24' Shoulder Section</u>	\$1.40M per mile
<u>Grade Separations</u>	\$2.10M each
<u>Simple Diamond Interchange</u>	\$10.95M each
<u>Full Clover Interchange W/1 Collector-Distributor</u>	\$23.40M each
<u>Simple Flyover Interchange</u>	\$8.15M each
Right-of-Way in Rural	20-25% of TOTAL project cost
Right-of-Way in Urban	40-45% of TOTAL project cost

TRAFFIC DATA:

The 2011 average annual daily traffic (AADT) count for the segment between I-95 and US 301 is 7,200. The segment between US 301 and US 501 is 9,000 AADT. The 2011 AADT at the junction of US 76 and US 501 is 17,100, which is down from 2007's AADT of 19,000. The 2011 average annual daily traffic count between the Town of Aynor and SC 22 is 23,500, which is down from 2007's AADT of 25,400.

