



I-40 / I-81 Corridor Feasibility Study

Task 4.0 Technical Memorandum

Project Priorities – A Corridor Plan

FINAL REPORT

August 2008

Executive Summary

In 2005, the Tennessee Department of Transportation (TDOT) completed the State's first 25-Year Long Range Transportation Plan (PLAN Go). A major component of the 25-Year Vision Plan included the advancement of a 10-Year Strategic Investments Plan. The 10-Year Strategic Investments Plan established three interrelated core investment initiatives: Congestion Relief, Transportation Choices, and Key Corridors.

The Interstate 40/Interstate 81 (I-40/I-81) Corridor from Memphis to Bristol was identified through the statewide planning effort as a strategic statewide corridor and several projects along the corridor are included in the 10-Year Strategic Investments Plan as a high priority. The purpose of the I-40/I-81 Corridor Feasibility Study was to gain a more detailed understanding of the deficiencies of the corridor and to develop corridor level multi-modal solutions to address these deficiencies. The study considered improvements to the I-40/I-81 corridor, investigated parallel arterials to I-40/I-81 that could be used for local travel, rail lines that could be candidates for freight diversion from the interstate, and considered major inter-modal hubs located along the corridor.

The study area for the I-40/I-81 corridor extends from Memphis to Bristol, a distance of about 550 miles. The study area traverses 27 of the 95 counties within Tennessee and falls within nine of the twelve Rural Planning Organization (RPO) boundaries and eight of the eleven Metropolitan Planning Organization (MPO) and Transportation Planning Organization (TPO) areas. Numerous cities including Memphis, Jackson, Nashville, Lebanon, Cookeville, Crossville, Knoxville, Sevierville, Jefferson City, Morristown, Kingsport, Johnson City and Bristol are dependent upon this corridor for commerce, tourism, and daily access. The study area also includes parallel Class I railroads, including their junctions with short-line railroads.

The technical memorandum for Task 4, Project Priorities – A Corridor Plan, describes the benefit-cost (B/C) methodology which aided in the prioritization of multi-modal investments in order to develop a corridor plan of improvement solutions for I-40/I-81. The corridor plan estimates expenditures for each recommended improvement solution by year between 2010 and 2029. Costs have been inflated from 2008 dollars to year-of-expenditure expenses using an annual inflation rate of 3.6 percent. This yearly inflation rate is based on the annual increase in construction costs over the past ten years as maintained by the *Engineering News-Record*. The following sections review the solutions recommended in the corridor plan by category of improvement.

Cost-Effective Widening of Existing I-40 and I-81

Approximately 82 miles of the corridor should be widened based on the results of the B/C analysis conducted for the planning year of 2030. The improvements would be implemented based on B/C ratios estimated for the interim years of 2015 and 2020. The estimated cost for widening the following sections of I-40 and I-81 is \$900 million in 2008 dollars or \$1.48 billion in year-of-expenditure dollars:

- 9 miles of I-40 to 8 lanes in Memphis
- 17 miles of I-40 to 6 lanes east of Memphis
- 19 miles of I-40 to 6 lanes in Jackson
- 9 miles of I-40 to 6 lanes between Nashville and Lebanon
- 7 miles of I-40/I-75 to 8 lanes west of Knoxville
- 15 miles of I-81 to 6 lanes near Morristown

- 6 miles of I-81 to 6 lanes in Tri-Cities

Construction of Improvements that Provide an Alternative to Traveling I-40 and I-81

Based on a comparison of the benefits of building the following three solutions to their costs, which are estimated at \$1.3 billion (2008 dollars) or \$2.1 billion (year-of-expenditure costs), the following proposed improvements would provide a cost-effective alternative to using I-40 and I-81:

- New crossing of Mississippi River in Memphis
- North 2nd/ 3rd Street Connector, also in Memphis
- Knoxville Parkway (SR-475) in Knoxville

Although the completion of the remaining segments of SR-840 South had the highest B/C ratio of any project providing an alternative to traveling along I-40 or I-81, this solution was not included in the I-40/I-81 corridor plan. It was assumed these improvements are already programmed.

Expanded Intelligent Transportation Systems and Incident Management Programs

Over 136 miles of additional coverage for TDOT's existing Intelligent Transportation Systems (ITS) and incident management (HELP) programs are recommended based on B/C analysis completed during this study. New installations, at an estimated capital/equipment cost and ongoing operating expenses of \$41 million (year-of-expenditure dollars), are proposed along:

- 10 miles of I-40 at the Tennessee River Bridge/Cuba Landing
- 9 miles of I-40 at the Piney River Bridge south of Dickson
- 51 miles of I-40 located both east and west of Nashville
- 48 miles of I-40 across the Cumberland Plateau
- 18 miles of I-81 in Tri-Cities

Interchange, Ramp and Bridge Improvements

Operational solutions at 13 locations along I-40 and I-81 are recommended to address specific congestion or safety issues. These improvements were identified using information provided in interviews with representatives of the Tennessee Highway Patrol and local transportation officials. The proposed improvements, at an estimated cost of \$110 million in 2008 dollars or \$148 million in year-of-expenditure costs, also are based on highway capacity and accident analyses performed along I-40 and I-81.

Truck Climbing Lanes

In order to address congestion and safety issues associated with trucks traveling up steep grades on I-40 and I-81, construction of truck climbing lanes is recommended at 15 locations where the added lane provides the greatest benefits. The cost of widening the interstate at these locations is estimated at \$366 million (in 2008 dollars) or \$480 million (in year-of-expenditure dollars).

Table E-1 summarizes estimated costs of recommended I-40/I-81 corridor solutions by category for three time periods – 2010-2014, 2015-2019 and 2020-2029 – based on year-of-expenditure dollars. **Figure E-1** shows the location of each recommended solution for the I-

40/I-81 corridor along with a brief description and cost estimate for all solutions in the corridor plan.

In addition to the aforementioned solutions recommended for improving travel conditions along I-40 and I-81, the technical memorandum for Task 4, Project Priorities – A Corridor Plan, highlights the following strategies and future activities to be considered by TDOT, MPOs, TPOs and RPOs to address freight and operational issues along the corridor:

- Assess the public benefits of Norfolk Southern Railroad’s proposed improvements to the Crescent Corridor within Tennessee as they are identified.
- Inventory truck parking supply along I-40/I-81 to determine any imbalances in demand for overnight truck parking
- Improve the management and enforcement of existing high occupancy vehicle (HOV) lanes located along I-40 in Nashville and Memphis.
- Study the feasibility of specific active traffic management (ATM) strategies along I-40 and I-81.

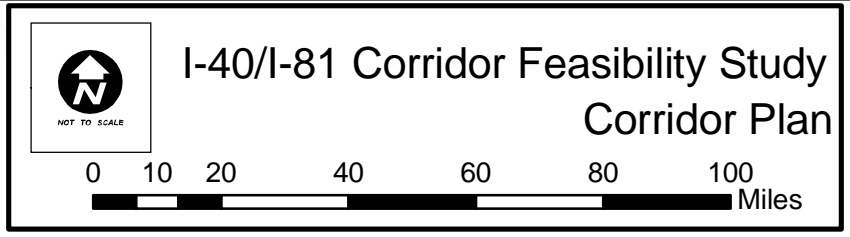
Table E-1: Summary of Recommended I-40/I-81 Corridor Plan (Year-of-Expenditure Dollars)

Improvement Category	Five Years (2010-2014)	Five Years (2015-2019)	10-Years (2020-2029)	Total (2010-2029)
Widening of Existing I-40/I-81 (Roadway Capacity Solutions)	\$228,176,000	\$303,976,000	\$943,267,000	\$1,475,419,000
Construction of Alternatives to I-40/I-81 (Corridor Capacity Solutions)	\$132,852,000	\$648,314,000	\$1,316,732,000	\$2,097,898,000
Truck Climbing Lanes	\$127,296,000	\$336,868,000	\$16,072,000	\$480,236,000
Interchange, Ramp & Bridge Improvements	\$75,673,000	\$0	\$72,267,000	\$147,940,000
Expanded ITS/HELP Programs	\$11,397,000	\$10,505,000	\$19,067,000	\$40,969,000
TOTAL	\$575,394,000	\$1,299,663,000	\$2,367,405,000	\$4,242,462,000

NOTE: Costs are year-of-expenditure dollars using an average annual 3.6 percent cost escalation based on *Engineering News-Record* construction cost index.

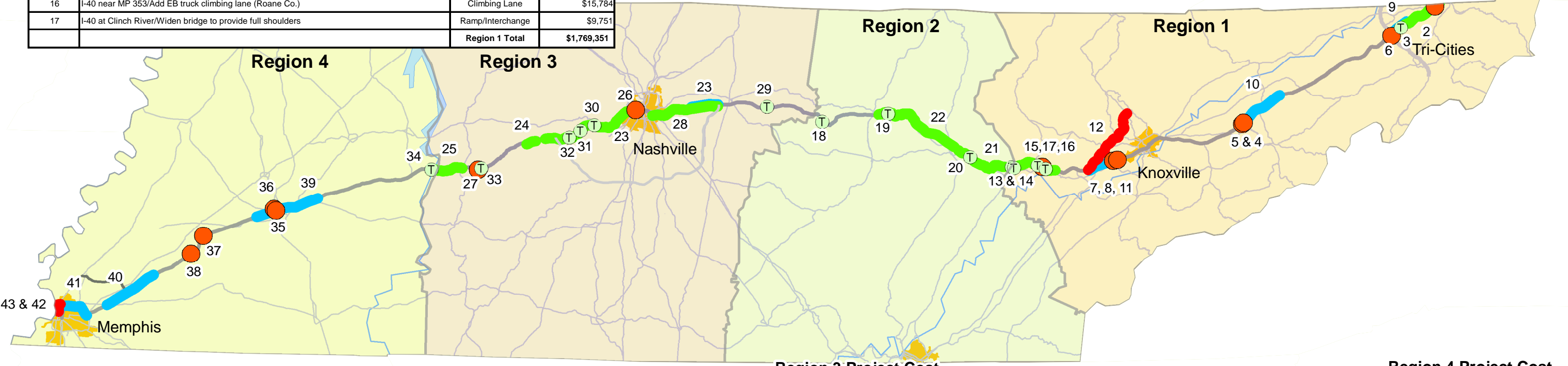
Region 1 Project Cost (Year-Of-Expenditure Dollars in Thousands)

Location	Description/Type of Work	Solution Category	Total (2010-2029)
1	I-81 widening interchange (Exit 69) near TN/ VA stateline	Ramp/Interchange	\$268
2	I-81 from I-26 (Exit 57) to State Line (Exit 75)/ ITS Freeway Management	ITS	\$7,551
3	I-81 near MP 60/Add EB truck climbing lane (Sullivan Co.)	Climbing Lane	\$29,357
4	I-40/I-81 Interchange/Lengthen ramps	Ramp/Interchange	\$1,497
5	I-81 Rest Area in Jefferson County/Lengthen ramps	Ramp/Interchange	\$723
6	I-81/I-26 Interchange/Re-construct	Ramp/Interchange	\$72,267
7	I-40 from I-75 (Exit 369) to I-140 (Exit 376)/Add WB auxiliary lane	Ramp/Interchange	\$1,312
8	I-40 Weigh Station in Knox County/Lengthen ramps	Ramp/Interchange	\$1,236
9	I-81 from I-26 (Exit 57) to SR-357 (Exit 63)/Widen to 6 lanes	Roadway Capacity	\$211,223
10	I-81 from I-40 (Exit 1) to SR-340 (Exit 15)/ Widen to 6 lanes	Roadway Capacity	\$304,942
11	I-40 from I-75 (Exit 369) to I-140 (Exit 376)/ Widen to 8 lanes	Roadway Capacity	\$183,460
12	SR-475 (Knoxville Parkway)/Construct new roadway	Corridor Capacity	\$828,821
13	I-40 near MP 341/Add WB truck climbing lane (Roane Co.)	Climbing Lane	\$35,054
14	I-40 near MP 342/Add WB truck climbing lane (Roane Co.)	Climbing Lane	\$32,660
15	I-40 near MP 350/Add WB truck climbing lane (Roane Co.)	Climbing Lane	\$33,444
16	I-40 near MP 353/Add EB truck climbing lane (Roane Co.)	Climbing Lane	\$15,784
17	I-40 at Clinch River/Widen bridge to provide full shoulders	Ramp/Interchange	\$9,751
Region 1 Total			\$1,769,351



Region 2 Project Cost (Year-Of-Expenditure Dollars in Thousands)

Location	Description/Type of Work	Solution Category	Total (2010-2029)
18	I-40 near MP 270/Add EB truck climbing lane (Putnam Co.)	Climbing Lane	\$37,837
19	I-40 between MP 293-MP 297/Add EB truck climbing lane (Putnam Co.)	Climbing Lane	\$104,683
20	I-40 near MP 326/Add WB truck climbing lane (Cumberland Co.)	Climbing Lane	\$16,797
21	I-40 near MP 339/Add EB truck climbing lane (Cumberland Co.)	Climbing Lane	\$27,095
22	I-40 from Spring St (Exit 290) to SR-299 (Exit 338)/ ITS Freeway Management	ITS	\$10,003
Region 2 Total			\$196,416



Region 3 Project Cost (Year-Of-Expenditure Dollars in Thousands)

Location	Description/Type of Work	Solution Category	Total (2010-2029)
23	I-40 from SR-46 (Exit 172) to Briley Parkway (Exit 204) and from Donelson Pike (Exit 216) to SR-840 (Exit 235)/ ITS Freeway Management	ITS	\$17,432
24	I-40 at Piney River, from SR-48 (Exit 163) to SR-46 (Exit 172)/ ITS Freeway Management	ITS	\$2,970
25	I-40 at Tennessee River, from SR-191 to SR-13S (Exit 143)/ ITS Freeway Management	ITS	\$3,012
26	I-40/I-440 Interchange/Lengthen ramp	Ramp/Interchange	\$3,214
27	I-40/SR-50 Interchange/Lengthen ramps	Ramp/Interchange	\$1,440
28	I-40 from Mt. Juliet Rd (Exit 226) to SR-840 (Exit 235)/ Widen to 6 lanes	Roadway Capacity	\$66,217
29	I-40 near MP 250/Add EB truck climbing lane (Smith Co.)	Climbing Lane	\$15,739
30	I-40 near MP 189/Add WB truck climbing lane (Cheatham Co.)	Climbing Lane	\$21,576
31	I-40 near MP 186/Add WB truck climbing lane (Cheatham Co.)	Climbing Lane	\$30,106
32	I-40 near MP 180/Add EB truck climbing lane (Dickson Co.)	Climbing Lane	\$28,744
33	I-40 near MP 149/Add WB truck climbing lane (Hickman Co.)	Climbing Lane	\$20,263
Region 3 Total			\$210,714

Region 4 Project Cost (Year-Of-Expenditure Dollars in Thousands)

Location	Description/Type of Work	Solution Category	Total (2010-2029)
34	I-40 near MP 133/Add WB truck climbing lane (Benton Co.)	Climbing Lane	\$31,096
35	I-40/US-45 Bypass & I-40/US-45 Interchanges/Re-construct & add auxiliary lanes	Ramp/Interchange	\$47,138
36	US-412 (Hollywood Dr) from I-40 to Miller Dr/Widen to 5 lanes	Ramp/Interchange	\$7,082
37	I-40/SR-76 Interchange/Lengthen ramps	Ramp/Interchange	\$1,288
38	I-40 Weigh Station in Haywood County/Lengthen ramps	Ramp/Interchange	\$723
39	I-40 from Lower Brownsville Rd (Exit 74) to SR-152 (Exit 93)/ Widen to 6 lanes	Roadway Capacity	\$345,431
40	I-40 from Germantown (Exit 18) to SR-59 (Exit 35)/ Widen to 6 lanes	Roadway Capacity	\$196,643
41	I-40 from SR-300 (Exit 3) to Sycamore View Rd (Exit 12)/ Widen to 8 lanes	Roadway Capacity	\$167,502
42	North 2nd/3rd St Connector from Downtown Memphis to I-40/SR-300 (Exit 3)/Construct new roadway	Corridor Capacity	\$80,605
43	New Mississippi River Crossing north of existing I-40/ Construct new bridge	Corridor Capacity	\$1,188,471
Region 4 Total			\$2,065,980

Figure E-1:
Recommended Solutions and Cost for I-40/ I-81 Corridor (Year-Of-Expenditure)

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1.0 INTRODUCTION

1.1 Project Background

In 2005, the Tennessee Department of Transportation (TDOT) completed the State's first 25-Year Long Range Transportation Plan (PLAN Go). A major component of the 25-Year Vision Plan included the advancement of a 10-Year Strategic Investments Plan. The 10-Year Strategic Investments Plan established three interrelated core investment initiatives: Congestion Relief, Transportation Choices, and Key Corridors.

The Interstate 40/Interstate 81 (I-40/I-81) Corridor from Memphis to Bristol was identified through the statewide planning effort as a strategic statewide corridor and several projects along the corridor are included in the 10-Year Strategic Investments Plan as a high priority. The purpose of the I-40/I-81 Corridor Feasibility Study was to gain a more detailed understanding of the deficiencies of the corridor and to develop corridor level multi-modal solutions to address these deficiencies. The study considered improvements to the I-40/I-81 corridor, investigated parallel arterials to I-40/I-81 that could be used for local travel, rail lines that could be candidates for freight diversion from the interstate, and considered major inter-modal hubs located along the corridor.

The study area for the I-40/I-81 corridor extends from Memphis to Bristol, a distance of about 550 miles. The study area traverses 27 of the 95 counties within Tennessee and falls within nine of the twelve Rural Planning Organization (RPO) boundaries and eight of the eleven Metropolitan Planning Organization (MPO) and Transportation Planning Organization (TPO) areas. Numerous cities including Memphis, Jackson, Nashville, Lebanon, Cookeville, Crossville, Knoxville, Sevierville, Jefferson City, Morristown, Kingsport, Johnson City and Bristol are dependent upon this corridor for commerce, tourism, and daily access. The study area also includes parallel Class I railroads, including their junctions with short-line railroads.

1.2 Purpose of Report

The Technical Memorandum for Task 4, Project Priorities, includes a corridor plan describing proposed strategies and solutions to address the following along I-40 and I-81:

- Capacity
- Operations and Safety
- Freight Movement/Diversion
- Economic Access

The report documents the methodology which aided in the prioritization of multi-modal investments. The technical memorandum includes a corridor plan of improvement solutions for I-40/I-81 and a summary of recommended strategies for improving corridor conditions. The report concludes with a summary of the recommended multi-modal approach for addressing I-40 and I-81 deficiencies.

1.3 Organization and Content

The multi-modal solutions and strategies prioritized in this task are presented as follows:

- Chapter 2, Prioritization Process, describes the methodology used in prioritizing individual solutions and provides a sample project to illustrate the process.
- Chapter 3, Corridor Plan, is a matrix of solutions, proposed for implementation in two five-year increments (2010 to 2014 and 2015 to 2019) and a ten-year timeframe (2020 to 2029), categorized by the four TDOT Regions.
- Chapter 4, Improvement Strategies, contains solutions to be considered by TDOT, MPOs, TPOs and RPOs located along the corridor to address capacity, safety, and operational issues.
- Chapter 5, Recommended Multi-Modal Approach, reviews the elements of the suggested approach for addressing identified I-40 and I-81 deficiencies.

2.0 PRIORITIZATION PROCESS

The purpose of this chapter is to describe the methodology used in prioritizing individual solutions for the I-40/I-81 corridor. In Task 3, Multi-Modal Solutions, performance metrics for “packages” of solutions (e.g. increased roadway capacity, increased corridor capacity, rail-focused, operational) were developed for various segments of I-40/I-81. The emphasis of the prioritization process in Task 4 is to estimate the benefit-cost (B/C) ratio for each proposed solution within the “packages” in order to identify the solutions that were found to have a significantly beneficial impact. The B/C ratios were calculated based on four specific performance metrics:

- Recurrent congestion
- Non-recurrent congestion
- Safety
- Air quality

2.1 Estimation of Performance Metrics

2.1.1 Recurrent Delay

Recurrent congestion is the congestion that results from daily congestion on the roadway. It is the result of daily demand for travel that exceeds the capacity of the roadway. The amount of recurrent congestion for each solution was calculated by evaluating travel conditions on I-40/I-81 with and without the proposed solution using the travel demand model where the improvements were located. For solutions located within the MPO boundaries of Memphis, Nashville, and Knoxville, the MPO travel demand models were used to generate the estimates. Similar use of the MPO travel demand models for Jackson, Morristown, Kingsport and Bristol was considered; however, I-40 and I-81 segments through these areas were short, resulting in minor differences from forecasts generated by the statewide travel demand model. Therefore the statewide travel demand model was employed for these MPOs and other locations in the corridor. The output from the travel demand model generated the daily hours of recurrent delay with and without the solution under consideration. These recurrent delay values were calculated for the years 2011 and 2030 and interpolated using a straight-line technique for intermediate years. Values for recurrent delay were extrapolated for years 2009 and 2010.

2.1.2 Non-recurrent Delay

Non-recurrent delay is caused by unpredictable incidents such as accidents, debris in the roadway, and inclement weather. Non-recurrent delay is only changed by select Intelligent Transportation Systems (ITS) solutions (such as weather management systems, variable message signs, and incident response teams) which are focused on reducing 1) the number of these delays, 2) the amount of delay associated with each incident, or 3) the time to provide emergency assistance to impacted drivers. These benefits were calculated using the ITS Deployment Analysis Software (IDAS).

2.1.3 Safety

Safety was measured in terms of two performance measures: 1) the number of accidents and 2) the number of fatalities. These performance measures were estimated based on

accident and fatality rates which were calculated from 2002-2004 statewide safety data for I-40/I-81. These rates were tied to vehicle miles of travel (VMT) and volume-to-capacity (V/C) ratios based on statewide ratios. The estimated changes in accidents and fatalities were estimated based on changes in VMT and V/C.

2.1.4 Air Quality

Following input from the second series of corridor public meetings held in March and April 2008, an air quality metric was added to the B/C ratio calculation. Using the Federal Highway Administration’s (FHWA) Highway Economic Requirement System (HERS) analysis, the air pollution cost per mile traveled was identified for autos and trucks.

2.2 B/C Ratio Estimation Process

The B/C ratios calculated as part of this task refer only to the benefits and costs which accrue to the I-40/I-81 corridor. Each of the solutions also has broader system-wide impacts on regional travel, including impacts to other roadways, which are not included in this analysis. The B/C ratio estimating approach used in this study was designed to focus on how each proposed improvement would impact I-40/I-81 operations. In addition, B/C ratios are not the sole determinant of a solution’s value.

To develop B/C ratios for each metric, it was necessary to determine the monetary value of each of the performance metrics that were calculated. Conversion of benefits into monetary values was based on national standards that have been developed as part of the FHWA HERS, the FHWA Technical Advisory on Motor Vehicle Accident Costs, and the IDAS software system. The monetary values for each of the metrics are shown in **Table 2-1**.

Table 2-1: Monetary Value of I-40/I-81 Performance Metrics

Performance Metric	Monetary Value
Recurrent Congestion for Autos	\$19.82/hour of delay
Recurrent Congestion for Trucks	\$36.05/hour of delay
Non-recurrent Congestion for Autos	\$39.64/ hour of delay
Non-recurrent Congestion for Trucks	\$72.10/hour of delay
Accidents	\$8,500 per accident*
Fatalities	\$4,300,000 per fatality
Auto Air Pollution Costs	\$0.011 per VMT
Truck Air Pollution Costs	\$0.039 per VMT

Source: FHWA, Highway Economic Requirements System: Technical Report, U.S. Department of Transportation, 2002; ITS Deployment Analysis System, 2008

The costs for the solutions were based on TDOT’s methodology for project cost estimating, which was discussed in the Task 3 Technical Memorandum, with a few exceptions. The costs for the ITS-related solutions were generated by IDAS project costs inflated to 2009

values. Costs for the Crescent Corridor were based on public information released by Norfolk Southern. Costs for the Trans-Tennessee Rail Corridor were developed based on the TDOT State Rail Plan. For each project, the time to complete construction was estimated based on similarly constructed projects, and the costs were distributed equally to each year of construction. The benefits were calculated to accrue beginning in the year following the construction completion year. A discount rate of 5 percent was applied to costs and benefits to normalize costs to the year 2008.

There were exceptions to the B/C ratio methodology employed for analysis of rail-focused solutions. The two major railroad projects considered during the study include the Trans-Tennessee Rail Corridor and Norfolk Southern Crescent Corridor. The calculation of benefits for the Trans-Tennessee Rail Corridor includes the economic benefits of the corridor as estimated in the Tennessee Rail Plan. For the Crescent Corridor, benefits calculation was limited to those experienced solely within Tennessee while estimated costs covered the entire corridor from Pennsylvania to both Tennessee and Louisiana.

2.2.1 Implementation of B/C Ratio Methodology

To better describe the methodology behind the calculation of the benefit-cost ratios, the following sections will describe the calculation of the benefit-cost ratio for a specific solution. The sample solution is the widening of I-40 in the Memphis region between SR-300 and US-64. The methodology described below was repeated for each solution during this screening process.

The first step was to calculate performance metrics based on the output from the Memphis MPO travel demand model. The model was run using the “no build” model and network along with this singular project for the base year 2011 and the future year 2030. The values for auto VMT, truck VMT, auto delay, and truck delay were extracted from these model runs. These values were compared to the “no build” model output to develop statistics on the differences in VMT and delay that can be achieved using this solution. Similarly, these calculations were generated for 2030 (**Table 2-2**). Based on the change in VMT and the change in delay, the number of accidents and fatalities was generated based on current accident rates on I-40 and I-81. The safety data for the corridor are shown in **Table 2-3**. For computational purposes, the numbers of accidents and fatalities were left as decimals, even though from a practical perspective, a fraction of an accident is not possible.

Table 2-2: Auto/ Truck VMT and Delay for I-40 Roadway Widening Between SR-300 and US-64

Performance Metric	2011 No Build	2011 Build Solution	2030 No Build	2030 Build Solution
Daily Auto VMT (hrs)	1,416,140	1,730,204	1,474,973	1,850,483
Daily Truck VMT (hrs)	343,658	366,683	481,010	508,353
Daily Total VMT	1,759,798	2,097,167	1,955,983	2,358,836
Daily Auto Delay (hrs)	12,592	2,232	7,045	5,514
Daily Truck Delay (hrs)	3,194	505	2,538	1,693

Table 2-3: Performance Metrics for I-40 Roadway Widening between SR-300 and US-64

Performance Metric	2011 No Build	2011 Build Solution	2030 No Build	2030 Build Solution
Change in Daily Total VMT	1,759,798	2,097,167	1,955,983	2,358,836
Change in Auto Delay (hrs)	12,592	2,232	7,045	5,514
Change in Truck Delay (hrs)	3,194	505	2,538	1,693
Number of Accidents	693	814	725	1,014
Number of Fatalities	3.6	4.1	3.8	4.5

The reduction in delay and accidents was then monetized for the years 2011 and 2030 based on the values shown in **Table 2-1**. Similarly, the change in air pollution costs was estimated as a function of the change in VMT based on the values in **Table 2-1**. Using a straight-line approach, these values were then extrapolated and interpolated to develop estimates of monetary benefits for this solution between 2010 through 2040. These values are shown in **Table 2-4**.

The cost for this widening of I-40 was estimated to be \$121 million using a methodology developed from TDOT cost estimation techniques. This solution was assumed to take five years to complete, and it was assumed to start in year 2010. The solution cost was assumed to be equally distributed over the estimated five-year construction period. Therefore, benefits from this solution would not accrue until 2015. All of the benefits calculated before this year in **Table 2-4** were zeroed out and only the benefits from 2015 to 2040 were calculated. Using a discount rate of five percent, the B/C ratio can be calculated for any of the years from 2010 to 2040. For example, the B/C ratios are 1.6 in 2020, 2.6 in 2030, and 2.4 in 2040. The B/C ratio was compared for all solutions using the year 2030. Because the cost is expended in the initial years, while the benefits are experienced in all subsequent years, the B/C ratio tends to increase with time. However, some solutions increase the amount of VMT on I-40/I-81, therefore, the number of accidents increase. This can cause the benefits to decrease long-term as the negative benefits of accidents decrease the total benefit of a solution.

Table 2-4: Annualized Benefits/Costs for I-40 Widening between SR-300 and US-64

Year	Benefit	Cost
2010	-	24,105,400
2011	-	24,105,400
2012	-	24,105,400
2013	-	24,105,400
2014	-	24,105,400
2015	46,515,604	-
2016	43,803,074	-
2017	41,090,545	-
2018	38,378,015	-
2019	35,665,485	-
2020	32,952,955	-
2021	30,240,425	-
2022	27,527,895	-
2023	24,815,365	-
2024	22,102,835	-
2025	19,390,305	-
2026	16,677,775	-
2027	13,965,245	-
2028	11,252,715	-
2029	8,540,186	-
2030	5,827,656	-
2031	3,115,126	-
2032	402,596	-
2033	(2,309,934)	-
2034	(5,022,464)	-
2035	(7,734,994)	-
2036	(10,447,524)	-
2037	(13,160,054)	-
2038	(15,872,584)	-
2039	(18,585,114)	-
2040	(21,297,643)	-

Table 2-5: Benefit/Cost Ratios for I-40 Widening Between SR-300 and US-64

2015 B/C Ratio	2020 B/C Ratio	2030 B/C Ratio	2040 B/C Ratio
0.4	1.6	2.6	2.4

3.0 CORRIDOR PLAN

This chapter identifies the solutions which would address deficiencies along the I-40/I-81 corridor, presented according to the “packages” described in the technical memorandum for Task 3, Multi-Modal Solutions. The chapter also describes the solutions that were evaluated and excluded from the corridor plan and includes an implementation schedule for recommended solutions by region and type of improvement.

3.1 Roadway Capacity Solutions

As described in technical memorandum for Task 3, this “package” of solutions includes widening of I-40 and I-81 to achieve a minimum level of service for 2030 based on results from TDOT’s statewide travel demand model and the urban area travel demand models. All model runs using the statewide model assumed an existing-plus-committed (E+C) highway network. Although the 2030 statewide model already included an E+C network, segments of I-40, I-81 and all major intersection roadways were checked for accuracy. Minor network edits were made as necessary.

Table 3-1 lists the 2015, 2020 and 2030 B/C ratios for roadway capacity solutions identified in the technical memorandum for Task 3, Multi-Modal Solutions. The construction cost estimates shown in **Table 3-1** are based on average costs for similar projects provided by TDOT and adjusted to reflect widening costs, expenses for bridges and interchanges and constructability constraints.

Based on reviews of the B/C results listed in **Table 3-1** by MPO or TPO staff members in Memphis, Jackson, Nashville, Knoxville and Tri-Cities, sub-segments of the interstate were analyzed to determine how widening shorter segments of I-40 or I-81 could address corridor deficiencies. **Table 3-2** summarizes the 2030 B/C ratios for the portions of I-40 and I-81 undergoing this analysis.

3.2 Corridor Capacity Solutions

This approach for addressing forecasted interstate congestion involves improving roadways along the I-40/I-81 corridor that could provide an alternative to traveling along the freeway. **Table 3-3** summarizes the B/C ratios for the four corridor capacity solutions identified in the technical memorandum for Task 3. These solutions are included in the I-40/I-81 corridor plan presented later in this chapter.

3.3 Operational Improvement Solutions

This “package” of solutions addresses locations along I-40 and I-81 where safety or operational deficiencies exist. In Task 3, Multi-Modal Solutions, solutions which included enhancements to interchanges, weigh stations and rest areas were identified along with possible expansions of TDOT’s Intelligent Transportation System (ITS) and incident management program (HELP). The “package” also includes truck climbing lanes for I-40 and I-81 segments that meet the steepness and length of grade criteria specified in *A Policy on Geometric Design of Highways and Streets*, published by the American Association of State and Highway Transportation Officials (AASHTO). Truck climbing lanes may not be warranted for selected segments depending on the projected traffic volumes for the time period being analyzed.

Table 3-1: Benefit/ Cost Ratio for Roadway Capacity Solutions

Solution Description	Region	Total Miles	Total Cost (2008 Dollars)	Cumulative Net Benefits in 2030	2015 B/C Ratio	2020 B/C Ratio	2030 B/C Ratio
Add lanes to provide an 8-lane facility along the east-west segment from the river through downtown to I-240 Midtown	Memphis	2.3	\$60,117,000	\$5,725,724	0.0	0.1	0.1
Widen to 8 lanes from SR-300 to Sycamore View Rd.	Memphis	8.5	\$120,527,000	\$268,916,271	0.4	1.6	2.6
Widen to 6 lanes between Germantown (Exit 18) and SR-59 (Exit 35)	Memphis	17.4	\$151,630,000	\$388,232,705	0.2	1.1	3.0
Widen to 6 lanes between SR-59 and Lower Brownsville Road	Memphis to Jackson	39.3	\$283,107,000	\$260,821,529	0.1	0.5	1.1
Widen to 6 lanes between Lower Brownsville Road and SR-1/US-70 E	Jackson	12.0	\$158,293,000	\$115,000,363	0.1	0.4	0.8
Widen to 6 lanes between SR-1/US-70 E and SR-840	Jackson to Nashville	87.4	\$886,952,000	\$383,994,570	0.0	0.2	0.5
Widen to 6 lanes between SR-840 to SR-96	Nashville	5.1	\$86,707,000	\$11,719,518	0.0	0.0	0.2
Widen to 8 lanes between SR-96 and SR-249	Nashville	6.4	\$133,356,800	\$174,105,834	0.0	0.4	1.5
Widen to 10 lanes from SR-249 to SR-251 (West)	Nashville	11.1	\$231,290,700	\$559,741,543	0.1	0.8	2.8
Widen to 12 lanes between SR-251 to I-440	Nashville	6.5	\$135,440,500	\$117,133,480	0.0	0.3	1.0
Widen to 10 lanes between I-440 and I-24 (West)	Nashville	5.4	\$168,645,000	\$5,955,140	0.0	0.0	0.0
Widen to 12 lanes from I-24 (West) to I-24 (East)	Nashville	1.7	\$54,442,000	\$117,372,612	0.2	1.0	2.5
Widen to 8 lanes between I-24 (East) to SR-155 (East)	Nashville	1.8	\$37,763,000	\$12,823,145	0.0	0.1	0.4
Widen to 6 lanes from Mt. Juliet Rd. (Exit 226) to SR-840 (Exit 235)	Nashville	7.8	\$53,530,000	\$149,424,281	0.2	1.3	3.2
Widen to 6 lanes from SR-840 (Exit 235) to I-75 (Exit 368)	Nashville to Knoxville	132.0	\$1,944,576,000	\$598,892,781	0.0	0.1	0.4
Widen to 8 lanes between I-75 (South) and I-140	Knoxville	7.6	\$112,100,801	\$228,057,560	0.1	0.9	2.3
Widen to 10 lanes between I-140 and I-75 (North)	Knoxville	9.5	\$291,770,000	\$8,906,775	0.0	0.0	0.0
Widen to 8 lanes between I-275 (North) and North 5th Ave.	Knoxville	3.2	\$98,588,000	\$22,354,823	0.0	0.1	0.3
Widen I-81 to 6 lanes from I-40 to VA state line	Lakeway & Tri-Cities	72.0	\$849,655,000	\$170,106,546	0.0	0.1	0.2

Table 3-2: Benefit/ Cost Ratios for I-40 and I-81 Sub-Segments Proposed By MPO/ TPO Staff

Solution Description	Region	Total Miles	Total Cost (2008 Dollars)	Cumulative Net Benefits in 2030	2015 B/C Ratio	2020 B/C Ratio	2030 B/C Ratio
Widen I-40 to 6 lanes between Lower Brownsville Rd (Exit 74) and SR-152 (Exit 93)	Jackson	19.0	\$208,000,000	\$166,000,000	0.1	0.4	0.8
Widen I-40 to 8 lanes between I-75 (South) and I-140	Knoxville	7.6	\$112,101,000	\$228,057,560	0.1	0.9	2.3
Widen I-81 to 6 lanes from I-40 (Exit 1) to SR-340 (Exit 15)	Lakeway	15.0	\$147,000,000	\$38,675,995	0.0	0.1	0.3
Widen I-81 to 6 lanes from I-26 (Exit 57) to SR-357 (Exit 63)	Tri-Cities	6.0	\$105,000,000	\$14,886,923	0.0	0.1	0.2

Table 3-3: Benefit/ Cost Ratios for Corridor Capacity Solutions

Solution Description	Region	Total Cost (2008 Dollars)	Cumulative Net Benefits in 2030	2015 B/C Ratio	2020 B/C Ratio	2030 B/C Ratio
Add new Mississippi River bridge crossing: 1) north of I-40 or 2) south of I-40	Memphis	\$600,000,000	\$986,245,518	0.0	0.4	1.9
Add north 2nd/3rd Street connector from north of downtown to SR-300	Memphis	\$74,375,308	\$98,392,321	0.3	0.9	1.5
Complete remaining segments of SR-840 South	Nashville	\$248,800,000	\$1,269,302,572	0.3	1.5	5.6
Construct SR-475 (Knoxville Parkway)	Knoxville	\$609,000,000	\$241,757,462	0.0	0.1	0.5

3.3.1 ITS Enhancements

In Task 3, Multi-Modal Solutions, six enhancements to TDOT's ITS and HELP programs were identified. **Table 3-4** describes the elements of each of the ITS solutions and includes estimated B/C ratios based on the ITS Deployment Analysis System (IDAS), as presented in Chapter 2. The recommended ITS solutions are prioritized in the corridor plan found later in this chapter.

3.3.2 Interchange and Ramp Improvements

Table 3-5 lists the 13 operational solutions that are included in the corridor plan to address safety and/or operational problems. A benefit/cost analysis was not performed for these solutions because of the difficulty in monetizing the benefits of ramp extensions or interchange re-construction. However, the improvements were carried forward for consideration as potential solutions to identified deficiencies at those specific locations.

3.3.3 Truck Climbing Lanes

Table 3-6 summarizes the I-40 and I-81 segments where implementation of truck climbing lanes could provide the greatest benefits because of the length and steepness of the grade, number of trucks, and overall traffic volumes. These solutions are prioritized in the corridor plan based on the number of locations within the segment where accidents exceed the critical accident rate according to TDOT's crash database.

3.4 Corridor Implementation Plan

Table 3-7 through **Table 3-18** represents implementation schedules for the proposed corridor solutions categorized by TDOT Region. All costs have been inflated from 2008 dollars to year-of-expenditure expenses using an annual inflation rate of 3.6 percent. This inflation rate is based on the annual increase in construction costs over the past ten years as maintained by the *Engineering News-Record*.

Figure 3-1 through **Figure 3-4** indicates the locations of the recommended solutions by TDOT Region while **Figure 3-5** shows solutions for the entire I-40/I-81 Corridor.

Table 3-4: Benefit/ Cost Ratios for ITS Enhancements

Solution Description	Region	Total Miles	Problems	Solution Elements	Capital Cost (2008 Dollars)	Annual Operating & Maintenance Costs (2008 Dollars)	2030 B/C Ratio
Rural ITS Implementation along I-40 at Tennessee River, near Cuba Landing SR-191 (Birdsong Rd) to SR-13S	Jackson to Nashville	10	Slippery bridge during ice Occasional fog	Surveillance cameras Dynamic message signs	\$1,015,000	\$69,000	1.6
Rural ITS Implementation along I-40 at Piney River, SR-48 (Exit 163) to SR-46 (Exit 172)	Jackson to Nashville	10	Slippery bridge during ice Occasional fog Grade & curve at bridge	Weather station Surveillance cameras Dynamic message signs	\$1,015,000	\$69,000	1.7
ITS Expansion along I-40 west of Nashville between SR-46 (Exit 172) and Briley Pkwy (Exit 204) and east of Nashville between Donelson Pike (Exit 216) and SR-840 (Exit 235)	Nashville	51	Congestion & accidents Slippery roadway near Percy Priest dam	Surveillance cameras Dynamic message signs Speed detection at 1/2-mile intervals HELP service vehicles 511 and Web traveler information Real time weather sensors	\$4,344,800	\$446,000	144.0
Rural ITS Implementation along I-40 on Cumberland Plateau, from Spring St in Cookeville (Exit 290) to SR-299 (Exit 338)	Nashville to Knoxville	47	Slippery roadway during snow or ice Occasional fog	Weather station Surveillance cameras Dynamic message signs	\$2,785,000	\$273,000	0.7
ITS Expansion along I-81 between I-26 (Exit 57) and Virginia State Line (Exit 75)	Tri-Cities	19	Congestion & accidents Slippery roadway during snow or ice	Surveillance cameras Dynamic message signs Speed detection at 1/2-mile intervals HELP service vehicles 511 and Web traveler information Real time weather sensors	\$1,777,400	\$203,000	81.0

Table 3-5: Interchange & Ramp Improvements Along I-40/ I-81 Corridor

Description	Region	Solution	Cost Estimate (2008 Dollars)
Lengthen acceleration/deceleration lanes at I-40 weigh station near Exit 52.	Memphis to Jackson	Extend I-40 off-ramp deceleration lane 500 feet for both EB and WB directions. Extend I-40 on-ramp acceleration lane 600 feet for both EB and WB directions. (Includes one culvert extension.)	\$650,000
Lengthen ramps at I-40/SR-76 interchange (Exit 56)		Extend I-40 EB off-ramp 400 feet, EB on-ramp 1000 feet, WB off-ramp 600 feet and WB on-ramp 1100 feet.	\$1,200,000
Widen US-412 (Hollywood Dr) from I-40 to Miller Dr to 5 lanes	Jackson	Only segment of US-412 west of Jackson that has not been widened to 5 lanes	\$6,600,000
Re-design I-40/US-45 BP interchange.		Reconfigure I-40/US-45 BP cloverleaf as a single point interchange. Add 2.9 total miles of full auxiliary lanes between Keith Short Bypass (US-45 BP) and N. Highland Avenue (US-45). Reconfigure I-40/US-45 full cloverleaf as a partial cloverleaf interchange with a new traffic signal.	\$40,400,000
Extend on/off ramps at I-40/SR-50 interchange.	Jackson to Nashville	Extend I-40 off-ramp deceleration lane 500 feet for both EB and WB directions. Extend I-40 EB on-ramp acceleration lane 1100 feet and I-40 WB on-ramp acceleration lane 1200 feet.	\$1,300,000
Improve ramp from I-40 East to I-440 South.	Nashville	Extend I-40 EB to I-440 system ramp deceleration lane 2100 feet.	\$2,800,000
Increase shoulder width on bridge in Kingston.	Lebanon to Knoxville	Widen 1450 feet along the I-40 Clinch River Bridge and approaches by 6 feet in each direction to provide full shoulders.	\$8,800,000
Extend ramp from I-140 SB to I-40/I-75 WB.	Knoxville	Add full auxiliary lane between interchanges 2650 feet.	\$1,100,000
Lengthen ramps at I-40 weigh station		Extend I-40 off-ramp deceleration lanes 400 feet for EB and 500 feet for WB directions. Extend I-40 on-ramp acceleration lanes 900 feet for EB and 500 feet for WB directions.	\$1,000,000

Table 3-5: Interchange & Ramp Improvements Along I-40/ I-81 Corridor (Cont.)

Description	Region	Solution	Cost Estimate (2008 Dollars)
Improve operations of I-40/I-81 interchange.	Lakeway & Tri-Cities	Extend I-40 WB, I-40 EB and I-81 NB acceleration lanes 800 feet. Extend I-81 SB deceleration lane 400 feet.	\$1,300,000
Lengthen ramps at I-81 rest area		Extend I-81 SB acceleration lane 900 feet and SB deceleration lane 700 feet.	\$650,000
Improve exit ramp capacity at I-81 interchange at Exit 69		Provide dual right turn lane on I-81 NB off-ramp for 500 feet.	\$250,000
Re-design I-81/I-26 interchange.		Reconfigure I-81 and I-26 system cloverleaf interchange by converting two existing loop ramps to directional fly-over ramps. Improvement includes ramp modifications, culvert extension and bridge widening.	\$43,600,000

Table 3-6: Recommended Truck Climbing Lanes (Thousands of 2008 Dollars)

County	Begin Log Mile	End Log Mile	Mile Post	Length (mi)	Median Width	ROW	Bridges	Bridge Cost	ROW Cost	Constr Cost	PE Cost	% Barrier	% Constraints	Cost of Constraints	Total Cost
BENTON	7	8.13	133	1.13	2	300	1	\$4,000	\$3,122	\$3,966	\$1,527	100%	100%	\$11,300	\$23,915
HICKMAN	0.34	1.44	149	1.1	52	300		\$0	\$0	\$3,861	\$1,486		100%	\$11,000	\$16,347
DICKSON	16.5	17.83	180	1.33	100	300	1	\$4,000	\$0	\$4,668	\$1,797		100%	\$13,300	\$23,765
CHEATHAM	1.35	2.63	186	1.28	54	300	1	\$4,000	\$0	\$4,493	\$1,601		90%	\$11,520	\$21,614
CHEATHAM	5.09	5.64	189	0.55	60	300	2	\$8,000	\$0	\$1,931	\$743		100%	\$5,500	\$16,174
SMITH	0.04	0.6	250	0.56	50	300	1	\$4,000	\$0	\$1,966	\$757		100%	\$5,600	\$12,322
PUTNAM	3.03	4.74	270	1.71	2	300		\$0	\$4,724	\$6,353	\$2,345	100%	100%	\$17,100	\$30,522
PUTNAM	25.32	29.32	293	4	2 - 999	400 - 1500	2	\$8,000	\$2,265	\$21,962	\$6,196	21%	100%	\$40,000	\$78,423
CUMBERLAND	21.24	22.26	326	1.02	90	300		\$0	\$0	\$3,580	\$1,378		100%	\$10,200	\$15,158
CUMBERLAND	34.55	35.85	339	1.3	52	300	1	\$4,000	\$0	\$4,563	\$1,756		100%	\$13,000	\$23,319
ROANE	0.2	1.35	341	1.15	54 - 300	300 - 600	1	\$4,000	\$2,486	\$6,467	\$1,797		100%	\$11,500	\$26,249
ROANE	1.53	2.64	342	1.11	300	600		\$0	\$3,066	\$6,893	\$1,799		100%	\$11,100	\$22,859
ROANE	9.64	10.68	350	1.04	30	350	2	\$8,000	\$0	\$3,650	\$1,305		90%	\$9,400	\$22,355
ROANE	12.39	13.15	353	0.76	44	300 - 350	1	\$4,000	\$0	\$2,668	\$647		50%	\$3,800	\$11,114
SULLIVAN	6.78	7.98	60	1.2	32	250	1	\$4,000	\$0	\$4,212	\$1,621		100%	\$12,000	\$21,833
TOTAL				19.24				\$56,000	\$15,663	\$81,232	\$26,755			\$186,320	\$365,971

**Table 3-7: FY 2010-2014 Corridor Implementation Plan for TDOT Region 1
(Year-Of-Expenditure Dollars in Thousands)**

I-40 near MP 341/Add WB truck climbing lane (Roane Co.)		Climbing Lane				1.2 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Preliminary Engineering	\$0	\$0	\$0	\$0	\$2,221	\$2,221	
Project Total	\$0	\$0	\$0	\$0	\$2,221	\$2,221	
SR-475 (Knoxville Parkway)/Construct new roadway		Corridor Capacity				27.8 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Preliminary Engineering	\$17,169	\$17,786	\$18,424	\$0	\$0	\$53,380	
Right of Way	\$0	\$0	\$0	\$32,207	\$33,363	\$65,571	
Project Total	\$17,169	\$17,786	\$18,424	\$32,207	\$33,363	\$118,951	
I-81 from I-26 (Exit 57) to State Line (Exit 75)/ ITS Freeway Management		ITS				19 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Purchasing Equipment & Installation	\$0	\$987	\$1,024	\$0	\$0	\$2,011	
Operating & Maintenance	\$0	\$0	\$0	\$242	\$251	\$493	
Project Total	\$0	\$987	\$1,024	\$242	\$251	\$2,504	
I-40 at Clinch River/Widen bridge to provide full shoulders		Ramp/ Interchange				0.3 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Construction	\$0	\$8,893	\$0	\$0	\$0	\$8,893	
Preliminary Engineering	\$858	\$0	\$0	\$0	\$0	\$858	
Project Total	\$858	\$8,893	\$0	\$0	\$0	\$9,751	
I-40 from I-75 (Exit 369) to I-140 (Exit 376)/Add WB auxiliary lane		Ramp/ Interchange				0 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Construction	\$0	\$0	\$0	\$1,193	\$0	\$1,193	
Preliminary Engineering	\$0	\$0	\$0	\$119	\$0	\$119	
Project Total	\$0	\$0	\$0	\$1,312	\$0	\$1,312	
I-40 Weigh Station in Knox County/Lengthen ramps		Ramp/ Interchange				0 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Construction	\$0	\$0	\$0	\$0	\$1,124	\$1,124	
Preliminary Engineering	\$0	\$0	\$0	\$0	\$111	\$111	
Project Total	\$0	\$0	\$0	\$0	\$1,235	\$1,235	

Table 3-7: FY 2010-2014 Corridor Implementation Plan for TDOT Region 1 (Cont.)
(Year-Of-Expenditure Dollars in Thousands)

I-40/I-81 Interchange/Lengthen ramps			Ramp/ Interchange		0 miles	
Work Activity	2010	2011	2012	2013	2014	Total
Construction	\$0	\$0	\$1,359	\$0	\$0	\$1,359
Preliminary Engineering	\$0	\$0	\$138	\$0	\$0	\$138
Project Total	\$0	\$0	\$1,497	\$0	\$0	\$1,497
I-81 Rest Area in Jefferson County/Lengthen ramps			Ramp/ Interchange		0 miles	
Work Activity	2010	2011	2012	2013	2014	Total
Construction	\$0	\$656	\$0	\$0	\$0	\$656
Preliminary Engineering	\$0	\$67	\$0	\$0	\$0	\$67
Project Total	\$0	\$723	\$0	\$0	\$0	\$723
I-81/SR-394 Interchange/Widen exit ramp			Ramp/ Interchange		0 miles	
Work Activity	2010	2011	2012	2013	2014	Total
Construction	\$241	\$0	\$0	\$0	\$0	\$241
Preliminary Engineering	\$27	\$0	\$0	\$0	\$0	\$27
Project Total	\$268	\$0	\$0	\$0	\$0	\$268
Grand Total	\$18,295	\$28,389	\$20,945	\$33,761	\$37,070	\$138,462

**Table 3-8: FY 2015-2019 Corridor Implementation Plan for TDOT Region 1
(Year-Of-Expenditure Dollars in Thousands)**

I-40 near MP 341/Add WB truck climbing lane (Roane Co.)		Climbing Lane				1.2 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$0	\$14,565	\$15,086	\$0	\$0	\$29,651	
Right of Way	\$3,182	\$0	\$0	\$0	\$0	\$3,182	
Project Total	\$3,182	\$14,565	\$15,086	\$0	\$0	\$32,833	
I-40 near MP 342/Add WB truck climbing lane (Roane Co.)		Climbing Lane				1.1 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$0	\$0	\$0	\$12,802	\$13,260	\$26,062	
Preliminary Engineering	\$0	\$2,387	\$0	\$0	\$0	\$2,387	
Right of Way	\$0	\$0	\$4,211	\$0	\$0	\$4,211	
Project Total	\$0	\$2,387	\$4,211	\$12,802	\$13,260	\$32,660	
I-40 near MP 350/Add WB truck climbing lane (Roane Co.)		Climbing Lane				1 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$0	\$0	\$0	\$0	\$15,515	\$15,515	
Preliminary Engineering	\$0	\$0	\$0	\$1,857	\$0	\$1,857	
Project Total	\$0	\$0	\$0	\$1,857	\$15,515	\$17,372	
I-40 near MP 353/Add EB truck climbing lane (Roane Co.)		Climbing Lane				0.8 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$0	\$0	\$0	\$14,895	\$0	\$14,895	
Preliminary Engineering	\$0	\$0	\$889	\$0	\$0	\$889	
Project Total	\$0	\$0	\$889	\$14,895	\$0	\$15,784	
I-81 near MP 60/Add EB truck climbing lane (Sullivan Co.)		Climbing Lane				1.2 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$0	\$13,401	\$13,882	\$0	\$0	\$27,282	
Preliminary Engineering	\$2,075	\$0	\$0	\$0	\$0	\$2,075	
Project Total	\$2,075	\$13,401	\$13,882	\$0	\$0	\$29,357	
SR-475 (Knoxville Parkway)/Construct new roadway		Corridor Capacity				27.8 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$108,804	\$112,710	\$116,756	\$119,525	\$123,816	\$581,610	
Project Total	\$108,804	\$112,710	\$116,756	\$119,525	\$123,816	\$581,610	

**Table 3-8: FY 2015-2019 Corridor Implementation Plan for TDOT Region 1 (Cont.)
(Year-Of-Expenditure Dollars in Thousands)**

I-81 from I-26 (Exit 57) to State Line (Exit 75)/ ITS Freeway Management		ITS				19 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Operating & Maintenance	\$260	\$269	\$279	\$289	\$299	\$1,396	
Project Total	\$260	\$269	\$279	\$289	\$299	\$1,396	
I-40 from I-75 (Exit 369) to I-140 (Exit 376)/ Widen to 8 lanes		Roadway Capacity				7.6 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Preliminary Engineering	\$0	\$0	\$0	\$8,537	\$4,926	\$13,464	
Right of Way	\$0	\$0	\$0	\$0	\$4,914	\$4,914	
Project Total	\$0	\$0	\$0	\$8,537	\$9,840	\$18,378	
Grand Total	\$114,321	\$143,332	\$151,103	\$157,905	\$162,730	\$729,390	

**Table 3-9: FY 2020-2029 Corridor Implementation Plan for TDOT Region 1
(Year-Of-Expenditure Dollars in Thousands)**

I-40 near MP 350/Add WB truck climbing lane (Roane Co.)							Climbing Lane			1 miles	
Work Activity	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
Construction	\$16,072	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$16,072
Project Total	\$16,072	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$16,072
SR-475 (Knoxville Parkway)/Construct new roadway							Corridor Capacity			27.8 miles	
Work Activity	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
Construction	\$128,261	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$128,261
Project Total	\$128,261	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$128,261
I-81 from I-26 (Exit 57) to State Line (Exit 75)/ ITS Freeway Management							ITS			19 miles	
Work Activity	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
Operating & Maintenance	\$310	\$321	\$333	\$345	\$357	\$370	\$383	\$397	\$411	\$426	\$3,651
Project Total	\$310	\$321	\$333	\$345	\$357	\$370	\$383	\$397	\$411	\$426	\$3,651
I-81/I-26 Interchange/Re-construct							Ramp/	Interchange		0 miles	
Work Activity	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
Construction	\$0	\$0	\$32,443	\$33,607	\$0	\$0	\$0	\$0	\$0	\$0	\$66,050
Preliminary Engineering	\$3,054	\$3,163	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$6,217
Project Total	\$3,054	\$3,163	\$32,443	\$33,607	\$0	\$0	\$0	\$0	\$0	\$0	\$72,267
I-40 from I-75 (Exit 369) to I-140 (Exit 376)/ Widen to 8 lanes							Roadway Capacity			7.6 miles	
Work Activity	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
Construction	\$0	\$36,943	\$38,269	\$39,643	\$41,066	\$0	\$0	\$0	\$0	\$0	\$155,921
Right of Way	\$9,161	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$9,161
Project Total	\$9,161	\$36,943	\$38,269	\$39,643	\$41,066	\$0	\$0	\$0	\$0	\$0	\$165,082
I-81 from I-26 (Exit 57) to SR-357 (Exit 63)/Widen to 6 lanes							Roadway Capacity			6 miles	
Work Activity	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
Construction	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$61,567	\$63,777	\$66,067	\$191,412
Preliminary Engineering	\$0	\$0	\$0	\$0	\$0	\$0	\$19,811	\$0	\$0	\$0	\$19,811
Project Total	\$0	\$0	\$0	\$0	\$0	\$0	\$19,811	\$61,567	\$63,777	\$66,067	\$211,223

Table 3-9: FY 2020-2029 Corridor Implementation Plan for TDOT Region 1 (Cont.)
(Year-Of-Expenditure Dollars in Thousands)

I-81 from I-40 (Exit 1) to SR-340 (Exit 15)/ Widen to 6 lanes							Roadway Capacity				15 miles
Work Activity	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
Construction	\$0	\$0	\$0	\$0	\$0	\$0	\$60,377	\$62,544	\$64,790	\$67,116	\$254,827
Preliminary Engineering	\$0	\$0	\$0	\$0	\$24,616	\$25,499	\$0	\$0	\$0	\$0	\$50,115
Project Total	\$0	\$0	\$0	\$0	\$24,616	\$25,499	\$60,377	\$62,544	\$64,790	\$67,116	\$304,942
Grand Total	\$156,858	\$40,427	\$71,045	\$73,595	\$66,039	\$25,869	\$80,571	\$124,508	\$128,978	\$133,609	\$901,498

**Table 3-10: FY 2010-2014 Corridor Implementation Plan for TDOT Region 2
(Year-Of-Expenditure Dollars in Thousands)**

I-40 between MP 293-MP 297/Add EB truck climbing lane (Putnam Co.)		Climbing Lane				4 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Preliminary Engineering	\$0	\$0	\$0	\$7,391	\$0	\$7,391	
Right of Way	\$0	\$0	\$0	\$0	\$2,799	\$2,799	
Project Total	\$0	\$0	\$0	\$7,391	\$2,799	\$10,190	
I-40 near MP 270/Add EB truck climbing lane (Putnam Co.)		Climbing Lane				1.7 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Construction	\$0	\$0	\$0	\$0	\$14,491	\$14,491	
Preliminary Engineering	\$0	\$0	\$2,700	\$0	\$0	\$2,700	
Right of Way	\$0	\$0	\$0	\$5,635	\$0	\$5,635	
Project Total	\$0	\$0	\$2,700	\$5,635	\$14,491	\$22,826	
I-40 near MP 326/Add WB truck climbing lane (Cumberland Co.)		Climbing Lane				1 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Construction	\$0	\$15,318	\$0	\$0	\$0	\$15,318	
Preliminary Engineering	\$1,479	\$0	\$0	\$0	\$0	\$1,479	
Project Total	\$1,479	\$15,318	\$0	\$0	\$0	\$16,797	
I-40 near MP 339/Add EB truck climbing lane (Cumberland Co.)		Climbing Lane				1.3 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Construction	\$0	\$0	\$16,121	\$9,022	\$0	\$25,143	
Preliminary Engineering	\$0	\$1,952	\$0	\$0	\$0	\$1,952	
Project Total	\$0	\$1,952	\$16,121	\$9,022	\$0	\$27,095	
Grand Total	\$1,479	\$17,270	\$18,821	\$22,048	\$17,290	\$76,908	

**Table 3-11: FY 2015-2019 Corridor Implementation Plan for TDOT Region 2
(Year-Of-Expenditure Dollars in Thousands)**

I-40 between MP 293-MP 297/Add EB truck climbing lane (Putnam Co.)		Climbing Lane				4 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$22,388	\$23,192	\$24,026	\$24,888	\$0	\$94,493	
Project Total	\$22,388	\$23,192	\$24,026	\$24,888	\$0	\$94,493	
I-40 near MP 270/Add EB truck climbing lane (Putnam Co.)		Climbing Lane				1.7 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$15,011	\$0	\$0	\$0	\$0	\$15,011	
Project Total	\$15,011	\$0	\$0	\$0	\$0	\$15,011	
I-40 from Spring St (Exit 290) to SR-299 (Exit 338)/ ITS Freeway Management		ITS				47 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Purchasing Equipment & Installation	\$3,565	\$0	\$0	\$0	\$0	\$3,565	
Operating & Maintenance	\$0	\$362	\$375	\$388	\$402	\$1,528	
Project Total	\$3,565	\$362	\$375	\$388	\$402	\$5,093	
Grand Total	\$40,964	\$23,554	\$24,401	\$25,276	\$402	\$114,597	

**Table 3-12: FY 2020-2029 Corridor Implementation Plan for TDOT Region 2
(Year-Of-Expenditure Dollars in Thousands)**

I-40 from Spring St (Exit 290) to SR-299 (Exit 338)/ ITS Freeway Management								ITS	47 miles		
Work Activity	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
Operating & Maintenance	\$417	\$432	\$447	\$463	\$480	\$497	\$515	\$534	\$553	\$573	\$4,911
Project Total	\$417	\$432	\$447	\$463	\$480	\$497	\$515	\$534	\$553	\$573	\$4,911
<hr/>											
Grand Total	\$417	\$432	\$447	\$463	\$480	\$497	\$515	\$534	\$553	\$573	\$4,911

**Table 3-13: FY 2010-2014 Corridor Implementation Plan for TDOT Region 3
(Year-Of-Expenditure Dollars in Thousands)**

I-40 near MP 149/Add WB truck climbing lane (Hickman Co.)		Climbing Lane				1.1 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Construction	\$0	\$0	\$0	\$0	\$14,828	\$14,828	
Preliminary Engineering	\$0	\$0	\$0	\$1,773	\$0	\$1,773	
Project Total	\$0	\$0	\$0	\$1,773	\$14,828	\$16,601	
I-40 near MP 180/Add EB truck climbing lane (Dickson Co.)		Climbing Lane				1.3 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Construction	\$0	\$0	\$0	\$13,102	\$13,573	\$26,675	
Preliminary Engineering	\$0	\$0	\$2,069	\$0	\$0	\$2,069	
Project Total	\$0	\$0	\$2,069	\$13,102	\$13,573	\$28,744	
I-40 near MP 250/Add EB truck climbing lane (Smith Co.)		Climbing Lane				0.6 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Preliminary Engineering	\$0	\$0	\$0	\$0	\$935	\$935	
Project Total	\$0	\$0	\$0	\$0	\$935	\$935	
I-40 at Piney River, from SR-48 (Exit 163) to SR-46 (Exit 172)/ ITS Freeway Management		ITS				10 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Purchasing Equipment & Installation	\$0	\$0	\$0	\$0	\$1,254	\$1,254	
Project Total	\$0	\$0	\$0	\$0	\$1,254	\$1,254	
I-40 at Tennessee River, from SR-191 to SR-13S (Exit 143)/ ITS Freeway Management		ITS				10 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Purchasing Equipment & Installation	\$0	\$0	\$0	\$1,211	\$0	\$1,211	
Operating & Maintenance	\$0	\$0	\$0	\$0	\$85	\$85	
Project Total	\$0	\$0	\$0	\$1,211	\$85	\$1,296	
I-40 from SR-46 (Exit 172) to Briley Parkway (Exit 204) and from Donelson Pike (Exit 216) to SR-840 (Exit 235)/ ITS Freeway Management		ITS				51 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Purchasing Equipment & Installation	\$2,331	\$2,416	\$0	\$0	\$0	\$4,746	
Operating & Maintenance	\$0	\$0	\$514	\$532	\$551	\$1,597	
Project Total	\$2,331	\$2,416	\$514	\$532	\$551	\$6,343	

Table 3-13: FY 2010-2014 Corridor Implementation Plan for TDOT Region 3 (Cont.)
(Year-Of-Expenditure Dollars in Thousands)

I-40/I-440 Interchange/Lengthen ramp		Ramp/ Interchange				0 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Construction	\$0	\$0	\$2,936	\$0	\$0	\$2,936	
Preliminary Engineering	\$0	\$278	\$0	\$0	\$0	\$278	
Project Total	\$0	\$278	\$2,936	\$0	\$0	\$3,214	
I-40/SR-50 Interchange/Lengthen ramps		Ramp/ Interchange				0 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Construction	\$0	\$1,312	\$0	\$0	\$0	\$1,312	
Preliminary Engineering	\$129	\$0	\$0	\$0	\$0	\$129	
Project Total	\$129	\$1,312	\$0	\$0	\$0	\$1,441	
I-40 from Mt. Juliet Rd (Exit 226) to SR-840 (Exit 235)/ Widen to 6 lanes		Roadway Capacity				7.8 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Construction	\$0	\$0	\$28,788	\$29,821	\$0	\$58,609	
Preliminary Engineering	\$4,292	\$2,223	\$0	\$0	\$0	\$6,516	
Right of Way	\$0	\$1,092	\$0	\$0	\$0	\$1,092	
Project Total	\$4,292	\$3,315	\$28,788	\$29,821	\$0	\$66,217	
Grand Total	\$6,752	\$7,321	\$34,307	\$46,439	\$31,226	\$126,045	

**Table 3-14: FY 2015-2019 Corridor Implementation Plan for TDOT Region 3
(Year-Of-Expenditure Dollars in Thousands)**

I-40 near MP 149/Add WB truck climbing lane (Hickman Co.)		Climbing Lane				1.1 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$3,662	\$0	\$0	\$0	\$0	\$3,662	
Project Total	\$3,662	\$0	\$0	\$0	\$0	\$3,662	
I-40 near MP 186/Add WB truck climbing lane (Cheatham Co.)		Climbing Lane				1.3 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$0	\$0	\$13,746	\$14,238	\$0	\$27,983	
Preliminary Engineering	\$0	\$2,123	\$0	\$0	\$0	\$2,123	
Project Total	\$0	\$2,123	\$13,746	\$14,238	\$0	\$30,106	
I-40 near MP 189/Add WB truck climbing lane (Cheatham Co.)		Climbing Lane				0.6 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$0	\$15,912	\$4,713	\$0	\$0	\$20,625	
Preliminary Engineering	\$951	\$0	\$0	\$0	\$0	\$951	
Project Total	\$951	\$15,912	\$4,713	\$0	\$0	\$21,576	
I-40 near MP 250/Add EB truck climbing lane (Smith Co.)		Climbing Lane				0.6 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$14,804	\$0	\$0	\$0	\$0	\$14,804	
Project Total	\$14,804	\$0	\$0	\$0	\$0	\$14,804	
I-40 at Piney River, from SR-48 (Exit 163) to SR-46 (Exit 172)/ ITS Freeway Management		ITS				10 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Operating & Maintenance	\$88	\$91	\$95	\$98	\$102	\$474	
Project Total	\$88	\$91	\$95	\$98	\$102	\$474	
I-40 at Tennessee River, from SR-191 to SR-13S (Exit 143)/ ITS Freeway Management		ITS				10 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Operating & Maintenance	\$88	\$91	\$95	\$98	\$102	\$474	
Project Total	\$88	\$91	\$95	\$98	\$102	\$474	

**Table 3-14: FY 2015-2019 Corridor Implementation Plan for TDOT Region 3 (Cont.)
(Year-Of-Expenditure Dollars in Thousands)**

I-40 from SR-46 (Exit 172) to Briley Parkway (Exit 204) and from Donelson Pike (Exit 216) to SR-840 (Exit 235)/ ITS Freeway Management		ITS				51 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Operating & Maintenance	\$571	\$591	\$613	\$635	\$657	\$3,067	
Project Total	\$571	\$591	\$613	\$635	\$657	\$3,067	
<hr/>							
Grand Total	\$20,164	\$18,808	\$19,262	\$15,069	\$861	\$74,163	
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**Table 3-15: FY 2020-2029 Corridor Implementation Plan for TDOT Region 3
(Year-Of-Expenditure Dollars in Thousands)**

I-40 at Piney River, from SR-48 (Exit 163) to SR-46 (Exit 172)/ ITS Freeway Management								ITS	10 miles			
Work Activity	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total	
Operating & Maintenance	\$105	\$109	\$113	\$117	\$121	\$126	\$130	\$135	\$140	\$145	\$1,241	
Project Total	\$105	\$109	\$113	\$117	\$121	\$126	\$130	\$135	\$140	\$145	\$1,241	
I-40 at Tennessee River, from SR-191 to SR-13S (Exit 143)/ ITS Freeway Management								ITS	10 miles			
Work Activity	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total	
Operating & Maintenance	\$105	\$109	\$113	\$117	\$121	\$126	\$130	\$135	\$140	\$145	\$1,241	
Project Total	\$105	\$109	\$113	\$117	\$121	\$126	\$130	\$135	\$140	\$145	\$1,241	
I-40 from SR-46 (Exit 172) to Briley Parkway (Exit 204) and from Donelson Pike (Exit 216) to SR-840 (Exit 235)/ ITS Freeway Management								ITS	51 miles			
Work Activity	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total	
Operating & Maintenance	\$681	\$705	\$731	\$757	\$784	\$812	\$842	\$872	\$903	\$935	\$8,022	
Project Total	\$681	\$705	\$731	\$757	\$784	\$812	\$842	\$872	\$903	\$935	\$8,022	
<hr/>												
Grand Total	\$891	\$923	\$957	\$991	\$1,026	\$1,064	\$1,102	\$1,142	\$1,183	\$1,225	\$10,504	

**Table 3-16: FY 2010-2014 Corridor Implementation Plan for TDOT Region 4
(Year-Of-Expenditure Dollars in Thousands)**

I-40 near MP 133/Add WB truck climbing lane (Benton Co.)			Climbing Lane		1.1 miles	
Work Activity	2010	2011	2012	2013	2014	Total
Preliminary Engineering	\$0	\$0	\$0	\$0	\$1,887	\$1,887
Project Total	\$0	\$0	\$0	\$0	\$1,887	\$1,887
North 2nd/3rd St Connector from Downtown Memphis to I-40/SR-300 (Exit 3)/Construct new roadway			Corridor Capacity		4.2 miles	
Work Activity	2010	2011	2012	2013	2014	Total
Right of Way	\$0	\$0	\$0	\$0	\$13,901	\$13,901
Project Total	\$0	\$0	\$0	\$0	\$13,901	\$13,901
I-40 Weigh Station in Haywood County/Lengthen ramps			Ramp/ Interchange		0 miles	
Work Activity	2010	2011	2012	2013	2014	Total
Construction	\$0	\$656	\$0	\$0	\$0	\$656
Preliminary Engineering	\$0	\$67	\$0	\$0	\$0	\$67
Project Total	\$0	\$723	\$0	\$0	\$0	\$723
I-40/SR-76 Interchange/Lengthen ramps			Ramp/ Interchange		0 miles	
Work Activity	2010	2011	2012	2013	2014	Total
Construction	\$1,170	\$0	\$0	\$0	\$0	\$1,170
Preliminary Engineering	\$118	\$0	\$0	\$0	\$0	\$118
Project Total	\$1,288	\$0	\$0	\$0	\$0	\$1,288
I-40/US-45 Bypass & I-40/US-45 Interchanges/Re- construct & add auxiliary lanes			Ramp/ Interchange		0 miles	
Work Activity	2010	2011	2012	2013	2014	Total
Construction	\$0	\$0	\$21,188	\$21,949	\$0	\$43,137
Preliminary Engineering	\$0	\$4,002	\$0	\$0	\$0	\$4,002
Project Total	\$0	\$4,002	\$21,188	\$21,949	\$0	\$47,139
US-412 (Hollywood Dr) from I-40 to Miller Dr/Widen to 5 lanes			Ramp/ Interchange		1.4 miles	
Work Activity	2010	2011	2012	2013	2014	Total
Construction	\$7,082	\$0	\$0	\$0	\$0	\$7,082
Project Total	\$7,082	\$0	\$0	\$0	\$0	\$7,082

**Table 3-16: FY 2010-2014 Corridor Implementation Plan for TDOT Region 4 (Cont.)
(Year-Of-Expenditure Dollars in Thousands)**

I-40 from Germantown (Exit 18) to SR-59 (Exit 35)/ Widen to 6 lanes		Roadway Capacity				17.4 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Construction	\$0	\$23,344	\$24,182	\$42,943	\$44,485	\$134,953	
Preliminary Engineering	\$4,292	\$5,558	\$5,758	\$0	\$0	\$15,608	
Project Total	\$4,292	\$28,902	\$29,940	\$42,943	\$44,485	\$150,561	
I-40 from SR-300 (Exit 3) to Sycamore View Rd (Exit 12)/ Widen to 8 lanes		Roadway Capacity				8.5 miles	
Work Activity	2010	2011	2012	2013	2014	Total	
Preliminary Engineering	\$0	\$0	\$0	\$5,964	\$5,433	\$11,398	
Project Total	\$0	\$0	\$0	\$5,964	\$5,433	\$11,398	
Grand Total		\$12,662	\$33,627	\$51,128	\$70,856	\$65,706	\$233,979

**Table 3-17: FY 2015-2019 Corridor Implementation Plan for TDOT Region 4
(Year-Of-Expenditure Dollars in Thousands)**

I-40 near MP 133/Add WB truck climbing lane (Benton Co.)		Climbing Lane				1.1 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$9,301	\$15,912	\$0	\$0	\$0	\$25,213	
Right of Way	\$3,996	\$0	\$0	\$0	\$0	\$3,996	
Project Total	\$13,297	\$15,912	\$0	\$0	\$0	\$29,209	
North 2nd/3rd St Connector from Downtown Memphis to I-40/SR-300 (Exit 3)/Construct new roadway		Corridor Capacity				4.2 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$0	\$25,691	\$26,612	\$0	\$0	\$52,303	
Right of Way	\$14,400	\$0	\$0	\$0	\$0	\$14,400	
Project Total	\$14,400	\$25,691	\$26,612	\$0	\$0	\$66,703	
I-40 from Germantown (Exit 18) to SR-59 (Exit 35)/ Widen to 6 lanes		Roadway Capacity				17.4 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$46,082	\$0	\$0	\$0	\$0	\$46,082	
Project Total	\$46,082	\$0	\$0	\$0	\$0	\$46,082	
I-40 from Lower Brownsville Rd (Exit 74) to SR- 152 (Exit 93)/ Widen to 6 lanes		Roadway Capacity				19 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$0	\$0	\$0	\$35,573	\$36,850	\$72,423	
Preliminary Engineering	\$0	\$0	\$10,989	\$0	\$0	\$10,989	
Project Total	\$0	\$0	\$10,989	\$35,573	\$36,850	\$83,412	
I-40 from SR-300 (Exit 3) to Sycamore View Rd (Exit 12)/ Widen to 8 lanes		Roadway Capacity				8.5 miles	
Work Activity	2015	2016	2017	2018	2019	Total	
Construction	\$0	\$0	\$43,025	\$44,573	\$46,173	\$133,771	
Right of Way	\$11,520	\$10,814	\$0	\$0	\$0	\$22,334	
Project Total	\$11,520	\$10,814	\$43,025	\$44,573	\$46,173	\$156,105	
Grand Total	\$85,299	\$52,417	\$80,626	\$80,146	\$83,023	\$381,511	

**Table 3-18: FY 2020-2029 Corridor Implementation Plan for TDOT Region 4
(Year-Of-Expenditure Dollars in Thousands)**

New Mississippi River Crossing north of existing I-40/ Construct new bridge							Corridor Capacity				0 miles
Work Activity	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
Construction	\$0	\$0	\$0	\$0	\$0	\$0	\$268,866	\$278,518	\$288,517	\$298,875	\$1,134,776
Preliminary Engineering	\$0	\$0	\$0	\$0	\$26,374	\$27,321	\$0	\$0	\$0	\$0	\$53,695
Project Total	\$0	\$0	\$0	\$0	\$26,374	\$27,321	\$268,866	\$278,518	\$288,517	\$298,875	\$1,188,471
I-40 from Lower Brownsville Rd (Exit 74) to SR-152 (Exit 93)/ Widen to 6 lanes							Roadway Capacity				19 miles
Work Activity	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
Construction	\$38,173	\$0	\$36,047	\$37,341	\$0	\$41,892	\$43,396	\$44,954	\$0	\$0	\$241,803
Preliminary Engineering	\$0	\$7,909	\$0	\$0	\$12,308	\$0	\$0	\$0	\$0	\$0	\$20,217
Project Total	\$38,173	\$7,909	\$36,047	\$37,341	\$12,308	\$41,892	\$43,396	\$44,954	\$0	\$0	\$262,020
Grand Total	\$38,173	\$7,909	\$36,047	\$37,341	\$38,682	\$69,213	\$312,262	\$323,472	\$288,517	\$298,875	\$1,450,491

Figure 3-1: I-40/I-81 Corridor Plan for TDOT Region 1

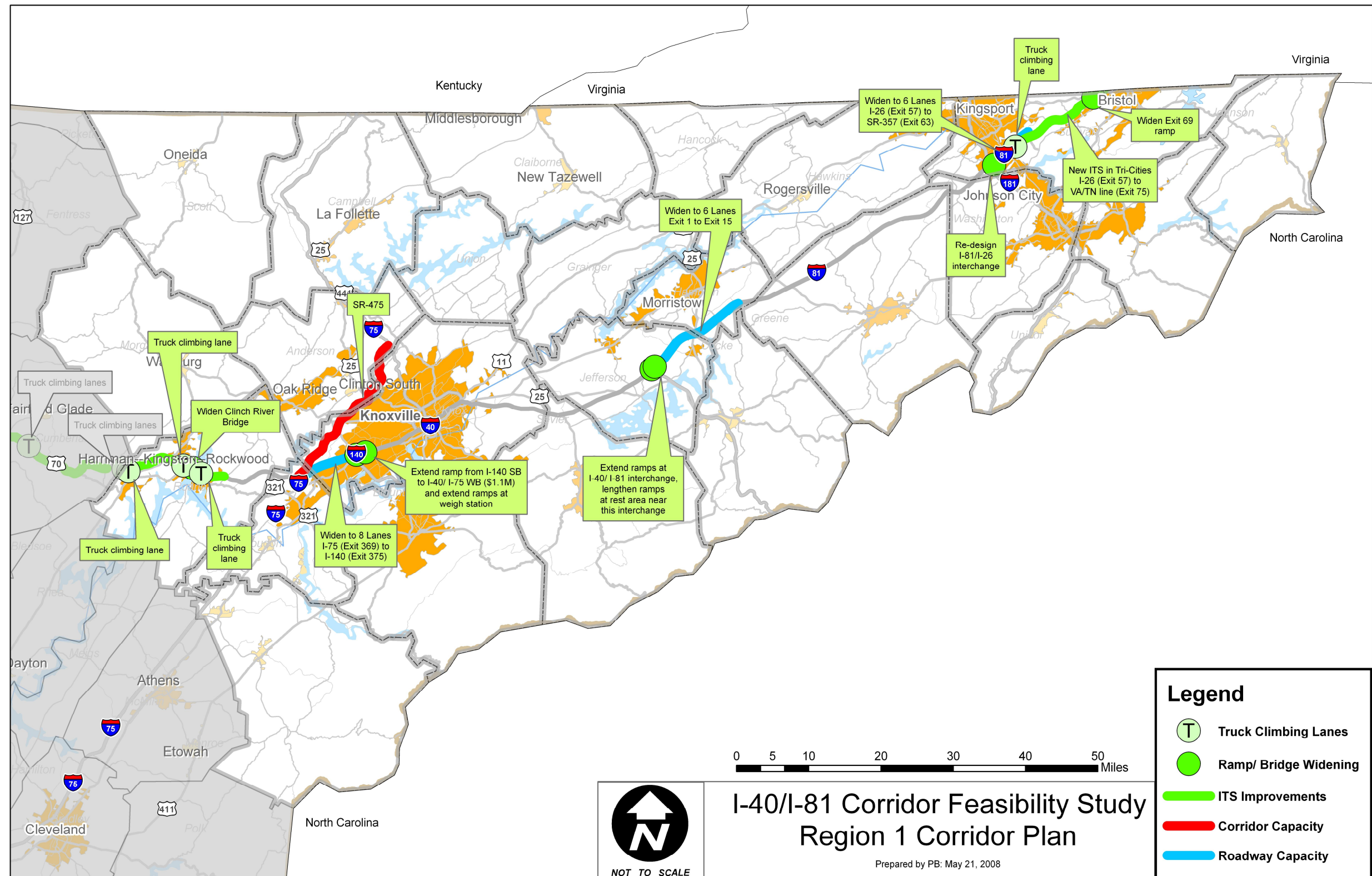


Figure 3-2: I-40/I-81 Corridor Plan for TDOT Region 2

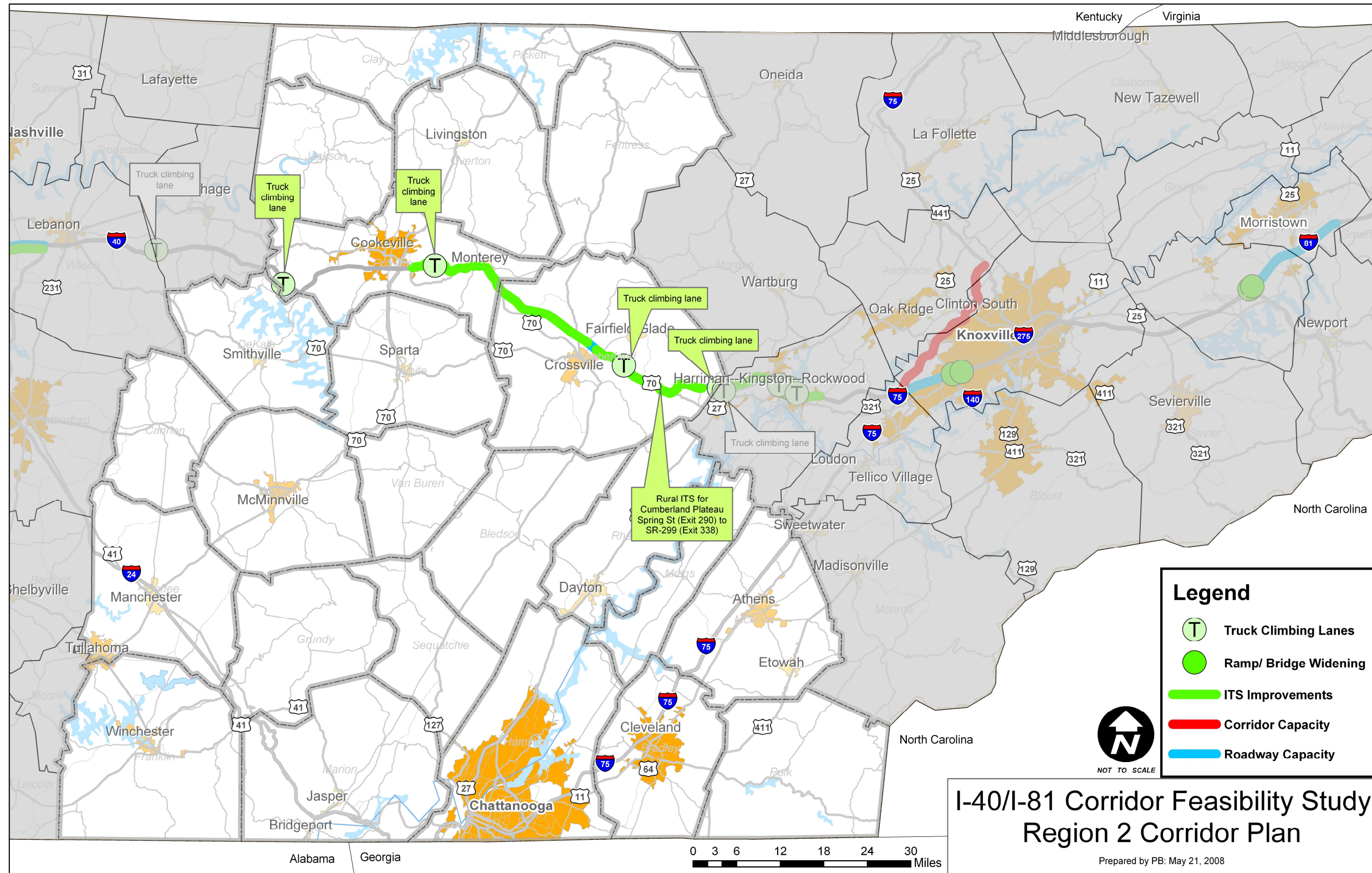


Figure 3-3: I-40/I-81 Corridor Plan for TDOT Region 3

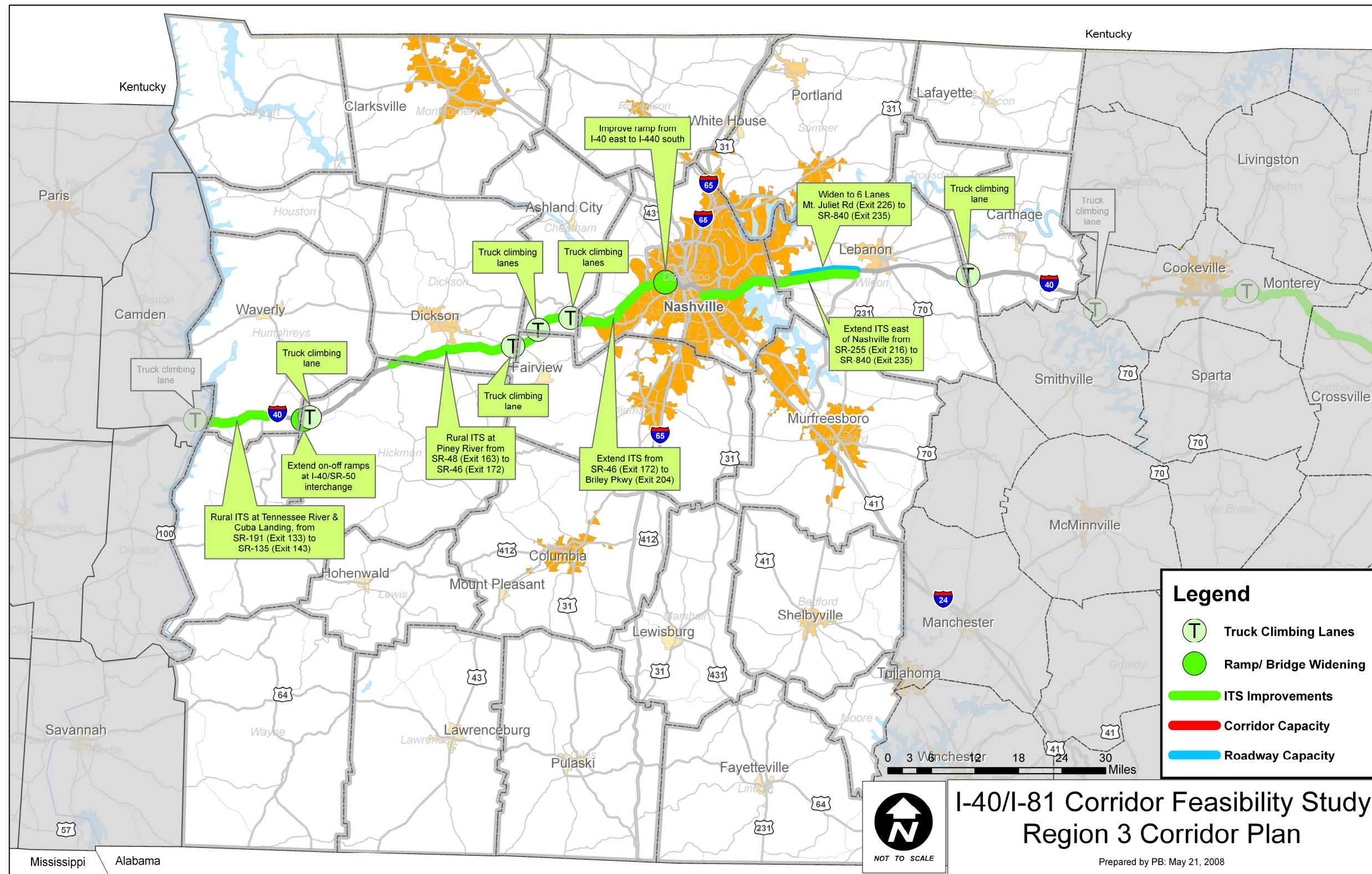


Figure 3-4: I-40/I-81 Corridor Plan for TDOT Region 4

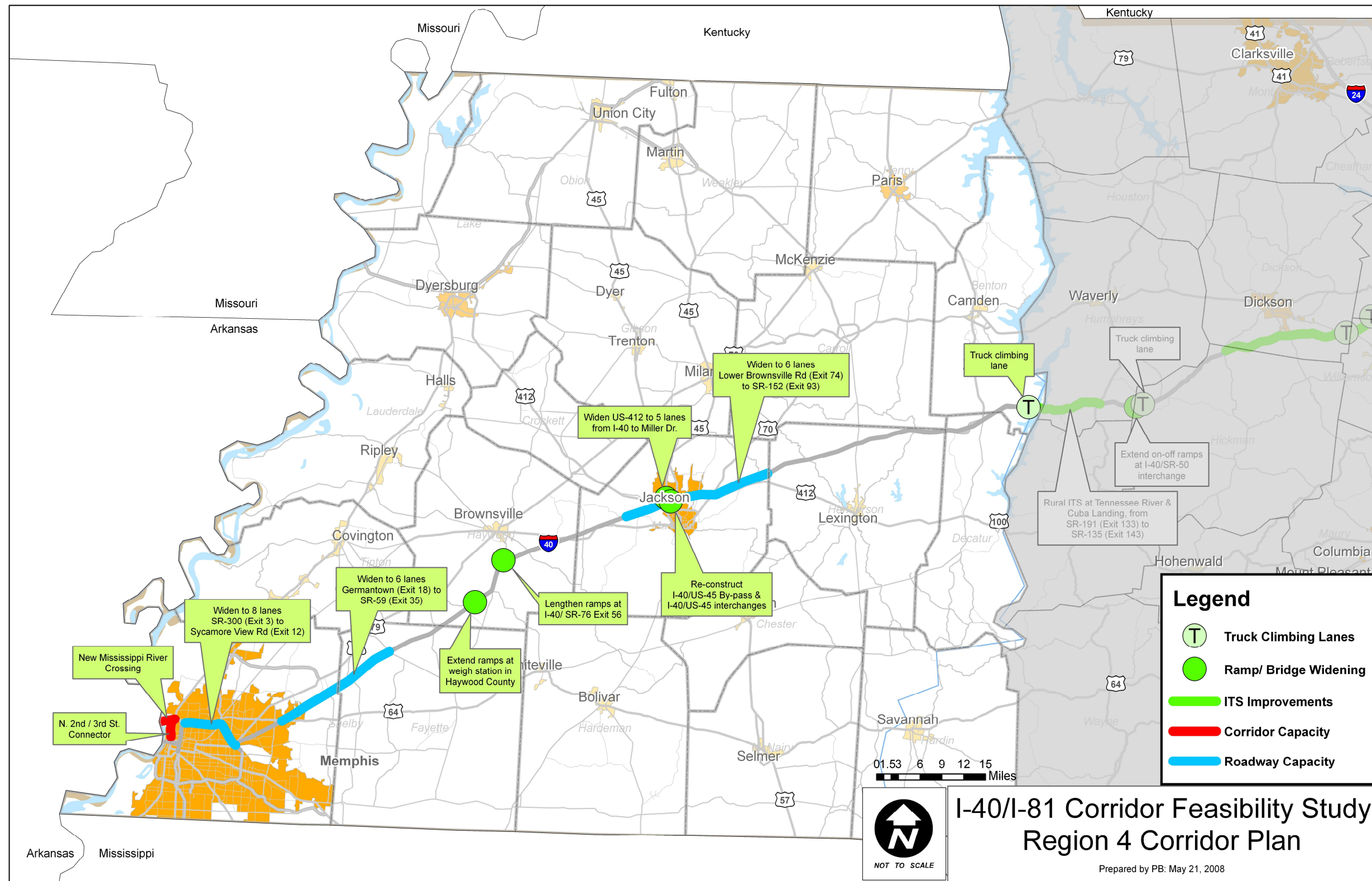
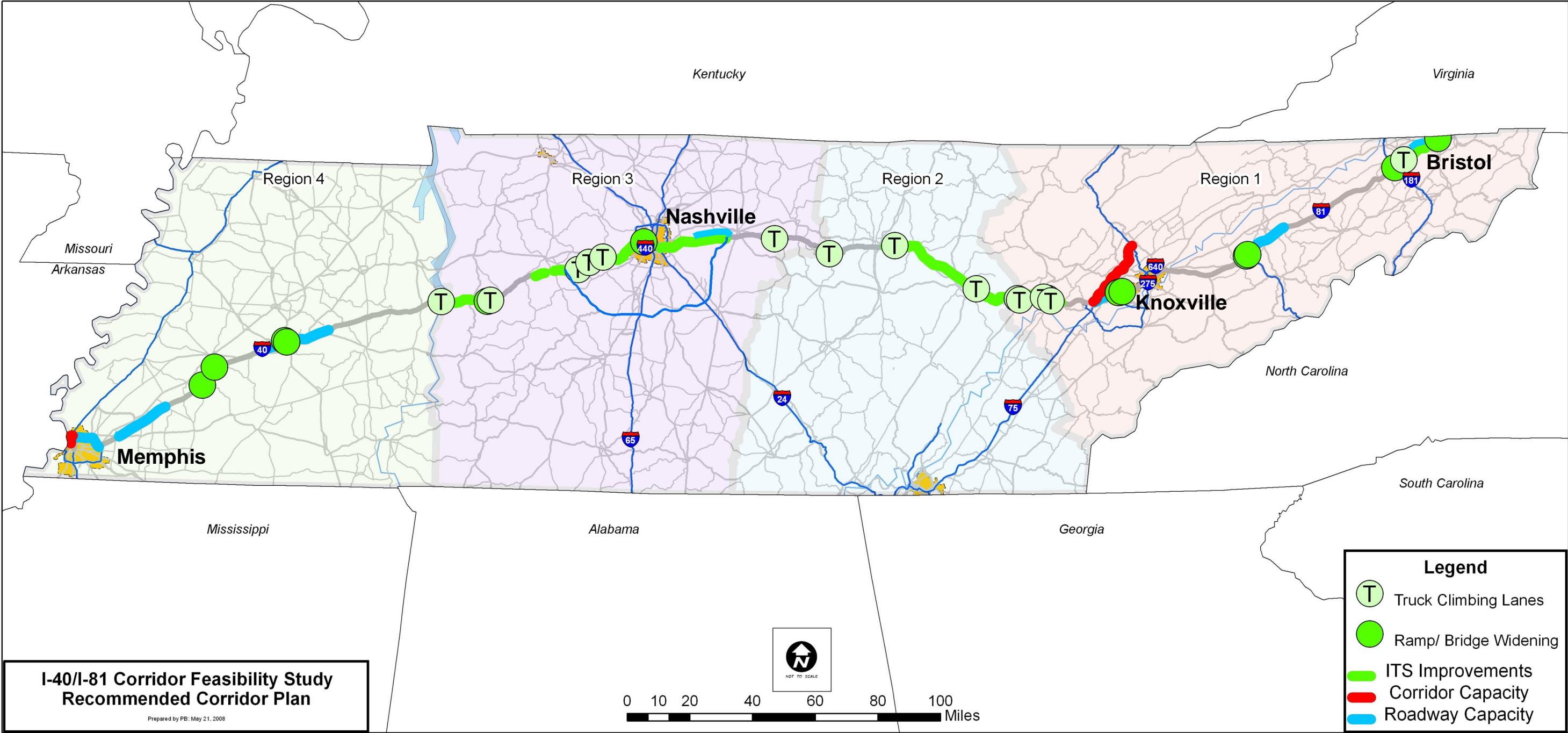


Figure 3-5: I-40/I-81 Corridor Plan



3.5 Rail-Focused Solutions

The following rail-focused solutions were assessed in the I-40/I-81 corridor study:

- The Trans-Tennessee Rail Corridor
- Norfolk Southern Crescent Corridor

3.5.1 Trans-Tennessee Rail Corridor

The Trans-Tennessee Rail corridor is described in the *Tennessee Rail System Plan* as the redevelopment of a rail line connecting Crossville and Cookeville and improvements to the existing rail line across Tennessee that would allow the heaviest class of rail cars to be used. This would enable rail to travel east to west through the state of Tennessee and provide a direct rail line from Knoxville to Nashville. The alignment is shown in the context of a multi-state rail system as a dashed green and red line in **Figure 3-6**.

The B/C ratio for the Trans-Tennessee Rail Corridor is 0.1 based on cumulative net benefits accruing through 2030 and a total estimated cost of about \$1.36 billion. **This estimate includes only the benefits occurring along the I-40/I-81 corridor and excludes regional benefits or benefits to local highways.** The estimated B/C ratio includes the economic benefits from implementation of the Trans-Tennessee Corridor identified in *An Evaluation of Tennessee Rail Plan's Treatment of a Trans-Tennessee Rail Routing*.

3.5.2 Crescent Corridor

The Crescent Corridor is a package of rail improvements planned by the Norfolk Southern Railroad on their existing rail lines spanning from New Jersey to Memphis and New Orleans. **Figure 3-7** shows the rail lines that constitute the Crescent Corridor and the locations of route improvements on the lines. The Crescent Corridor is being aggressively marketed and implemented by Norfolk Southern as a means to increase its revenue and market share in the region. It is based on the premise that long-haul intermodal services along I-20, I-40, I-75, I-85 and I-81 corridors are largely undeveloped and that many of these highways are congested. Both intermodal shippers and motor carriers have expressed interest in developing services in this corridor.

Norfolk Southern expects to deliver high quality services in the corridor that are competitive with single driver transit times when the Crescent Corridor is fully funded and developed. As examples, Norfolk Southern is proposing target train schedules of about 30 hours between Memphis-Harrisburg and Knoxville-New Jersey, and about 43 hours for Memphis-Philadelphia. Once fully implemented, the Crescent Corridor will require 28 dedicated intermodal trains on the Norfolk Southern network in the region.

Norfolk Southern is seeking a portion of this work to be funded by public investment based on improvements for the general public such as increased safety, reduced highway maintenance and expansion requirements, environmental benefits (emissions, land use, fuel consumption) and economic development. Investments in the corridor are scheduled to begin in 2008. The first new or improved services will be rolled out in 2009. The entire network is scheduled to be complete by 2013, but is dependent on the availability of investment funds to direct to the project.

The B/C ratio estimated for the Crescent Corridor is 5.0 based on cumulative net benefits accruing along the I-40/I-81 corridor within the State of Tennessee through 2030 and a total

estimated cost of about \$2 billion for improvements both in and out of the state. The positive B/C ratio for Tennessee for the overall corridor program warrants further analysis of planned Norfolk Southern improvements within the state.

Figure 3-6: Schematic of Existing Rail Lines in Tennessee and Eastern United States

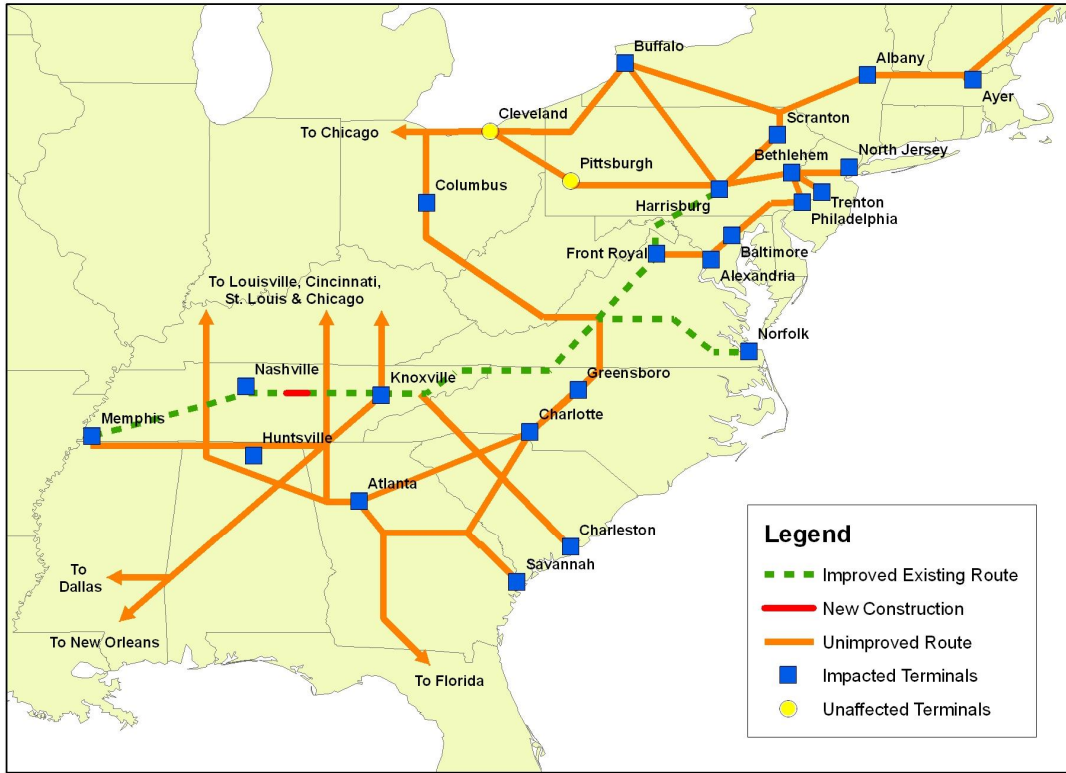
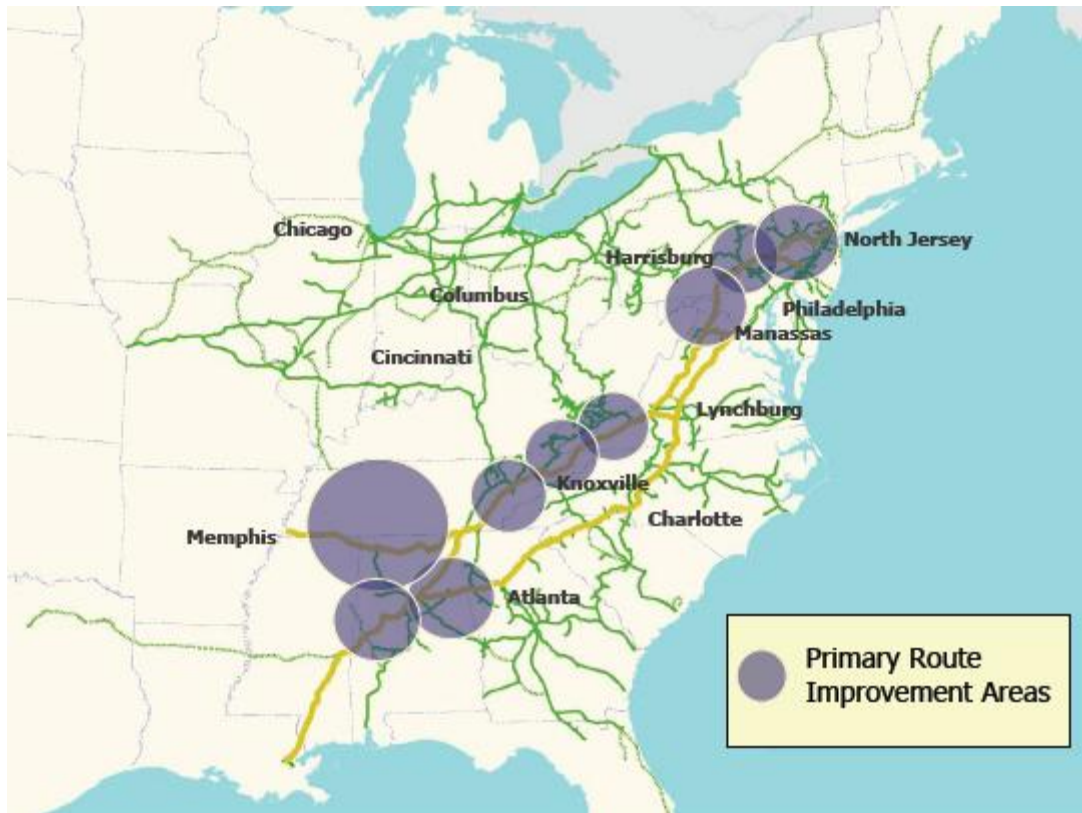


Figure 3-7: Norfolk Southern Crescent Corridor and Proposed Rail Improvements



4.0 IMPROVEMENT STRATEGIES

This chapter highlights strategies and future activities to be considered by TDOT, MPOs, TPOs and RPOs to address capacity, safety, and operations issues along the I-40/I-81 corridor.

4.1 Freight Movement

4.1.1 Collaboration with Norfolk Southern on the Crescent Corridor

As discussed in Chapter 3, planned improvements by Norfolk Southern to the Crescent Corridor appear to be one strategy for accommodating Tennessee's increasing freight traffic, particularly in the I-40/I-81 corridor. TDOT should continue to work with Norfolk Southern to analyze whether there are adequate public benefits for the state to consider assisting with improvements proposed for the Crescent Corridor. Although TDOT currently provides annual grants to short-line rail operators, the department does not have a similar program for Class I railroads in the state. TDOT's 2005 Long Range Transportation Plan recommended funding for an expanded railroad grant program which could be used to implement cost-effective rail improvements identified along the Crescent Corridor.

4.1.2 Truck Parking Issues

Based on interviews conducted in 2007 with representatives of the Tennessee Highway Patrol (THP) and the Commercial Vehicle Enforcement office of the Tennessee Department of Safety, truck parking is an issue along the entire I-40/I-81 corridor. Because there are not enough parking spots at truck stops, drivers stop along the side of the interstate, particularly along ramps, and park in other lots overnight. This problem is not unique to Tennessee as many states are facing inadequate locations for truck drivers to park at night.

Interviews with THP personnel identified the following locations along I-40 as having truck parking problems:

- Between Exit 68 just west of Jackson and Exit 143 east of the Tennessee River/Cuba Landing. Rest areas located in this 70-mile section of I-40 need to be studied for ways to accommodate more trucks.
- Improper truck parking on ramps at the following exits between Dickson and Lebanon – 163, 172, 176, 188, 232, 238 and 245. The rest areas near Exits 172 and 226 need more parking for trucks at night.
- Along the Cumberland Plateau, with a need to re-design the existing rest areas to accommodate larger trucks.
- Improper truck parking on ramps at Exit 412 (between Knoxville and Morristown) and a need for more truck parking at the rest areas near the I-40/I-81 interchange.

Truck parking has been identified as deficient in several states across the country. In 2002, the FHWA released a report entitled *Inadequacy of Truck Parking*. This report developed estimates for the supply and demand of truck parking spaces at both rest areas and truck-stops for each state. The report also identified a formula to estimate the amount of truck parking spaces required for a corridor or in a region based on truck vehicle miles traveled and the split of short-haul trucks and long-haul trucks. For Tennessee, the report estimates that the truck parking space demand exceeded the supply at rest areas but not for truck-

stops (Table 4-1). At rest areas, demand exceeded supply by 447 spaces or 37 percent. At truck-stops, supply exceeded demand by 2,346 spaces or 58 percent in 2000.

Table 4-1: Supply and Demand for Truck Parking Spaces in Tennessee, 2000

	Truck-stops	Rest Areas
Truck Parking Demand	4,073	1,214
Truck Parking Supply	6,419	767

For the I-40/I-81 corridor, demand for truck parking spaces can be estimated based on formulas provided by the FHWA as part of this study. The truck parking demand for I-40/I-81 is estimated to be 5,940 for truck-stops and 394 for rest areas in 2011. This represents 60 percent of the projected statewide total demand for truck-stop parking spaces in 2011 and 33 percent of the projected statewide total demand for rest areas in 2011 assuming a 4 percent annual increase in demand. An inventory of truck parking supply along I-40/I-81 would be needed to determine the existence and nature of any imbalance in terms of truck parking demand and supply along the corridor. The information collected during the interviews regarding truck parking indicate that even if there is sufficient truck-stop parking at the statewide and corridor level, there could still be deficiencies along the corridor where parking demand exceeds supply. For rest areas, 14 of the total 32 rest area locations in Tennessee are located along I-40 or I-81. This is roughly 44 percent of the total rest areas in the state, slightly above the 33 percent of the rest area demand that occurs on I-40/I-81.

4.2 Feasibility of Converting Existing I-40 HOV Lanes to HOT Lanes

4.2.1 Background on HOV Lanes along I-40 in Memphis and Nashville

TDOT supports the development and operation of HOV lanes (one type of managed lanes) which meet the goal of maximizing people-moving capability of the highway system while mitigating transportation-related pollution. HOV lanes were implemented along I-40 in Nashville and Memphis in May 2002.

TDOT defines a “successful” HOV facility as a lane that carries at least the same number of persons in fewer vehicles than the adjacent non-HOV lanes, based on the purpose of an HOV lane to encourage ridesharing and the use of mass transit. TDOT has set a target (vehicles to persons) for an HOV facility of 800 vehicles transporting 1600 persons, which requires at least two persons per vehicle. The department considers 1600 persons per hour as the number which would be carried in a non-HOV lane at capacity (level-of-service E).

In Task 2, use of the I-40 HOV lanes was analyzed based on data collected in 2005 by TDOT. The I-40 HOV facility in Memphis was clearly shown as providing a level of benefits that generates a reasonably good volume of HOVs. However, the level of violations along all portions of I-40 where HOV data had been collected was concerning. The compliance rates ranged from 38 to 52 percent in both Memphis and Nashville, placing these projects among the ten most serious for enforcement breaches from more than 120 projects across the country. The HOV lane vehicle-carrying capacity appeared capped by the number of violators (i.e., the mix of eligible and ineligible users equals the same vehicle flow as

adjacent lanes). A more aggressive enforcement program to address this shortcoming and divert violators could inadvertently create level of service E or worse in the remaining lanes, thus triggering TDOT's procedures to reassess HOV lane viability.

The amount of HOV use is directly related to the adjacent roadway level of service being experienced, in which higher levels of HOV use are found where travel time savings potential exists, and a lower proportionate level of use is observed where no benefit seems to exist. The lack of speed data made this observation difficult to confirm with certainty for I-40 HOV facilities in Memphis and Nashville. Some HOV segments such as I-40 in Wilson County reflected a level of HOV use of the dedicated lanes between 27 and 39 percent of "before" volumes. Because it appeared that a significant number of multi-occupant vehicles are still traveling in the general purpose lanes, this portion of the I-40 HOV lane in the Nashville region is likely not providing meaningful travel time savings.

4.2.2 Definition of Managed Lanes

In Task 3, the feasibility of implementing managed lanes in urban areas along the I-40/I-81 corridor where traffic volumes of all modes and freeway congestion are greatest – in the greater Memphis, Nashville and Knoxville areas – was assessed. Managed lanes can consist of high occupancy vehicle (HOV) lanes, high occupancy toll (HOT) lanes, truck-only lanes (TOL) or truck-only toll (TOT) lanes, express lanes, toll facilities and combinations thereof that have as a common goal the intent of using pro-active traffic management strategies to preserve a high operational efficiency and mobility in the managed lanes, thereby promoting the noted benefits in the definition. Most commonly, managed lanes are a single directional lane adjacent to the general purpose lanes. Managed lanes may operate full time or part-time, reverting to a general purpose lane outside peak demand periods. **All managed lane concepts only make sense where congestion is present in order to provide the desired benefits.** Thus, managed lanes typically are considered when other strategies to address congestion through capacity expansion and other transportation demand management (TDM) strategies are not expected to reduce existing or forecast congestion.

4.2.3 Application of Managed Lanes Evaluation

The assessment of managed lanes feasibility in the I-40/I-81 corridor study in Task 3 was performed at a high level because of the extensive corridor length, data availability and the desire to examine deficiencies in both a short- and long-range context.

Two primary forms of data were considered: 1) current and forecast traffic conditions (primarily congestion) and 2) physical corridor attributes.

Specific demand for both general traffic and target users—HOVs, long distance commuters, intra- or interstate trips and trucks—could not be easily assessed, at least for peak periods. But current levels of use of HOV lanes in Memphis and Nashville suggest attaining moderate thresholds for HOVs in the future as these corridors presently have volumes comparable to national averages for similar-type corridors. Along I-40 segments in Memphis and Nashville, the HOV volumes are within the managed lane capacity thresholds of 1500 vehicles/hour to permit single-occupant vehicles to "buy-in" to the HOV lanes, without causing major speed reductions or a loss of mobility in these lanes. HOT volumes typically mirror HOV demand and may be even higher because of a larger pool of potential users which include HOVs and commuters who are willing to pay. Recent technological advancements to control HOT-lane tolling and enforcement electronically, such as the HOT

lanes implemented on I-395 in Minneapolis, Minnesota, may make conversion of I-40 lanes in Memphis and Nashville from HOV to HOT possible even where there is no permanent barrier to control HOT lane use. For the current HOV lanes in Nashville and Memphis, electronic enforcement could provide adequate control of HOT lane use, negating the need to construct costly enforcement areas where the corridor is narrow.

4.2.4 Re-assessment of Current Operations of I-40 HOV Lanes

Public perceptions of accepted HOV violation levels may not be as critical in settings where benefits, in terms of travel time savings, are marginalized. Typically, such savings should generate five minutes of travel time savings between the HOV and general purpose lanes for individual trips during peak commute periods. The HOV lanes in Memphis and Nashville do not meet this threshold for all operation periods or all segments of the current projects. For this reason, HOV projects experiencing enforcement breaches similar to I-40 in Nashville and Memphis have continued to function because they provide some modest level of benefit to HOVs and are not usually political targets to be converted to general purpose lanes as long as the remaining lanes generally operate below capacity. This dynamic can change if corridor congestion is worsening and noticeable, and police are not able to adequately enforce. Pro-active policies and operational changes are desirable to address such project shortcomings prior to becoming politicized.

Long-range needs suggest dedicated lane treatments that serve HOVs and perhaps other users are appropriate because congestion is projected to extend over longer segments of the urban and exurban portions of I-40 surrounding Memphis and Nashville. The ability to meet demand will be challenging due to limited available rights-of-way, available route options, and funding availability. Better management of existing HOV lanes and whatever roadway capacity can be added will be critical to preserving mobility and offering various travelers choices during periods of greatest demand.

4.2.5 Action Steps in Analyzing I-40 HOV Lane Conversion to HOT Lanes

Potential work activities to support I-40 HOV lane conversion to HOT lanes include:

- **Forecast the demand for I-40 HOT lanes in Memphis and Nashville.** This activity involves determining the amount of excess capacity which is available on the HOV lanes for pricing. Specific assumptions would be established to maximize capacity while retaining the same design and access provided under current I-40 HOV operations.
- **Identify and develop I-40 HOT lanes issues.** Based on I-40 design attributes in Memphis and Nashville, issues and relative impacts would be identified for different payment approaches, such as a monthly sticker program (subscription) or electronic toll collection. Issues warranting study would be comprehensive covering physical, operational, technology, back office and institutional. Legal issues, including tolling authority for existing interstates, would be identified and provided to TDOT's Legal Division for consideration.
- **Evaluate operational impacts.** Peak hour traffic conditions would be simulated at locations along the current I-40 HOV corridors in Memphis or Nashville where increased traffic volumes could adversely impact either the proposed HOT lanes or adjacent general purpose traffic lanes. The objective of this task is to achieve the best balance of demand to capacity without significantly altering the design of the current HOV lanes in the two cities. Potential improvement strategies could involve lengthening of project

limits, re-striping of lanes and shoulders, restricting access, or other actions to address impacts.

- **Prepare Concept of Operations Report.** The Concept of Operations (ConOps) plan would outline the physical, operational, enforcement and administrative requirements for HOT lane implementation along I-40 in Memphis and/or Nashville. The ConOps plan will not include specific legislative actions or organizational arrangements that must be executed for HOT lane implementation to occur, but will outline topics to be reviewed by TDOT's Legal Division.
- **Estimate Implementation and Operations Costs.** Capital costs associated with modifying the current HOV lanes in Memphis and Nashville to incorporate lane pricing will be estimated for up to three pricing scenarios to understand the cost impacts of different conversion approaches. This task also includes estimating annual operation and maintenance (O&M) expenses for up to three pricing scenarios. The basis for costs will come from national experience for similar projects, adjusted to reflect Tennessee conditions.
- **Recommend pricing strategy(s).** One or more pricing strategies will be identified for testing through a toll optimization procedure. The purpose of developing alternative pricing strategies is to find the best balance between an approach which maximizes revenues, preserves travel benefits and is easily understandable for potential users. Potential pricing strategies include dynamic, distance-based, time-based and flat tolls or potential combinations thereof which could be implemented in phases. This work activity identifies how each concept would work, typical prices for trips of varying lengths, and how the variable price information would be communicated to the consumer at a concept level.
- **Funding and financial feasibility.** HOT lane demand and revenue forecasts would be estimated for conversion of the HOV lanes in Memphis and Nashville. These estimates will be used to evaluate the adequacy of planned funding sources in converting the existing I-40 HOV lanes for tolling. A comprehensive cash flow analysis will match revenue/funding sources and financing with capital costs and ongoing O&M expenses to identify gaps, if any, in the project's financial plan that will need to be supplemented from other sources.
- **Determine public attitudes toward converting I-40 HOV lanes to HOT lanes and develop a public outreach approach to address concerns and issues.** Use stakeholder interviews, focus groups and media outreach to discover public reaction to HOV lane conversion in both Memphis and Nashville. Based on survey results, develop an education plan that outlines messages and strategies to address issues that could adversely affect project implementation, such as tolling policy and equity, disposition of net revenues, impacts to HOV patrons and any specific impacts to communities located along the I-40 corridor in the two cities.

4.3 Active Traffic Management

In addition to enhancing the use of managed lanes in the Memphis and Nashville urban areas and expanding TDOT's ITS network along the corridor, other operational solutions to address recurring and non-recurring congestion along I-40 and I-81 warrant further study.

Active Traffic Management (ATM) involves a freeway managing itself with limited human intervention except for major incidents. ATM strategies are highly responsive to changing traffic conditions such that minor incidents and bottlenecks are not permitted to create situations where uncontrolled queues form which adversely impact traffic flow and create secondary accidents. Because the overall benefits of these approaches are widely known outside of the United States, the Federal Highway Administration (FHWA) and AASHTO are interested in applying ATM strategies in this country. ATM benefits demonstrated in other countries include:

- Increase in average traffic throughput from 3 to 7 percent
- Overall increase in freeway capacity from 3 to 22 percent
- Decrease in primary accidents between 3 and 30 percent
- Reduction in secondary accidents between 40 and 50 percent
- Improved vehicle speeds
- More uniform motorist behavior
- Increased trip reliability
- Delays the beginning of freeway breakdowns

In urban areas, ATM strategies such as dynamic speed controls, queue warnings, temporary use of hard-shoulder running in peak-period conditions, dynamic re-routing where viable alternatives exist and ramp metering maximize the efficiency of the current interstate and reduce crash rates and severity. ATM approaches in rural segments of I-40 and I-81 could involve temporary applications through work zones.

Through the use of planning level screening criteria which help to establish basic data and screening thresholds for each group of ATM strategies, the feasibility for specific ATM approaches along I-40 and I-81 should be undertaken. Because this screening format requires limited data which is normally available, TDOT can quickly test the feasibility of ATM applications along the corridor.

5.0 RECOMMENDED APPROACH

Three approaches are available to TDOT to address corridor deficiencies identified during the I-40/I-81 Corridor Feasibility Study. The following sections summarize each alternative and highlight the elements of the recommended multi-modal approach.

5.1 “Business as Usual” Approach

The department could invest only in those projects along I-40 and I-81 already programmed over the next three years in addition to ongoing interstate maintenance. This approach falls well short of addressing the existing capacity and safety problems along the critical statewide interstate corridor.

5.2 Significant Roadway Investment Approach

To provide additional highway capacity along the corridor, TDOT could widen all existing four-lane sections of I-40 and I-81 to six lanes (approximately 373 miles). Estimated construction cost for this approach is nearly \$4.5 billion (**2008 dollars**). This cost estimate assumes all widening is completed in the near-term rather than reflecting a construction period extending over several decades. Additional long-term highway maintenance costs will result from widening the entire corridor to a minimum of six lanes. The capital cost, even expressed in 2008 dollars, expected maintenance expenses for the widened highway and the likely environmental impacts associated with this approach are significant.

5.3 Multi-Modal Approach

The recommended multi-modal approach for improving conditions along I-40 and I-81 is summarized in the following sections.

5.3.1 Cost-Effective Widening of Existing I-40 and I-81

Approximately 82 miles of the corridor should be widened based on the results of the B/C analysis conducted in Task 3, Multi-Modal Solutions, and Task 4, Project Priorities – A Corridor Plan, for the planning year of 2030. The improvements would be implemented based on B/C ratios estimated for the interim years of 2015 and 2020. The estimated cost for widening the following sections of I-40 and I-81 is \$900 million in 2008 dollars or \$1.48 billion in year-of-expenditure dollars:

- 9 miles of I-40 to 8 lanes in Memphis
- 17 miles of I-40 to 6 lanes east of Memphis
- 19 miles of I-40 to 6 lanes in Jackson
- 9 miles of I-40 to 6 lanes between Nashville and Lebanon
- 7 miles of I-40/I-75 to 8 lanes west of Knoxville
- 15 miles of I-81 to 6 lanes near Morristown
- 6 miles of I-81 to 6 lanes in Tri-Cities

5.3.2 Improvements that Provide an Alternative to Traveling I-40 or I-81

Based on a comparison of the benefits of building the following three solutions to their costs, which are estimated at \$1.3 billion (2008 dollars) or \$2.1 billion (year-of-expenditure costs), the following proposed improvements would provide a cost-effective alternative to using I-40 and I-81:

- New crossing of Mississippi River in Memphis
- North 2nd/ 3rd Street Connector, also in Memphis
- Knoxville Parkway (SR-475) in Knoxville

5.3.3 New and Expanded ITS Installations

Over 136 miles of additional coverage for TDOT's existing Intelligent Transportation Systems (ITS) and incident management (HELP) programs are recommended based on B/C analysis completed during this study. New installations, at an estimated capital/equipment cost and ongoing operating expenses of \$41 million (year-of-expenditure dollars), are proposed along:

- 10 miles of I-40 at the Tennessee River Bridge/Cuba Landing
- 9 miles of I-40 at the Piney River Bridge south of Dickson
- 51 miles of I-40 located both east and west of Nashville
- 48 miles of I-40 across the Cumberland Plateau
- 18 miles of I-81 in Tri-Cities

5.3.4 Interchange, Ramp and Bridge Improvements

Operational solutions at 13 locations along I-40 and I-81 are recommended to address specific congestion or safety issues. These improvements, summarized in **Table 3-5**, were identified using information provided in interviews with representatives of the Tennessee Highway Patrol and local transportation officials. The proposed improvements, at an estimated cost of \$110 million in 2008 dollars or \$148 million in year-of-expenditure costs, also are based on highway capacity and accident analyses performed along I-40 and I-81.

5.3.5 Truck Climbing Lanes

In order to address congestion and safety issues associated with trucks traveling up steep grades, construction of truck climbing lanes is recommended at 15 locations on I-40 or I-81 where the added lane provides the greatest benefits. The cost of building improvements at the locations listed in **Table 3-6** is estimated at \$366 million in 2008 dollars or \$480 million in year-of-expenditure dollars.

5.3.6 Strategies and Future Activities

TDOT, MPOs, TPOs and RPOs should consider the following strategies or future activities for the study corridor:

- Assess the public benefits of Norfolk Southern's proposed improvements to the Crescent Corridor within Tennessee as the railroad's plans become better defined. As stated in this study, Norfolk Southern is discussing with governments along the Crescent Corridor what portions of corridor work could be financed through public investment because of improved highway safety, reduced highway maintenance and expansion costs, and environmental benefits associated with diversion of freight from trucks to rail.
- Inventory truck parking supply along I-40/I-81 to determine any imbalances in demand for overnight truck parking.

- Improve the management and enforcement of existing HOV lanes on I-40 in Nashville and Memphis.
- Study the feasibility of specific ATM strategies along I-40 and I-81.

5.3.7 Summary of Recommended Corridor Plan

Table 5-1 summarizes the estimated costs in year-of-expenditure dollars of the recommended I-40/I-81 Corridor Plan by improvement category and implementation timeframe.

Table 5-1: Summary of Recommended Corridor Plan (Year-of-Expenditure Dollars)

Improvement Category	Five Years (2010-2014)	Five Years (2015-2019)	10-Years (2020-2029)	Total (2010-2029)
Widening of Existing I-40/I-81 (Roadway Capacity Solutions)	\$228,176,000	\$303,976,000	\$943,267,000	\$1,475,419,000
Construction of Alternatives to I-40/I-81 (Corridor Capacity Solutions)	\$132,852,000	\$648,314,000	\$1,316,732,000	\$2,097,898,000
Truck Climbing Lanes	\$127,296,000	\$336,868,000	\$16,072,000	\$480,236,000
Interchange, Ramp & Bridge Improvements	\$75,673,000	\$0	\$72,267,000	\$147,940,000
Expanded ITS/HELP Programs	\$11,397,000	\$10,505,000	\$19,067,000	\$40,969,000
TOTAL	\$575,394,000	\$1,299,663,000	\$2,367,405,000	\$4,242,462,000

NOTE: Cost estimates are year-of-expenditure dollars using an average annual 3.6 percent cost escalation based on *Engineering News-Record* construction cost index.