

Appendix B

Alternatives Development and Evaluation

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This appendix summarizes the alternatives development and evaluation phase of the study, as documented in *I-95 Alternatives Development and Analysis Tech Memo* (August 2010), incorporated by reference.

B.1 METHODOLOGY

This section describes the methods used during the alternatives development and evaluation process. This process was developed with input from the Agency Steering Committee, which is described in **Chapter 4**, and members of the general public.

B.1.1 Background

The process included three levels of alternatives screening and evaluation, which resulted in the development of the preferred design concept and scope and preferred funding option. To refine the preferred design concept and scope, the project team used traffic projections for the year 2040 to determine potential improvements needed along the I-95 corridor, both at interchanges and when widening would be required in order to accommodate traffic demands. The preferred design concept and scope was then evaluated for the potential for environmental impacts. The project team then estimated potential construction costs and operating and maintenance costs, and assessed the constructability of the project. Next, the financial experts on the team prepared a financial plan that evaluated available financing for the implementation of improvements, including an evaluation of tolling I-95 as a way to help finance the construction of the I-95 improvements as well as operations and maintenance. Finally, a plan for implementing likely phases of the project was developed. The financing and phasing plan is discussed in detail in **Chapter 2**.

B.1.2 Alternatives Development and Evaluation Process

The intent of the alternatives development and evaluation process was to identify a broad range of improvement strategies for the I-95 corridor and to screen them to yield a preferred design concept and scope that would be more thoroughly evaluated through alternatives refinement. General conceptual alternatives for I-95 were developed and subjected to an initial screening, Level 1. Those concepts that were carried forward for further evaluation were compared to each other in a Level 2 evaluation. The results of the Level 2 evaluation identified an alternative that would be further refined and evaluated through conceptual design, detailed traffic modeling, and environmental screening in Level 3. A schematic of the process is shown below in **Exhibit B-1**.

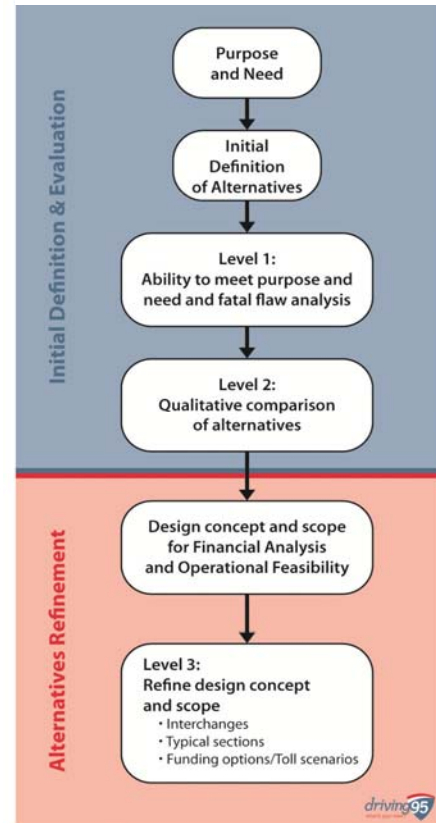
Evaluation criteria were established for each screening level, prior to the development of alternatives. These criteria were developed based on the project purpose and need.

Level 1 screening identified a range of project improvements that could meet the project purpose and need, while eliminating concepts from consideration that had a fatal flaw; that is, they were not reasonable or did not meet the purpose and need. Level 1 screening was supported by the baseline data collected for the *I-95 Study Area Needs Assessment* (September 2010). During the Level 1 screening, design concepts were evaluated qualitatively, primarily using the judgment of professionals with expertise in the applicable evaluation areas, such as roadway design, traffic, environmental resources, cost estimating, and alternative funding mechanisms. The Level 1 evaluation criteria based on purpose and need are described in **Section B.3.1**.

The Level 2 evaluation was a more detailed evaluation of the conceptual alternatives that passed the first level of screening. During Level 2 evaluation, alternatives were evaluated based on qualitative measures that assessed them for providing operational benefits and for financing feasibility. Level 2 evaluation criteria are described in **Section B.3.2**. The results of the Level 2 evaluation led to the selection of the preferred design concept and scope to be evaluated in the Level 3 alternative refinement process.

Further refinement of the preferred design concept and scope was performed in Level 3. The purpose of alternatives refinement was to evaluate design and funding options of elements within the preferred design concept and scope. During alternative refinement, the project team sought to improve the interchange operations, minimize environmental and community impacts, and identify a feasible funding strategy. The design and funding options chosen were incorporated into the refined preferred design concept and scope, as described in **Section 3.4**.

Exhibit B-1: Alternative Development & Evaluation Process



B.2 ALTERNATIVES CONSIDERED

According to the methodology previously described in **Section B.1**, the Level 1 screening identified conceptual alternatives for I-95 improvements based on the project purpose and need. As discussed in **Chapter 1** (Purpose and Need), much of the existing infrastructure needs to be replaced or rehabilitated. There are locations along the corridor where poor traffic operations require additional lanes to keep traffic flowing at acceptable levels of service. Some of these locations need additional lanes today, while others are projected to require expansion in five, ten, twenty or more years from now. The I-95 corridor contains a mix of travelers from out of state as well as in-state. There is a large percentage of truck traffic on the corridor as well. The conceptual alternatives considered these corridor needs.

The conceptual alternatives are listed and described below.

- No Action Alternative
- Preservation and Modernization Alternative
- Demand Management and System Management Measures Alternative
- Multimodal Alternative – Freight to Rail
- Multimodal Alternative – Passengers to Bus and Rail
- Add General Use Lanes on Existing Alignment Alternative
- Add Managed Lanes on Existing Alignment Alternative
- Add Truck Lanes on Existing Alignment Alternative
- New Alignment Freeway Alternative
- Widen US 301 to Four Lanes Alternative

B.2.1 No Action Alternative

The No Action Alternative would only include projects identified in the 2009-2015 State Transportation Improvement Program (STIP), which was the most recent at the time. The No Action Alternative would include no capacity improvements to address current or future congestion, and would fund safety, maintenance, or modernization needs only to the level that can be accomplished by funding levels in the current STIP, approximately \$61 million per year. This alternative would be funded by traditional STIP funding sources.

B.2.2 Preservation and Modernization Alternative

The Preservation and Modernization Alternative would include no capacity improvements, but would replace or rehabilitate the highway infrastructure in order to preserve the existing highway operations with a modern facility that meets current design standards, while fixing or replacing inadequate infrastructure. This proposal was identified as a way to meet the infrastructure needs of the corridor, while lowering potential costs by not addressing capacity issues. This alternative would be funded by traditional funding sources, but would require more funding than the current funding levels assumed for the No Action Alternative.

B.2.3 Demand Management and System Management Measures Alternative

The Demand Management and System Management Measures Alternative would use measures to improve traffic through means other than traditional highway expansion. Demand management measures include efforts to reduce the number of vehicles on the highway during times of peak congestion, through telecommuting to work, varying work shift start and end times, and reducing the number of single occupied vehicles through van and carpooling. System management measures include efforts to make the existing system function more efficiently without constructing new facilities or capacity. These measures would include strategies such as improved signal timing at interchanges, message boards on the highway alerting travelers to delays or alternative routes, and using road sensors and cameras to notify authorities of congestion issues to improve response time. This alternative was proposed as a lower cost solution to address capacity problems on I-95 and would be funded by traditional funding sources.

B.2.4 Multimodal Alternative – Freight to Rail

The Multimodal Alternative for Freight would improve operations and safety on I-95 by moving freight traveling through the corridor on trucks to freight trains that parallel the I-95 corridor. This alternative was proposed as a multimodal option for reducing construction costs and vehicle-miles traveled. This alternative was assumed to be accommodated by the existing CSX National Gateway program, described below.

In an effort to create a highly efficient freight transportation link between the Mid-Atlantic ports and the Midwest, CSX has initiated its National Gateway program (www.nationalgateway.org), which is supported by the Rail Division of NCDOT, among others. Rail routes identified as “National Gateway Corridors” include the I-95/I-81 Corridor between North Carolina and Baltimore, Maryland, via Washington DC. This high capacity rail mainline generally parallels I-95 from northern Virginia through North Carolina and on to Florida. There are several active rail-related bridge modification and removal projects along the I-95 corridor in Virginia. The National Gateway website currently lists one active project in North Carolina, the CSX Charlotte Intermodal Terminal. This project will expand the CSX intermodal terminal near I-85 in Charlotte to increase capacity to move freight containers between trucks and trains.

According to the National Gateway website, when completed, the National Gateway would provide greater capacity for product shipments in and out of the Midwest and reduce truck traffic on already crowded highways. One train can carry the load of more than 280 trucks, which is the approximate equivalent of 1,100 cars. A double-stack rail route between Mid-Atlantic ports and the Midwest markets would create an additional option for transporting freight, potentially freeing up highway capacity. The partnership plans to improve ports, upgrade rail lines and prepare bridges and tunnels as needed to accommodate the more efficient double-stack trains.

B.2.5 Multimodal Alternative – Passengers to Bus and Rail

The Multimodal Alternative for Passengers to Bus and Rail would improve operations and safety on I-95 by moving passengers and drivers traveling through the corridor in cars onto transit modes, including trains and intercity buses. This alternative was proposed as a multimodal option to reduce construction costs and vehicle-miles traveled. This alternative would be funded by traditional funding sources, and would be ineligible for other funding mechanisms such as tolling or public-private partnerships.

The Southeast High Speed Rail Project (www.sehsr.org) plans to improve passenger rail service from Washington DC to Charlotte, North Carolina. The goal for passenger service to begin along the preferred corridor from Washington DC to Charlotte is between 2018-2022. The preferred corridor in North Carolina is along I-85 and does not serve the I-95 travel market. Amtrak does serve the I-95 corridor from northeastern US to Florida, but there are no initiatives to improve service and add capacity, nor is it part of the identified national high speed rail system.

Existing private bus service in the I-95 corridor through North Carolina is provided by Greyhound (www.greyhound.com). Greyhound provides service to major cities throughout the US. Other providers of bus service in the I-95 corridor through all or part of North Carolina include Southeastern Stages (www.southeasternstages.com), Brothers Bus Line (www.brothersbusline.com), I-95 Coach (www.i95coach.com), and La Cubana (www.lacubanabus.com).

B.2.6 Add General Use Lanes on Existing Alignment Alternative

The Add General Use Lanes on Existing Alignment Alternative would reconstruct the existing alignment of I-95, adding additional lanes to I-95 to improve traffic operations and safety conditions, and would also replace or rehabilitate substandard infrastructure. The alternative would add one or two lanes in each direction, depending on the future traffic needs for each segment between interchanges. Interchanges would be upgraded, and deficient bridges and pavement would be replaced as well. This alternative could be funded by traditional funding sources, as well as by other funding mechanisms such as tolling and public-private partnerships.

B.2.7 Add Managed Lanes on Existing Alignment Alternative

This alternative would add additional capacity to I-95 with one or two additional lanes in each direction that would be tolled in order to guarantee acceptable level of service (LOS), defined as LOS C or better in rural areas and LOS D or better in urban areas. Only the new capacity lanes would be tolled and they would be separated from the general purpose lanes with either soft or hard physical barriers. This alternative could be funded by traditional funding sources, as well as by other funding mechanisms such as tolling and public-private partnerships.

B.2.8 Add Truck Lanes on Existing Alignment Alternative

This alternative would add additional capacity to I-95 with two additional tolled lanes in each direction that would be reserved for truck use only; there would be no additional capacity added to the general use lanes. The truck lanes would be separated from the general purpose lanes with either hard or soft physical barriers. This alternative was proposed as a way to address the crash rate on I-95. This alternative could be funded by traditional funding sources, as well as by other funding mechanisms such as tolling and public-private partnerships.

B.2.9 New Alignment Freeway Alternative

This alternative would leave the existing I-95 in place and construct a controlled access freeway on new alignment between South Carolina and Virginia that is either west of I-95, east of I-95, or a combination of both. Existing I-95 would not be rehabilitated under this alternative. This alternative could be funded by traditional funding sources, as well as by other funding mechanisms such as tolling and public-private partnerships.

B.2.10 Widen US 301 to Four Lanes Alternative

US 301 is a parallel route to I-95 through North Carolina. In the area from Exit 10 to Exit 22, US 301 and I-95 share the same alignment. Currently, US 301 is a two-lane facility along 115 miles of its 182-mile alignment in North Carolina. This alternative would upgrade US 301 to four lanes along its entire length and maintain current local access. Because US 301 and I-95 share the same alignment for a portion of the way, a new US 301 alignment was assumed to be constructed in this area. This alternative could be funded by traditional funding sources.

B.3 SCREENING OF ALTERNATIVES

A tiered screening process was used to qualitatively evaluate the ten alternatives, as described in **Section 3.1**. This process is detailed in the following sections.

B.3.1 Level 1 Screening

Level 1 screening evaluated a range of proposed improvements for their ability to meet the project purpose and need. Alternatives were eliminated that were not reasonable or did not meet the purpose and need. The screening also eliminated from further consideration alternatives that would have unacceptable levels of environmental or community impacts. Level 1 screening was supported by the baseline data collected for the *I-95 Study Area Needs Assessment*.

During the Level 1 screening, conceptual alternatives were qualitatively evaluated. The screening used a three level scale, rating satisfaction of evaluation criteria as Good, Fair, or Poor based on a relative comparison to the other alternatives. The basis for the rating for each screening criterion was:

- **Traffic Operations:** Good rating has an acceptable LOS (at least LOS C in rural areas and LOS D in urban areas). A Poor rating has an unacceptable LOS (LOS D or worse in rural areas and LOS E or worse in urban areas).
- **Safety:** Good rating has more potential for safer conditions and Poor rating has less potential for safer conditions. Safer conditions result from improvements to roadway geometry, bridge and pavement structures, or traffic conditions such as reducing the number of trucks.
- **Human and Physical Environmental Impacts:** Good rating has the least right of way requirements; Poor rating has the most right of way requirements.
- **Cost:** Good rating has a low relative total cost and Poor rating has high relative costs.
- **Constructability:** A Good rating means the alternative is relatively easy to build with no maintenance of traffic issues. A Poor rating means the alternative is relatively difficult to build and/or would have difficulties in maintaining traffic during construction.

The Level 1 screening matrix is shown in **Table B-1**. The criteria that best represent purpose and need are the traffic operations criterion and the safety criterion. Accordingly, these were given a higher priority in the final overall ratings.

The Add General Use Lanes on Existing Alignment Alternative rated the highest on the priority criteria of traffic operations and safety, and the Multimodal Freight to Rail, Multimodal Passengers to Bus and Rail and Preservation and Modernization Alternatives received the lowest ratings for these criteria. The New Alignment Freeway and Widen US 301 Alternatives rated low on human and physical environmental impacts criterion.

Table B-1: Level 1 Screening

Alternatives	Measures of Effectiveness at Meeting Purpose & Need		Other Factors Considered		
	Traffic Operations	Safety	Human and Physical Environmental Impacts	Cost	Constructability
No Action	Poor	Poor	Good	Good	Good
Preservation and Modernization	Poor	Poor	Good	Fair	Poor
Demand Management & System Management Measures	Poor	Poor	Good	Fair ¹	Poor ¹
Multimodal Freight to Rail	Poor	Poor	Good	Fair ¹	Poor ¹
Multimodal Passengers to Bus and Rail	Poor	Poor	Good	Fair ¹	Poor ¹
Add General Use Lanes On Existing Alignment	Good	Good	Fair	Poor	Fair
Managed Lanes	Fair	Fair	Fair	Poor	Fair
Truck Lanes	Fair	Fair	Fair	Poor	Fair
New Alignment Freeway	Good	Fair ²	Poor	Poor ¹	Fair
Widen US 301 to Four Lanes	Fair	Poor ²	Poor	Poor ¹	Fair ³

Source: I-95 Study Area Alternatives Development and Analysis Tech Memo (September 2010)

1. Does not fix old infrastructure
2. Does not fix safety on old I-95
3. Easier to construct four-lane versus freeway

B.3.1.1 Alternatives Eliminated

The alternatives listed below were eliminated because they had fatal flaws (not feasible or reasonable), they would not meet the project purpose and need, or would have extraordinary environmental or community impacts.

Preservation and Modernization

This alternative was eliminated because it would not meet the purpose and need of improving traffic operations on I-95 because it would not add needed capacity. The costs of replacing inadequate infrastructure would be very high. However, preservation needs will be considered during development of phasing and financing plans, to ensure that system preservation needs are reflected along with improvement needs.

Demand Management and System Management Measures

This alternative was eliminated because it would not meet the purpose and need of improving traffic operations and safety on I-95, nor address the inadequate infrastructure, even though it is a lower cost alternative. System management strategies may improve interchange operations, but they would not improve traffic operations on the I-95 mainline. Demand management strategies would reduce the number of vehicles on I-95 by only a small percentage. This alternative would be unlikely to sufficiently reduce people trips or freight trips to resolve the corridor's capacity needs.

Multimodal Alternatives (Move Freight to Rail and Passengers to Bus and Rail)

These alternatives were eliminated because they would not meet the purpose and need of improving traffic operations and safety on I-95, nor would address inadequate infrastructure. Moving freight to rail and passengers to bus and rail would reduce the number of vehicles on I-95 by only a small percentage. These alternatives would be unlikely to reduce auto or truck traffic sufficiently to resolve or eliminate the need for additional highway capacity.

New Alignment Freeway

This alternative was eliminated because it would have unacceptable impacts to the human and physical environment, and would not address the inadequate infrastructure on I-95. Also, it is expected that there would be a significant amount of traffic remaining on I-95. The costs to build and maintain this alternative would be very high. This alternative would only be further investigated as a last resort; it will be revisited only if further evaluation reveals that the Add Lanes on Existing Alignment alternative is not feasible.

Widen US 301 to Four Lanes

This alternative was eliminated because it would have unacceptable impacts to the human and physical environment, requiring substantial amounts of additional right of way along US 301; place increased amounts of traffic on inherently lower grade facility types compared to interstates; increase traffic through the developed areas along US 301, and would not address the inadequate infrastructure on I-95. Also, there would be a significant amount of traffic remaining on I-95. Due to lack of access control, this alternative could not provide a comparable level of safety or improvements to travel speed and times as would improvements to I-95 itself. Additionally, the costs to build this alternative would be very high.

B.3.1.2 Alternative Concepts Carried Forward

The No Action Alternative did not meet traffic operations nor safety evaluation criteria but is retained for baseline comparison. In addition to the No Action Alternative, the three concepts retained for Level 2 evaluation were the three existing alignment highway widening alternatives, including the Add General Use Lanes on Existing Alignment, Add Managed Lanes, and Add Truck Lanes Alternatives.

B.3.2 Level 2 Screening

The Level 2 evaluation was conducted for I-95 conceptual alternatives that passed the Level 1 screening. Three conceptual alternatives were carried forward from the Level 1 screening. These were compared to identify the preferred concept.

- Add General Use Lanes on Existing Alignment

- Add Managed Lanes
- Add Truck Lanes

The Level 2 qualitative analysis is documented in the *Tier 2 Alternatives Screening White Paper* [see Attachment B to the *I-95 Alternatives Development and Analysis Tech Memo* (September 2010.)] and describes the required improvements for the remaining conceptual alternatives. It describes the advantages and disadvantages relative to mobility, community, and financial goals for each alternative, and recommends whether each alternative should be considered further. Each of the alternatives was ranked for its ability to meet six criteria, relative to the other alternatives considered in Level 2. The rankings are on a ten point scale with ten being the best ranking and one being the poorest. The results of these rankings are included in **Table B-2**.

Table B-2: Level 2 Alternative Screening Results

Criterion	No Action	Add General Use Lanes on Existing Alignment	Add Managed Lanes	Add Truck Lanes
Human/Physical Environment	9	6	4	4
Cost	9	3	1	1
Traffic Operations	1	8	6	3
Safety	1	8	6	6
Constructability	10	5	5	5
Ability to Generate Revenue	1	9	3	9
Total	31	39	25	28

Source: *I-95 Alternatives Development and Screening Technical Memorandum* (September 2010)
 Rating scale: Good: 7-10, Fair: 4-6; Poor: 1-3.

The Add General Use Lanes on Existing Alignment Alternative would include reconstructing the existing travel lanes of I-95 and constructing additional travel lanes that would provide acceptable traffic operations (LOS C or better in rural areas and LOS D or better in urban areas). This alternative would provide a minimum of six total travel lanes and would provide eight travel lanes where needed to meet acceptable traffic operations requirements. The existing lanes are assumed to require full reconstruction due to their substandard condition. It is assumed that the Add General Use Lanes on Existing Alignment Alternative would be tolled.

The Add Managed Lanes Alternative would toll the additional capacity required to provide the needed traffic operations LOS within the I-95 corridor. This alternative assumes that a managed lane typical section would be in place to provide the additional capacity once the LOS within any section of the corridor becomes unacceptable. The proposed typical section would include two non-tolled general use lanes and one or two tolled ‘managed’ lanes in each direction. It is assumed that the entire corridor would be reconstructed due to the width of the existing median, the need for the managed lanes to be on the inside, and the poor condition of the existing pavement. The managed lanes would be separated from the general use lanes by a physical barrier with full shoulders on each side.

The Add Truck Lanes Alternative would add two additional lanes in each direction to the corridor that would be exclusive to trucks only. These truck lanes would add the additional capacity within the

corridor. The truck lanes, as well as the existing general use lanes, were assumed to be tolled because there has been much negative feedback from the trucking industry on projects that propose to toll trucks but not passenger cars. The alternative would require two lanes to allow trucks the ability to pass slower moving vehicles. A single lane could be considered but would require passing lanes at regular intervals. The typical section would include two general use lanes in each direction to be used by passenger vehicles. Due to the width of the existing median, the need for the truck lanes to be on the inside, and the poor condition of the existing pavement, it is assumed that the entire corridor would be reconstructed. The truck lanes would be separated from the general use lanes by a physical barrier with full shoulders on each side.

B.3.2.1 Alternative Concepts Eliminated

Managed lanes are typically constructed within heavily urbanized areas that have a great deal of congestion. They are typically constructed to manage congestion and provide a significant travel time savings compared to general use lanes. The I-95 traffic profile is mostly rural and has a great deal of recreational use and peaking characteristics atypical of urban traffic. For these reasons, the Add Managed Lanes Alternative was recommended to be eliminated from further consideration.

Truck lanes are typically constructed within high traffic volume facilities that have hourly volumes approaching 2,000 trucks per hour and LOS of E or F. Neither of these applies to the I-95 corridor. With the Add General Use Lanes on Existing Alignment Alternative, acceptable LOS (LOS C or better in rural areas and LOS D or better in urban areas) can be maintained at a much lower cost with fewer impacts to the environment and communities due to a smaller typical section. The Truck Lanes Alternative would require two truck lanes in each direction, physical barrier separation, plus two general purpose lanes to meet the traffic demands. For these reasons, the Add Truck Lanes Alternative was recommended to be eliminated from further consideration.

B.3.2.2 Preferred Design Concept and Scope

The Add General Use Lanes on Existing Alignment Alternative would provide acceptable LOS (C or better in rural areas and LOS D or better in urban areas), provide enhanced safety, and would have the least impacts to the environment and communities (highest score) of the concepts carried forward to Level 2 Screening. The Add General Use Lanes on Existing Alignment Alternative was recommended to be retained as the preferred design concept and scope for the project. This preferred design concept and scope was approved by the Agency Steering Committee (**Section 4.1**). A concurrence form signed by the environmental resource and regulatory agencies is included in **Appendix A**.

B.4 REFINEMENT OF PREFERRED DESIGN CONCEPT AND SCOPE

After Levels 1 and 2 of the screening process, further steps were taken in Level 3 to refine the design elements of the preferred design concept and scope. These additional design options include definition of the limits of mainline widening and interchange design improvements. Traffic operations and costs for the refined design concept and scope were also evaluated in the Level 3 screening and are discussed in **Section Error! Reference source not found.** The resulting refined preferred design concept and scope was used to evaluate the feasibility of potential funding options, as described in **Chapter 2**.

B.4.1 Mainline

The conceptual design was developed using two mainline typical sections, as shown in **Figure B-1**. Two basic typical sections were developed for the 6-lane and 8-lane segments: one for widening into the median with a depressed grass median and one for widening into the median with a hard median (concrete barrier). Widening would take place in the median wherever possible to minimize the need for right of way.

Mainline widening recommendations were developed based on preliminary 2040 traffic forecasts documented in the *2040 Average Annual Daily Traffic No-Build W/ Improved I-95* (March 2011), along with requirements for safety, lane continuity, and driver expectation. An assessment of mainline lane requirements using the preliminary Year 2040 Build Non-Toll traffic forecast was performed to determine the minimum number of lanes for each freeway segment for acceptable traffic operations. In order to maintain acceptable freeway LOS of C for rural areas and D for urban areas through 2040, the assessment of the 59 mainline segments showed:

- Nine segments would maintain acceptable LOS with the existing 4 lanes,
- Thirty-five segments will require 6 lanes,
- Fourteen segments will require 8 lanes, and
- One segment between Exit 46 and Exit 49 will require 10 lanes (8 lanes plus an auxiliary lane in each direction).

However, to preserve lane continuity along the corridor additional segments were recommended to be widened. The recommended mainline widening is shown in **Figure B-2**. The corridor was recommended to be widened to eight lanes between Exit 31 and Exit 81 and six lanes throughout the remainder of the corridor. In addition to the eight general travel lanes, one northbound and one southbound auxiliary lane were recommended between Exit 46 and Exit 49.

B.4.2 Interchanges

Modifications to interchanges were recommended to address the geometric deficiencies described in **Section 1.2.2** and to accommodate projected future traffic. A summary of recommended interchange modifications is provided in the following sections.

B.4.2.1 Interchange Form Modification

Conceptual design interchange form modifications were developed both to address design deficiencies identified in the *I-95 Study Area Needs Assessment* (September 2010) and to address operational deficiencies based on an assessment of preliminary traffic estimates, as described in the *Interchange Form Analysis Technical Memorandum* (June 2011), hereby incorporated by reference. Due to project schedule constraints, the conceptual design interchange forms were initially developed using preliminary traffic estimates. After receiving the final non-toll traffic projections, operational analysis was performed for the initial conceptual designs to ensure there were no operational deficiencies. As necessary, improvements were made to the conceptual design to provide, at a minimum, an overall intersection LOS D. In many cases, the projected traffic volumes could be accommodated with minor adjustments to the

existing interchange form, such as the addition of turn lanes. Where possible, the existing interchange form was retained for the conceptual design. In addition to traffic operations requirements, natural, physical, and human environment constraints as described in **Chapter 3** were also considered during the development of alternative interchange forms. The interchange form modifications included in the refined preferred design concept and scope are listed in **Table B-3** and shown in **Figure B-2**.

Table B-3: Interchange Form Modifications

Interchange	Existing Form	Conceptual Design ¹
NC 130 (Exit 2)	ParClo-A 2-quadrant	Parclo-A 4-quadrant
SR 1003 (Exit 10)	Diamond	Parclo-AB 2-quadrant
NC 72 (Exit 17)	Diamond	Parclo-A 2-quadrant
US 301 (Exit 22)	Diamond	Diverging Diamond
SR 2341 (Exit 44)	Diamond	Parclo-B 2-quadrant
NC 53/210 (Exit 49)	Single Loop 3-quadrant	Parclo-AB 2-quadrant
SR 1815 (Exit 61)	Diamond	Parclo-B 2-quadrant
SR 1793 (Exit 72)	Diamond	Split Diamond with southbound on-loop
US 421 (Exit 73)	Diamond	
NC 50 (Exit 79)	Single Loop 3-quadrant	Parclo-B 2-quadrant
US 701 / NC 96 / US 301 (Exit 90)	Modified Single Loop 3-quadrant	Parclo-AB 2-quadrant
SR 2137 (Exit 101)	Diamond	Parclo-AB 2-quadrant
SR 2239 (Exit 105)	Diamond	Parclo-AB 2-quadrant
US 264A (Exit 121)	Diamond	Parclo-B 2-quadrant
NC 43 (Exit 141)	Diamond	Diamond with Single Loop
NC 33 (Exit 150)	Diamond	Parclo-B 2-quadrant
NC 48 (Exit 180)	Diamond	Single Loop 3-quadrant

Source: *I-95 Conceptual Designs Packet* (July 2011)

1. Parclo stands for Partial Cloverleaf Interchange

B.4.2.2 Interchange Consolidation

The *I-95 Study Area Needs Assessment* (September 2010) identified 22 locations with inadequate interchange spacing. Many of these were addressed in the conceptual design by adjusting ramp configurations to provide additional spacing between interchanges. No existing interchanges were recommended to be closed in the conceptual design to provide additional spacing. However, two adjacent diamond interchanges were combined into a split diamond interchange at existing Exits 72 and 73. This change was recommended to remove the tight weaving segment between those two interchanges.

B.4.2.3 Geometric Improvements

Geometric improvements such as ramp modifications to meet current design standards were recommended at most interchanges. Interchange ramps that were identified as deficient due to insufficient acceleration or deceleration lane length in the *I-95 Study Area Needs Assessment* (September 2010) were recommended to be brought up to current standard in the conceptual design. In addition, current NCDOT practice requires that accommodations for future loops should be provided within each ramp quadrant to prevent major reconstruction in the event further interchange modifications are needed

in the future. In accordance with this practice, many ramps were recommended to be modified in the conceptual design to accommodate potential future loops. However, in some cases ramp modification to accommodate a potential future loop was not recommended due to natural, physical, or human environment constraints in the immediate vicinity of the interchange.

B.4.2.4 Service Road Modifications

Under existing conditions, there are several locations along the corridor that have service roads tying into interchange ramps. This approach is no longer practiced by the NCDOT due to the safety concerns of motorists heading down ramps and the interstate in the wrong direction. During the development of the conceptual design, all service roads were relocated off the ramp to either a more desirable location along the crossroad or terminated. Where practical, connectivity of service roads was preserved at the interchanges where modifications were recommended. A detailed study of service road locations will be completed as part of future project-level analysis to determine the cost feasibility of maintaining connectivity at each location.

B.4.2.5 Consideration of Bicycles and Pedestrians

The *I-95 Alternate Modes Technical Memorandum* (September 2010), incorporated by reference, documents information on non-highway modes in the I-95 corridor, including bicycling and walking. Effort was made during development of the conceptual design to preserve connectivity of existing designated NC bicycle routes that cross I-95. There are five such routes: Sand Hills Sector in vicinity of Fayetteville; Cape Fear Run in vicinity of Dunn; Mountains to Sea Trail and Ocracoke Option in vicinity of Wilson; and North Line Trace in Weldon/Roanoke Rapids. The NCDOT is currently developing the *North Carolina Department of Transportation Complete Streets Planning and Design Framework* (www.nccompletestreets.org), which will contain detailed design guidelines in accordance with the NCDOT *Complete Streets Policy* (NCDOT, July 2009). Detailed design for I-95 improvements at locations where designated NC bicycle routes cross I-95 will be developed in accordance with these guidelines as part of future project-level design efforts.

B.4.3 Funding and Finance

As described in **Chapter 2**, the current pay-as-you-go funding mechanism for improvements on I-95 will be insufficient to address corridor needs going forward. To address this issue, a detailed analysis of financing alternatives was completed, and a phasing and finance plan was developed. As shown in **Section 2.3**, a funding program that includes tolling was determined to be the most feasible funding program. The tolling analysis and recommendation are described in detail in **Chapter 2**.

B.4.4 Refined Preferred Design Concept and Scope

As described above, the alternative refinement process yielded recommended mainline and interchange modifications to be included in the refined preferred design concept and scope. The recommended mainline and interchange modifications are shown in **Figure B-2**. The mainline was recommended to be widened to eight lanes along 50 miles of I-95, and to six lanes throughout the rest of the corridor.

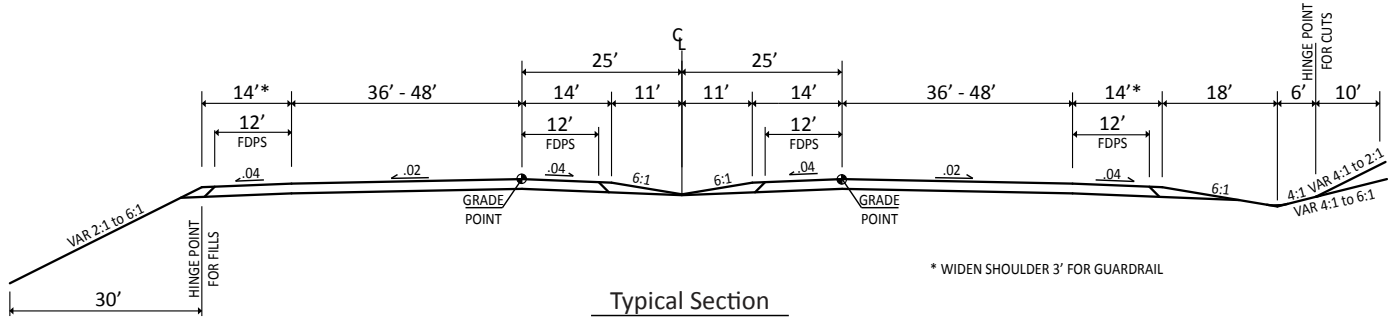
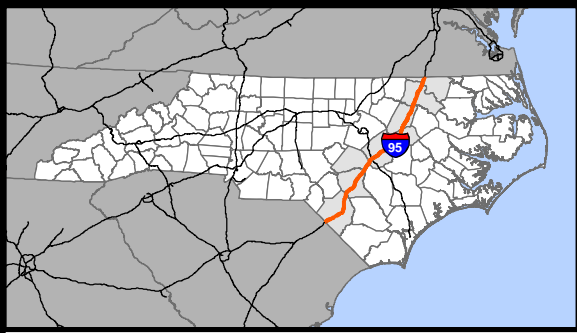
Seventeen interchanges were recommended for interchange form modification. All other interchanges were recommended for minor improvements, including ramp and service road modifications.

In addition to design refinements, the process described in **Section 2.3** also eliminated using only traditional funding as a feasible funding strategy and identified tolling as the preferred funding strategy. Details of the toll finance and phasing plan are included in **Chapter 2**.

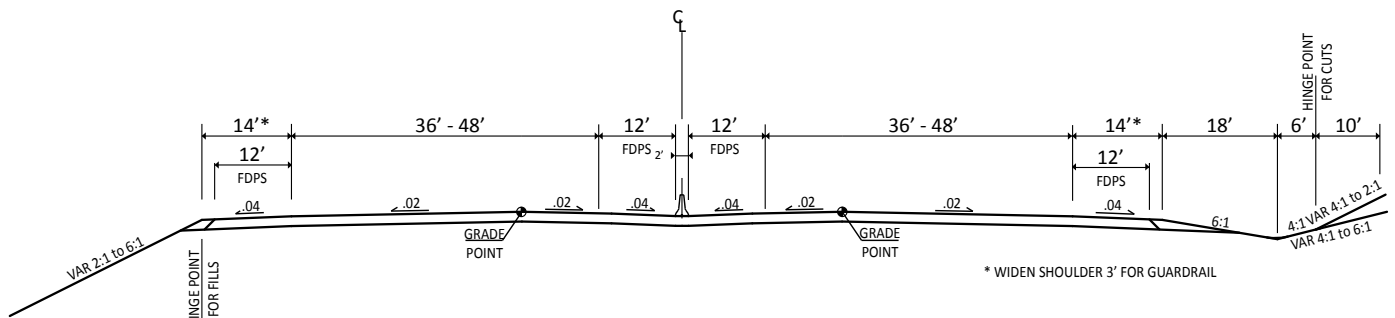
B.5 SUMMARY

This chapter documents the alternatives development and evaluation process. The alternatives development process included three levels of alternatives screening and evaluation. In Level 1, ten conceptual alternatives were evaluated based on their ability to meet the project's purpose and need. In Level 2, three widening alternatives that appeared to be able to meet the project's purpose and need were assessed to eliminate flawed alternatives, and alternatives were then compared to identify the preferred design concept and scope.

After the first two levels of analysis, the Add General Use Lanes on Existing Alignment alternative was identified as the preferred design concept and scope. In Level 3, the preferred design concept and scope was further refined to identify recommended design improvements and a feasible funding strategy. Mainline and interchange improvements were identified and incorporated into the refined preferred design concept and scope. In addition, tolling was identified as the recommended funding strategy.



Typical Section
 50ft MEDIAN, GENERAL USE
 IF TOLLED, ALL LANES TOLLED
 (250' RIGHT OF WAY)



Typical Section
 26ft MEDIAN w/BARRIER, GENERAL USE
 IF TOLLED, ALL LANES TOLLED
 (250' RIGHT OF WAY)

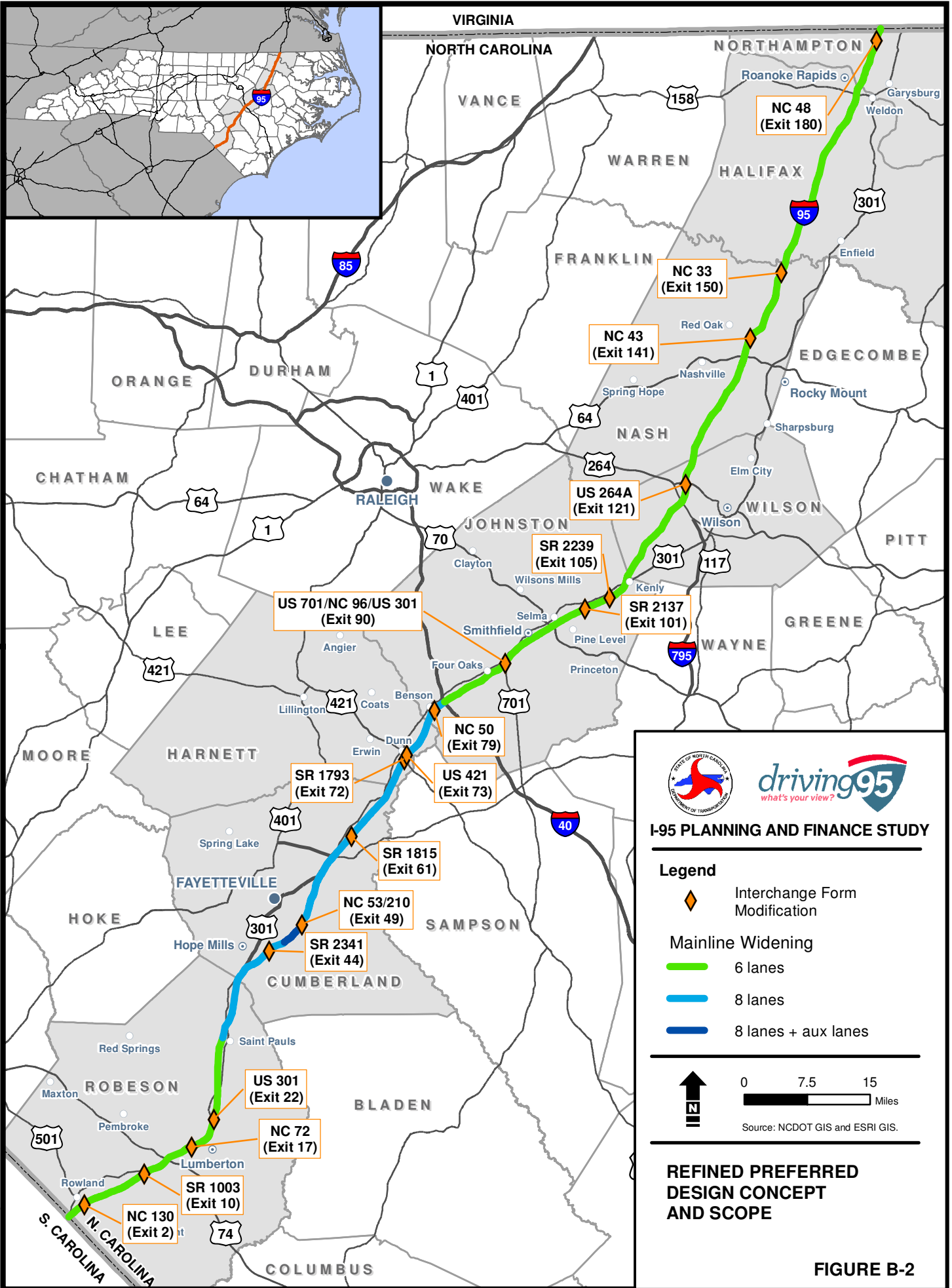
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I-95 PLANNING AND FINANCE STUDY

MAINLINE
 TYPICAL
 SECTIONS

FIGURE B-1



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FIGURE B-2