Interstate 65 Multimodal Corridor Study

Final Report

2018

Prepared for the Tennessee Department of Transportation by:

GRESHAM SMITH AND PARTNERS




THE FIRST-EVER
LEXUS
Hiller 292-6110
MACK

Table of Contents

Executive Summary 1
1. Introduction 1
2. Existing Conditions and Trends 3
3. Existing Deficiencies and Future Needs 5
4. Multimodal Solutions and Project Priorities 5
Section A: Corridor Data and Information Inventory 25
1. Introduction 25
1.1 Purpose of Corridor Data and Information Inventory 25
2. Previous and Current Plans and Studies 27
3. Existing Data and Information 28
3.1 Transportation Capacity, Travel Demand, and Congestion 28
3.2 System Operations and Maintenance 28
3.3 Multimodal Facilities and Services 31
3.4 Safety and Security 37
3.5 Freight Data and Models 40
3.6 Economic Access 41
4. Future Projections 52
4.1 Economic and Population Growth 52
4.2 Planned Transportation Projects 52
Section B: Assessment of Existing Deficiencies and Future Needs 61
1. Introduction 61
1.1 Defining the Trend Scenario 61
2. Land Use and Economic Development 63
2.1 Population and Employment Projections 63
2.2 Planned and Proposed Development 63
2.3 Existing and Future Opportunities and Challenges 67
3. Highway Capacity and Travel Demand 68
3.1 Traffic Volumes and Projections 68
3.2 Travel Patterns 68
3.3 Volume-to-Capacity Ratios 71
3.4 Bottlenecks 78
3.5 Travel Time and Delay 80
3.6 Existing Deficiencies and Future Needs 82

4. Safety 84
4.1 Crash Analysis 84
4.2 Existing Deficiencies and Future Needs 94
5. Operations and Maintenance 94
5.1 State of Good Repair 94
5.2 Intelligent Transportation Systems 95
5.3 ITS State of the Practice 97
5.4 Existing Deficiencies and Future Needs 100
6. Transit 102
6.1 Existing Transit Service 102
6.2 Access to Activity Centers 103
6.3 Nashville MTA/RTA Strategic Plan: nMotion 103
6.4 Cool Springs Multimodal Transportation Study 105
6.5 Rural Transit Services 105
6.6 Existing Deficiencies and Future Needs 107
7. Walking and Bicycling 107
7.1 State Bicycle Routes 107
7.2 Regional and Local Bicycle and Pedestrian Plans 108
7.3 20-Minute Walking and Bicycling Districts 110
7.4 Existing Deficiencies and Future Needs 110
8. Transportation Demand Management 112
8.1 Vanpools 113
8.2 HOV Lanes 113
8.3 Park-and-Ride Facilities 115
8.4 TDM State of the Practice 116
8.5 Existing Deficiencies and Future Needs 117
9. Freight and Intermodal Facilities 118
9.1 Freight Movement 118
9.2 Inbound/Outbound Freight Demand: 2012 and 2040 118
9.3 Intermodal Facilities: Air, Rail, and Water 120
9.4 Freight Diversion: From Truck to Rail/Water 125
9.5 Truck Parking 128
9.6 Other Emerging Freight Issues 128
9.7 Existing Deficiencies and Future Needs 130
10. Traditionally Underserved Populations 131
10.1 Urban Equity 131
10.2 Rural Equity 132
11. Public and Stakeholder Outreach 133
11.1 Public Workshops 133
11.2 Online Public Comment 135
11.3 Additional Public and Stakeholder Outreach 137

Section C : Goals, Objectives, and Performance Measures 139
1. Introduction 139
2. Study Goals and Objectives 139
3. Performance Measures 141
4. Next Steps 142
Section D: Development of Feasible Multimodal Solutions 143
1. Introduction 143
2. Overview of Existing Deficiencies and Future Needs 143
3. Performance Measures 150
4. Highway Capacity and Safety 151
4.1 Mainline Improvements 151
4.2 Interchange Improvements 163
4.3 High Occupancy Vehicle (HOV) Enforcement Analysis 166
4.4 Parallel Arterials 167
5. Intelligent Transportation Systems 172
5.1 Corridor Wide Solutions 172
5.2 North Sub-Area Solutions 174
5.3 Central Sub-Area Solutions 178
6. Freight 180
6.1 Mainline Improvements 180
6.2 Interchange Improvements 180
6.3 Managed Lanes 183
6.4 Parallel Corridors 184
6.5 Freight Arterial Bottlenecks 188
6.6 Dedicated Freight Corridors 188
6.7 Speed Modifications 189
6.8 Freight Traffic Diversion Strategies 189
6.9 Traffic Management Strategies 190
7. Transit 194
7.1 Transit 194
7.2 Station Area Development and Access 198
8. Walking and Bicycling 200
9. Transportation Demand Management 204
9.1 Regional TDM Program 205
9.2 TDM Marketing and Information Programs 205
9.3 Information and Communication Technologies 205
9.4 Ridesharing System 206
9.5 TDM Performance Measures 206

10. Performance Evaluation 207
10.1 Additional Outreach and Analysis 207
10.2 Public and Stakeholder Outreach 208
10.3 Environmental Constraints and Fatal Flaws 209
11. Recommended Multimodal Solutions 210
Section E: Project Priorities 223
1. Introduction 223
2. Priority Setting and Phasing Tool 224
2.1 Approach and Methodology 224
2.2 Prioritization Criteria and Measures 224
3. Project Rankings 226
3.1 Project Rankings by Mode and Strategy 226
3.2 Key Findings 230
Appendix: Public Workshop Summaries i

Figures

Executive Summary 1

Figure ES-1. I-65 Public Workshop Map 1
Figure ES-2. I-65 Corridor Study Area 2
Figure ES-3. I-65 Deficiencies and Needs: North Sub-Area 6
Figure ES-4. I-65 Deficiencies and Needs: Central Sub-Area 7
Figure ES-5. I-65 Deficiencies and Needs: South Sub-Area 8
Figure ES-6. I-65 Recommended Multimodal Solutions: North Sub-Area 11
Figure ES-7. I-65 Recommended Multimodal Solutions: Central Sub-Area 12
Figure ES-8. I-65 Recommended Multimodal Solutions: South Sub-Area 13

Section A: Corridor Data and Information Inventory 25

Figure 1-1. I-65 Corridor Study Area 26
Figure 3-1. MPO TDM Coverage 29
Figure 3-2. Nashville SmartWay, 2016 32
Figure 3-3. Public Transportation Providers and Routes 33
Figure 3-3b. Public Transportation Providers and Routes – Davidson Co. 34
Figure 3-4. Regional Park & Ride Lots 36
Figure 3-5. Existing State Bicycle Routes 38
Figure 3-6. Planned State Bicycle Routes 39
Figure 3-7. Minority Populations 44
Figure 3-8. Low-Income Populations 45
Figure 3-9. Character Area Map– Nashville Area MPO (North) 47
Figure 3-10. Character Area Map– Nashville Area MPO (Central) 48
Figure 3-11. Character Area Map– Nashville Area MPO (South) 49
Figure 3-12. Wetlands and Historic Data 51
Figure 4-1. Planned Interchange Projects 55
Figure 4-2. Planned Capacity and Reconstruction Projects 56
Figure 4-3. Planned Transit and ITS Projects 57

Section B: Assessment of Existing and Future Deficiencies 61

Figure 2-1. Study Area Map with Sub-Areas 64
Figure 3-1. 2015 Daily Traffic Volumes Along I-65 69
Figure 3-2. Existing Year (2016) Major Trip O-D Pairs 72
Figure 3-3. Existing Year (2016) County-to-County Work Flow 73
Figure 3-4. 2010 Daily V/C & LOS: Interstates 74
Figure 3-5. 2040 Daily V/C & LOS: Interstates 75
Figure 3-6. I-65 Directional Daily and Peak Traffic Analysis 76
Figure 3-7. Spillover Effect – Davidson/Williamson County Line 77
Figure 3-8. Spillover Effect – Spring Hill Area 77
Figure 3-9. Bottlenecks North of Nashville 78
Figure 3-10. Bottlenecks around Nashville 79
Figure 3-11. Bottlenecks South of Nashville 80

Figure 4-1. I-65 Three-Year (2013-2015) Crash Rates 85
Figure 4-2. I-65 Three-Year (2013-2015) Crash Breakdown by Type 87
Figure 4-3. 2013-2015 Crash Breakdown in Segments with High Crash Rates and Congestion 87
Figure 4-4. 2013-2015 Crash Breakdown in Segments with High Crash Rates and No Congestion 87
Figure 4-5. Geometric Deficiencies and Crash Hotspots 89
Figure 4-6. Traffic Increase at Hotspots 90
Figure 4-7. I-65 Number of Lanes at Crash Hotspots 91
Figure 4-8. 2013-2015 Pedestrian and Bicycle Crashes 92
Figure 4-9. 2013-2015 Pedestrian and Bicycle Crashes: Nashville Core 93
Figure 4-10. 2013-2015 Pedestrian and Bicycle Crashes: Williamson County 93
Figure 5-1. I-65 Bridge Conditions 96
Figure 5-2. Congestion Contributors 97
Figure 5-3. Managed Lane Applications 98
Figure 6-1. nMotion Recommended Plan 104
Figure 6-2. Cool Springs Transportation Study Regional Express Bus Recommendations 106
Figure 7-1. Existing and Planned State Bicycle Routes 109
Figure 7-2. Nashville Area MPO: Regional Bikeway Network Vision 111
Figure 8-1. I-65 Hourly Traffic Volumes: Davidson-Williamson County Line 113
Figure 9-1. Percent Difference in Truck Volume from Year 2010 to 2040 119
Figure 9-2. Air, Rail, and Water Facility Locations with V/C Ratio for 2040 124
Figure 9-3. Truck Rest Areas in the Study Area (Public and Private) 129
Figure 11-1. Summary of Priority Preferences 134
Figure 11-2. Word Cloud – Corridor Vision 134
Figure 11-3. Alternative Mode Preferences 136
Figure 11-4. Wikimaps Comments – Breakdown by Category 137
Figure 11-5. Geographic Distribution of Wikimaps Comments 138

Section D: Development of Feasible Multimodal Solutions 143

Figure 2-1. Existing Year (2016) County-to-County Work Flow 146
Figure 2-2. I-65 Deficiencies and Needs: North Sub-Area 147
Figure 2-3. I-65 Deficiencies and Needs: Central Sub-Area 148
Figure 2-4. I-65 Deficiencies and Needs: South Sub-Area 149
Figure 4-1. Mainline Improvements Map: North Sub-Area 155
Figure 4-2. Mainline Improvements Map: Central Sub-Area 156
Figure 4-3. Mainline Improvements Map: South Sub-Area 157
Figure 4-4. Interstate LOS Map (2040 Build) 159
Figure 4-5. 2040 Trend and 2040 Build LOS Comparison 160
Figure 4-6. New I-40/I-65 Interchange Configuration 165
Figure 4-7. HOV Lane Level of Service: Zero Percent Violation 168
Figure 4-8. HOV Lane Level of Service: 20 Percent Violation 169
Figure 4-9. HOV Lane Level of Service: 50 Percent Violation 170
Figure 4-10. Parallel Routes Level of Service (2040 Build) 171
Figure 5-1. ITS Improvements Map: North Sub-Area 175
Figure 5-2. ITS Improvements Map: Central Sub-Area 176

Figure 5-3. ITS Improvements Map: South Sub-Area 177
Figure 6-1. Projected 2040 Interstate Truck Percentages 181
Figure 6-2. Freight Improvements 182
Figure 6-3. Potential Alternative Freight Routes (A-D) 185
Figure 6-4. Potential Alternative Freight Routes (E-H) 186
Figure 6-5. I-65 Study Area Truck Trip Percentage Increase between 2010 and 2040 191
Figure 7-1. Transit Improvements 197
Figure 8-1. Recommended Bicycle and Pedestrian Projects 203
Figure 9-1. Transportation Demand Management Tools 204
Figure 10-1. Percentage Breakdown of Responses 208
Figure 11-1. Recommended Multimodal Solutions: North Sub-Area 220
Figure 11-2. Recommended Multimodal Solutions: Central Sub-Area 221
Figure 11-3. Recommended Multimodal Solutions: South Sub-Area 222

Section E: Project Priorities 223

Figure 3-1. Recommended Multimodal Solutions: North Sub-Area 231
Figure 3-2. Recommended Multimodal Solutions: Central Sub-Area 232
Figure 3-3. Recommended Multimodal Solutions: South Sub-Area 233

Tables

Executive Summary 1

Table ES-1. I-65 Corridor Plans, Programs and Studies 3
Table ES-2. I-65 Corridor County Growth Trends 4
Table ES-3. I-65 Corridor Performance Summary 10
Table ES-4 I-65 Corridor Project Prioritization Criteria 10
Table ES-5. Mainline Improvements: Highway Capacity 14
Table ES-6. Mainline Improvements: Highway Safety 17
Table ES-7. ITS Improvements 18
Table ES-8. Freight Improvements 19
Table ES-9. Transit Improvements 20
Table ES-10. Walking and Bicycling Improvements 21

Section A: Corridor Data and Information Inventory 25

Table 2-1. Previous and Current Plans, Programs, and Studies 27
Table 3-1. ITS Resources on I-65 31
Table 3-2. 2010 Population, Households, and Employment 42
Table 4-1. Population, Households, and Employment (2020, 2030, 2040) 53
Table 4-2. Planned and Programmed Projects 58

Section B: Assessment of Existing and Future Deficiencies 61

Table 1-1. I-65 Corridor Programmed Projects 62
Table 2-1. County Growth Trends 65
Table 2-2. Interchange Areas: Population and Employment, 2010-2040 66
Table 3-1. I-65 Area Daily Trip Breakdown 2010 and 2040 70
Table 3-2. VMT by Functional Class 70
Table 3-3. VHT by Functional Class 81
Table 3-4. VHD by Functional Class 81
Table 3-5. Average Speeds by Functional Class 82
Table 3-6. 2010 and 2040 Travel Time for Key O-D Pairs 82
Table 3-7. 2010 Typical Travel Time and Delay for Key O-D Pairs 83
Table 4-1. I-65 Crash Hotspots Table 86
Table 4-2. Sub-Area Crash Summary for Reported Crashes along I-65 (2013-2015) 86
Table 4-3. Non-Interstate Pedestrian and Bicycle Crash Locations 91
Table 5-1. I-65 Operations and Maintenance by County 95
Table 6-1. I-65 RTA Regional Bus Service: 2014-2015 Average Daily Ridership 102
Table 6-2. I-65 RTA Regional Bus Service: 2040 Projected Daily Ridership 102
Table 8-1. Commuter Mode Split 112
Table 8-2. HOV Lane Limits in the Nashville Region 114
Table 8-3. HOV Lane Observed Violation Rates 114
Table 8-4. Observed HOV Lane Speeds 114
Table 8-5. Park-and-Ride Lot Inventory 115
Table 8-6. Impact of Selected Employer-Based TDM Strategies 117

Table 9-1. Inbound and Outbound Freight Volumes by Mode for the Years 2012 and 2040 118
Table 9-2. Inbound Freight Tonnage and Value for 2012 and 2040 by Entry Road and Destination County 121
Table 9-3. Outbound Freight Tonnage and Value for 2012 and 2040 by Exit Road and Destination County 122
Table 9-4. MUT and SUT Productions and Attractions by County for 2010 (daily trips) 123
Table 9-5. Through Truck Traffic Tonnage (in Thousands) by Entry and Exit Road for 2012 and 2040 123
Table 9-6. Through Freight Tonnage and Value for Air, Water, and Rail for 2012 and 2040 123
Table 9-7. Inbound Freight Diversion Potential 125
Table 9-8. Outbound Freight Diversion Potential 126
Table 9-9. Top Inbound Commodities Transported by Multiple Modes for the Year 2040 127
Table 9-10. Top Outbound Commodities Transported by Multiple Modes for the Year 2040 127
Table 11-1. Transportation Needs Responses 135

Section C : Goals, Objectives, and Performance Measures 139

Table 2-1. I-65 Corridor Goals and Objectives 140
Table 3-1. Proposed Performance Measure Methodology 141

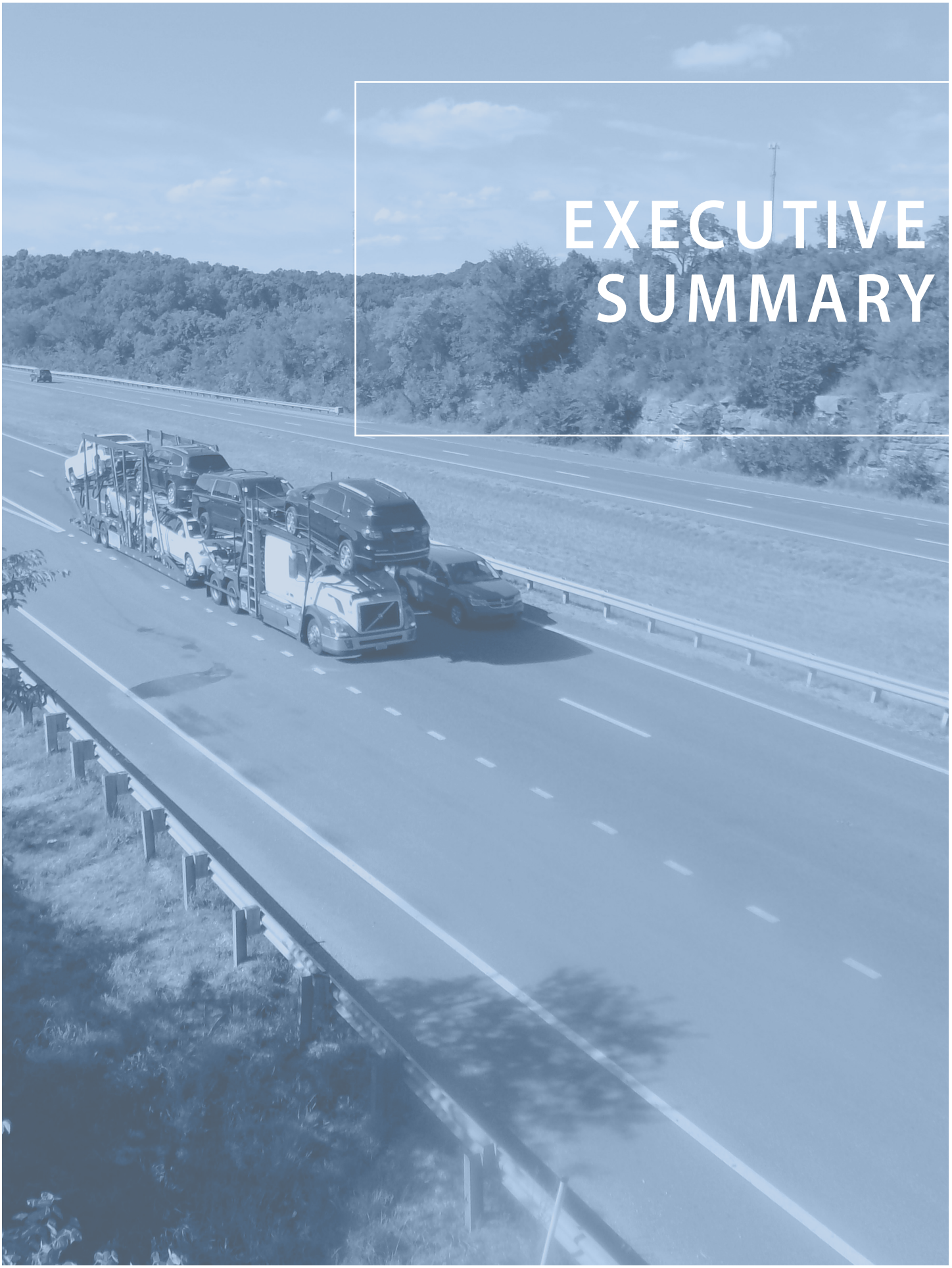
Section D: Development of Feasible Multimodal Solutions 143

Table 2-1. County Growth Trends 145
Table 3-1. Base Year and Trend Performance Measures 150
Table 4-1. Mainline Improvements: Highway Capacity 151
Table 4-2. Mainline Improvements: Safety 154
Table 4-3. 2010 and 2040 Travel Time for Key Travel Markets 158
Table 4-4. 2010, 2040 Trend, and 2040 Build Network Performance Measures 161
Table 4-5. Auto and Truck Person Throughput at Screenlines 162
Table 4-6. Interchange Improvement Results 163
Table 4-7. Weaving Analysis: Downtown Nashville 164
Table 4-8. Crash Type and Frequency 164
Table 4-9. HOV Eligible Vehicles 166
Table 4-10. HOV Eligible Vehicles and General Purpose Lane LOS 167
Table 5-1. ITS Improvements 173
Table 6-1. Freight Improvements 180
Table 6-2. Potential Alternative Freight Routes: Travel Times 187
Table 6-3. Potential Alternative Freight Routes: Volume to Capacity 187
Table 7-1. Transit Improvements 195
Table 7-2. Regional Transit Station Area Development Densities 198
Table 7-3. Walking and Bicycling Access to Transit Stations 199
Table 9-1. Hierarchy of Efficient Commuting Strategies 206
Table 10-1. Performance Summary 207
Table 11-1. Mainline Improvements: Highway Capacity 210
Table 11-2. Mainline Improvements: Safety 213
Table 11-3. ITS Improvements 214
Table 11-4. Freight Improvements 215
Table 11-5. Transit Improvements 216
Table 11-6. Recommended Bicycle and Pedestrian Projects 219

Section E: Project Priorities 223

Table 1-1. I-65 Corridor Goals and Objectives. 223
Table 2-1. I-65 Prioritization Criteria and Measures by Mode and Strategy 225
Table 3-1. Highway Capacity Improvements: Highly Ranked Projects 227
Table 3-2. ITS Improvements: Highly Ranked Projects 228
Table 3-3. Transit Improvements: Highly Ranked Projects 229
Table 3-4. Walking and Bicycling Improvements: Highly Ranked Projects. 230
Table 3-5. Highway Capacity Improvements: Project Rankings 235
Table 3-6. Safety Improvements: Project Rankings 239
Table 3-7. ITS Improvements: Project Rankings 241
Table 3-8. Freight Improvements: Project Rankings 245
Table 3-9. Transit Improvements: Project Rankings 247
Table 3-10. Walking and Bicycling Improvements: Project Rankings 249

EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

1. Introduction

The purpose of the Interstate 65 Multimodal Corridor Study is to identify multimodal transportation improvements that will address existing and future transportation deficiencies and needs along the Interstate 65 (I-65) corridor in Tennessee. The corridor study area (Figure ES-2) extends the full length of I-65 in Tennessee, 122 miles from the border with Alabama to Kentucky, and covers 14 counties that either include I-65 or have connections between I-65 and other interstate systems.

Over the course of the planning process, more than 200 people attended two rounds of public workshops held throughout the corridor. In addition, more than 2,600 people completed an online survey and over 140 comments were received through an online mapping tool. Finally, more than 20 presentations were made to various stakeholder groups in the corridor, including local and regional planning agencies, businesses, and community groups.

Figure ES-1. I-65 Public Workshop Map

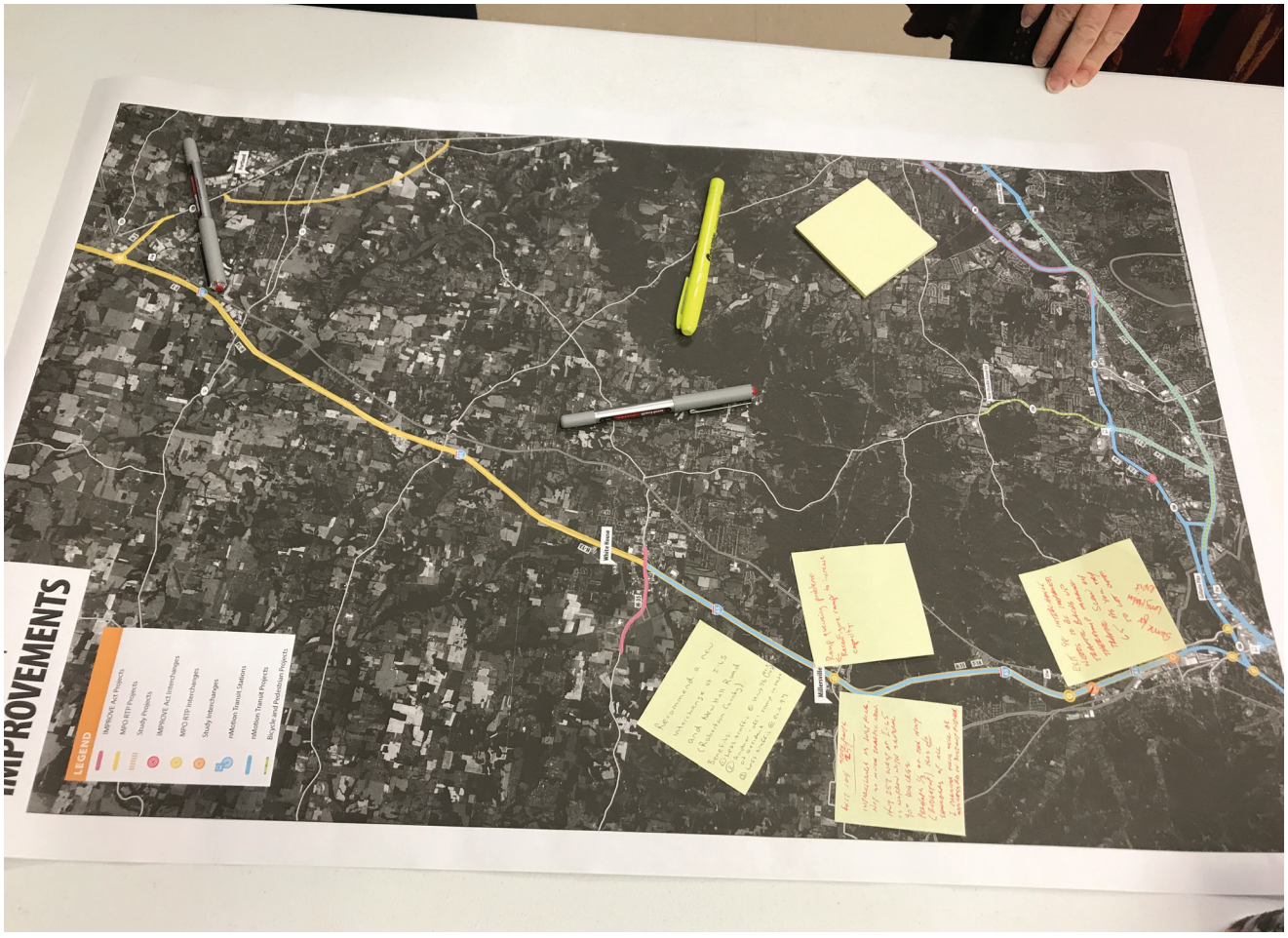
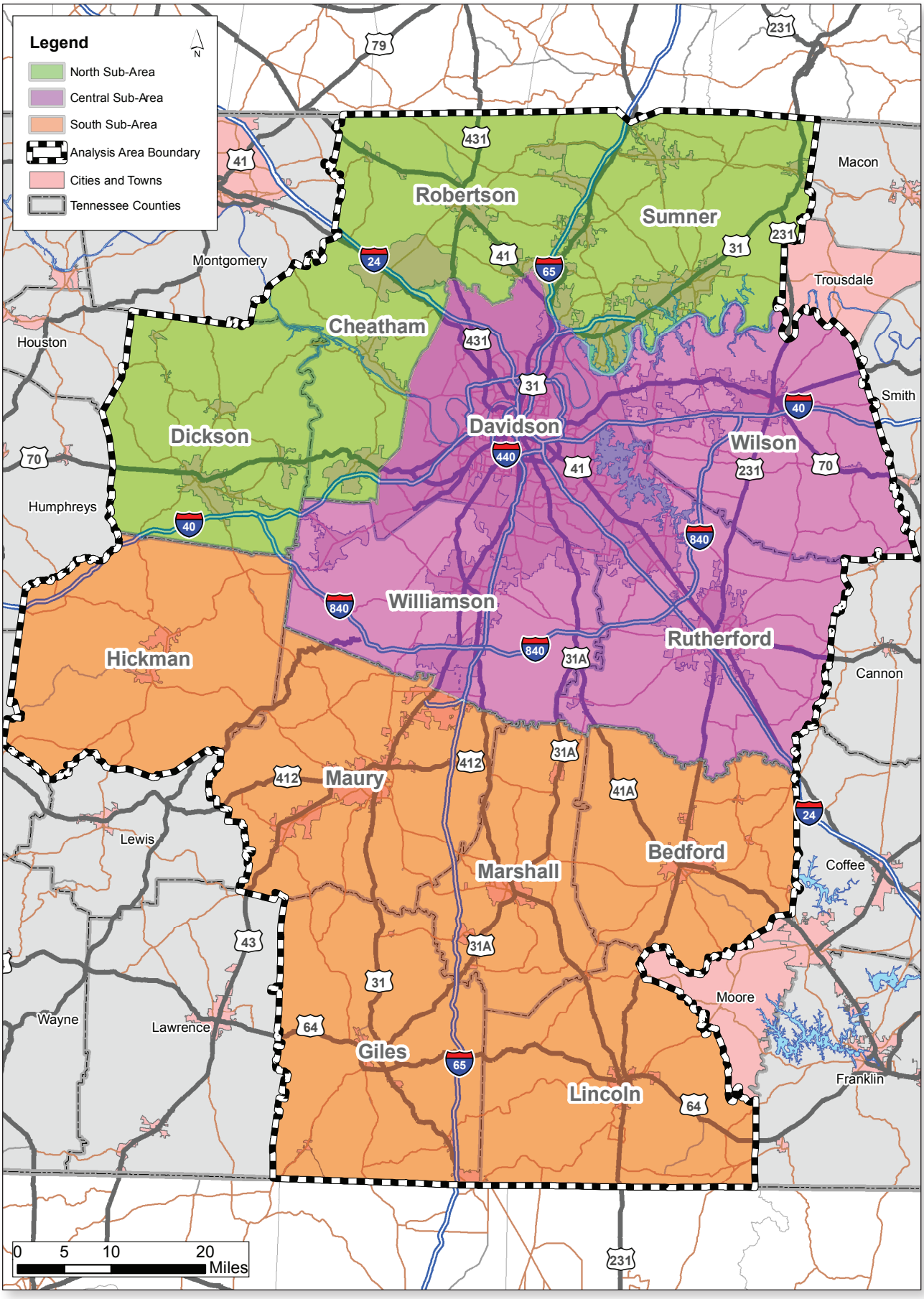


Figure ES-2. I-65 Corridor Study Area



2. Existing Conditions and Trends

While the focus of the I-65 study is on the corridor's transportation system, the underlying growth and development patterns will largely determine how transportation improvements can and should adapt over time to address existing deficiencies and meet new needs. Following are key findings related to growth and development in the I-65 corridor.

- Counties in the study area are expected to add approximately 1,215,000 more people and approximately 830,000 more jobs between 2010 and 2040, increases of 69 percent and 77 percent, respectively.
- Growth within one mile of existing I-65 interchanges will strongly tilt toward employment, with three jobs added for every new resident, for a total of approximately 154,000 new jobs within the interchange areas by 2040 – or one in five new jobs in the study area.
- Significant new developments near I-65 are already in some stage of the planning and development process. Projects such as the North Gateway Corridor in Portland are undertaking land use planning while others such as Berry Farms in Franklin are currently phasing construction. Nashville's latest comprehensive plan calls for substantial increases in development intensities along the I-65 corridor to absorb projected growth.
- Two thirds of projected population growth in the corridor is forecasted to occur in three counties, Rutherford, Williamson, and Wilson Counties, which will each more than double their 2010 populations by 2040 to approximately 603,000, 537,000, and 233,000 people, respectively. On the employment side, Davidson, Rutherford, and Williamson Counties will realize much of the growth between 2010 and 2040, adding approximately 326,000, 138,000, and 188,000 jobs, respectively.

As growth and development have accelerated along the I-65 corridor over the past decade, state, regional, and local agencies have adopted or undertaken a number of plans, programs, and studies to support and prepare for new employers and residents (Table ES-1). Importantly, the IMPROVE Act, the state transportation funding bill signed into law in 2017, has

Table ES-1. I-65 Corridor Plans, Programs and Studies

State and Regional Plans, Programs, and Studies	Local Transportation Plans and Studies	Local Land Use/ Comprehensive Plans
• Nashville Area MPO 2016-2040 Regional Transportation Plan (2015) • Nashville Area MPO Southeast Area Transportation and Land Use Study (2016) • Nashville Area MPO Southwest Area Transportation and Land Use Study (2010) • Nashville Area MPO Transportation Improvement Program, 2014-2017 (2013) • Nashville Area MPO Tri-County Transportation and Land Use Study (2010) • Nashville Area MPO Regional Bicycle and Pedestrian Study (2008) • TDOT 25-Year Long Range Transportation Plan (2015) • TDOT Transportation Improvement Program, 2014-2017 (2013) • TDOT Statewide Multimodal Freight Plan (2018)	• City of Lebanon, City of Mt. Juliet, Wilson County: Bicycle and Pedestrian Master Plan (2002) • Cool Springs Multimodal Transportation Network Study (2015) • Nashville Metropolitan Transit Authority/Regional Transportation Authority Strategic Plan: nMotion (to be completed 2016) • Metro Nashville and Davidson County Access Nashville 2040 (2015) • Spring Hill Bicycle and Greenway Plan (2015) • Williamson County Major Thoroughfare Plan Update (2011)	• Brentwood 2020 Plan Update (2008) • City of Portland Future Land Use Plan • Franklin Land Use Plan (2004) • Maury County Comprehensive Plan (2011) • Metro Nashville and Davidson County NashvilleNext (2015) • Robertson County 2040 Comprehensive Growth and Development Plan (2013) • Rutherford County Comprehensive Plan (2011) • Spring Hill Comprehensive Plan (2011) • Sumner County 2035 Comprehensive Plan (2010) • Thompson's Station General Plan • White House Comprehensive Plan 2025 (2008) • Williamson County Comprehensive Land Use Plan (2007) • Wilson County Land Use Master Plan (2006)

TDOT Statewide Multimodal Freight Plan (2018)

Table ES-2. I-65 Corridor County Growth Trends

		2010		2020				2030				2040			
		Population	Employment	Population		Employment		Population		Employment		Population		Employment	
Sub-Area	County	Total	Total	Total	Increase from 2010	Total	Increase from 2010	Total	Increase from 2010	Total	Increase from 2010	Total	Increase from 2010	Total	Increase from 2010
North	Cheatham	39,107	15,899	45,334	16%	19,351	22%	51,565	32%	22,813	43%	57,804	48%	26,281	65%
	Dickson	49,664	22,469	55,396	12%	25,839	15%	61,140	23%	29,129	30%	66,896	35%	32,608	45%
	Robertson	66,283	28,067	83,977	27%	33,591	20%	99,100	50%	39,857	42%	112,851	70%	47,190	68%
	Sumner	160,645	55,354	193,105	20%	66,686	20%	218,698	36%	80,227	45%	241,698	50%	95,970	73%
	Sub-Area Total	315,699	121,789	377,812	20%	145,467	19%	430,503	36%	172,026	41%	479,249	52%	202,049	66%
Central	Davidson	626,682	542,773	680,496	9%	635,738	17%	734,958	17%	745,177	37%	780,507	25%	869,137	60%
	Rutherford	262,604	133,803	384,504	46%	170,093	27%	497,364	89%	215,490	61%	602,977	130%	271,416	103%
	Williamson	183,182	120,266	309,328	69%	162,311	35%	426,801	133%	223,802	86%	537,377	193%	307,836	156%
	Wilson	113,993	51,640	157,139	38%	65,133	26%	196,478	72%	81,960	59%	233,085	104%	102,437	98%
	Sub-Area Total	1,186,461	848,481	1,531,467	29%	1,033,275	22%	1,855,601	56%	1,266,429	49%	2,153,946	82%	1,550,826	83%
South	Bedford	45,058	25,809	51,610	15%	29,345	14%	58,175	29%	32,892	27%	64,748	44%	36,448	41%
	Giles	29,485	14,153	31,048	5%	15,658	11%	32,620	11%	17,178	21%	34,199	16%	18,704	32%
	Hickman	24,690	6,543	26,773	8%	7,187	10%	28,866	17%	7,839	20%	30,967	25%	8,495	30%
	Lincoln	33,361	14,892	35,226	6%	16,287	9%	37,100	11%	17,690	19%	38,984	17%	19,104	28%
	Marshall	30,617	12,004	34,072	11%	12,836	7%	37,530	23%	13,672	14%	40,995	34%	14,520	21%
	Maury	80,956	39,996	94,861	17%	47,043	18%	106,276	31%	55,746	39%	116,514	44%	65,609	64%
	Sub-Area Total	244,167	113,397	273,590	12%	128,356	13%	300,567	23%	145,017	28%	326,407	34%	162,880	44%
	STUDY AREA TOTAL	1,746,327	1,083,668	2,182,869	25%	1,307,098	21%	2,586,671	48%	1,583,472	46%	2,959,602	69%	1,915,755	77%

Source: Statewide Travel Demand Model, Version 2

set the stage for many improvements to move forward with specific project studies already underway.

3. Existing Deficiencies and Future Needs

The highway network has served and will continue to serve as the primary transportation system in the corridor. Increasingly, however, other transportation modes and systems are assuming importance as major employment, commercial, and residential centers multiply and expand. The transportation deficiencies and needs have been grouped into three general categories and are summarized below. Figures ES-3, ES-4, and ES-5 underscore the wide range of deficiencies and needs, particularly in the counties experiencing the largest absolute and relative rates of growth.

Highways and Freight:

- By 2040, Level of Service D, E, and F is forecasted on most of I-65 between Kentucky and Spring Hill.
- Parallel and intersecting arterials are projected to approach or exceed capacity, including:
  - US 431/Hillsboro Pike/Lewisburg Pike
  - US 31/Franklin Pike/Columbia Pike
  - US41A/Nolensville Pike
  - SR 254/Old Hickory Boulevard
  - SR 96/Murfreesboro Road
  - SR 386/Vietnam Veterans Boulevard
- By 2040, travel times are projected to double on much of the corridor between Nashville and Spring Hill.
- Truck volumes are projected to increase by more than 50 percent on most of the roadway network by 2040.
- Between 2013-15, crashes increased 23 percent along I-65.

Transit, Walking, Bicycling, and Transportation Demand Management:

- Existing regional transit services are largely peak period and peak direction, limiting access to employment centers in communities throughout the corridor.
- Park-and-Ride lots in the I-65 corridor are underutilized compared to systemwide rates, in part due to their location.
- Development densities around existing and planned regional transit stops are low, limiting the ridership potential of both existing and planned services.
- Bicycle and pedestrian facilities are needed for all ages and abilities to and from major activity centers in the corridor.
- Violation rates on high occupancy vehicle (HOV) lanes range from 63 percent to 96 percent.

Operations and Maintenance:

- Numerous ITS devices are in place on I-65 as part of the Tennessee Department of Transportation (TDOT) Smartway system.
- On I-65, expansion of the Smartway system is proposed for two miles north of Exit 108/SR 76 and one mile south of Exit 59/I-840.
- There are numerous additional ITS application opportunities in the I-65 corridor to help manage and operate freeways, arterials, and transit.

4. Multimodal Solutions and Project Priorities

The recommended multimodal solutions for the I-65 Multimodal Corridor Study are depicted in Figures ES-6, ES-7, and ES-8 and listed in Tables ES-5 through ES-10. The recommend improvements incorporate technical analysis, public and stakeholder input, and coordination with public agencies. Importantly, the recommended solutions build on the strong foundation of existing plans, programs, and studies, in particular, the IMPROVE Act, the Nashville Area Metropolitan Planning Organization's (MPO) Regional Transportation Plan, and the Regional Transportation Authority (RTA)/Metropolitan Transit Authority (MTA) nMotion Plan. Taken together, the recommended solutions include:

- 68 Highway capacity and safety projects;
- 19 ITS projects;
- 11 Freight specific projects;
- 25 Transit projects;
- 40 Bicycle and pedestrian projects; and
- 13 Transportation demand management policies.

Figure ES-3. I-65 Deficiencies and Needs: North Sub-Area

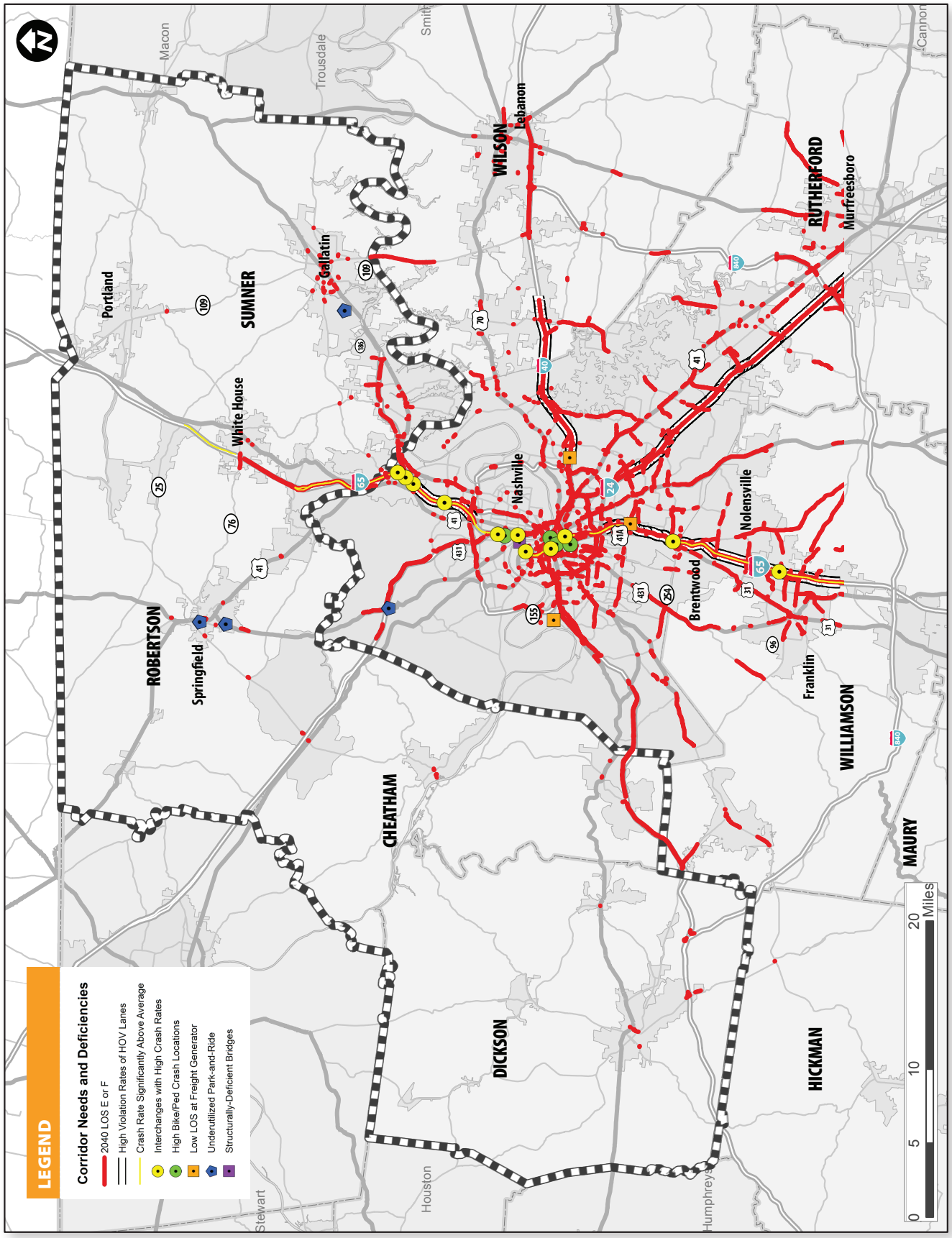


Figure ES-4. I-65 Deficiencies and Needs: Central Sub-Area

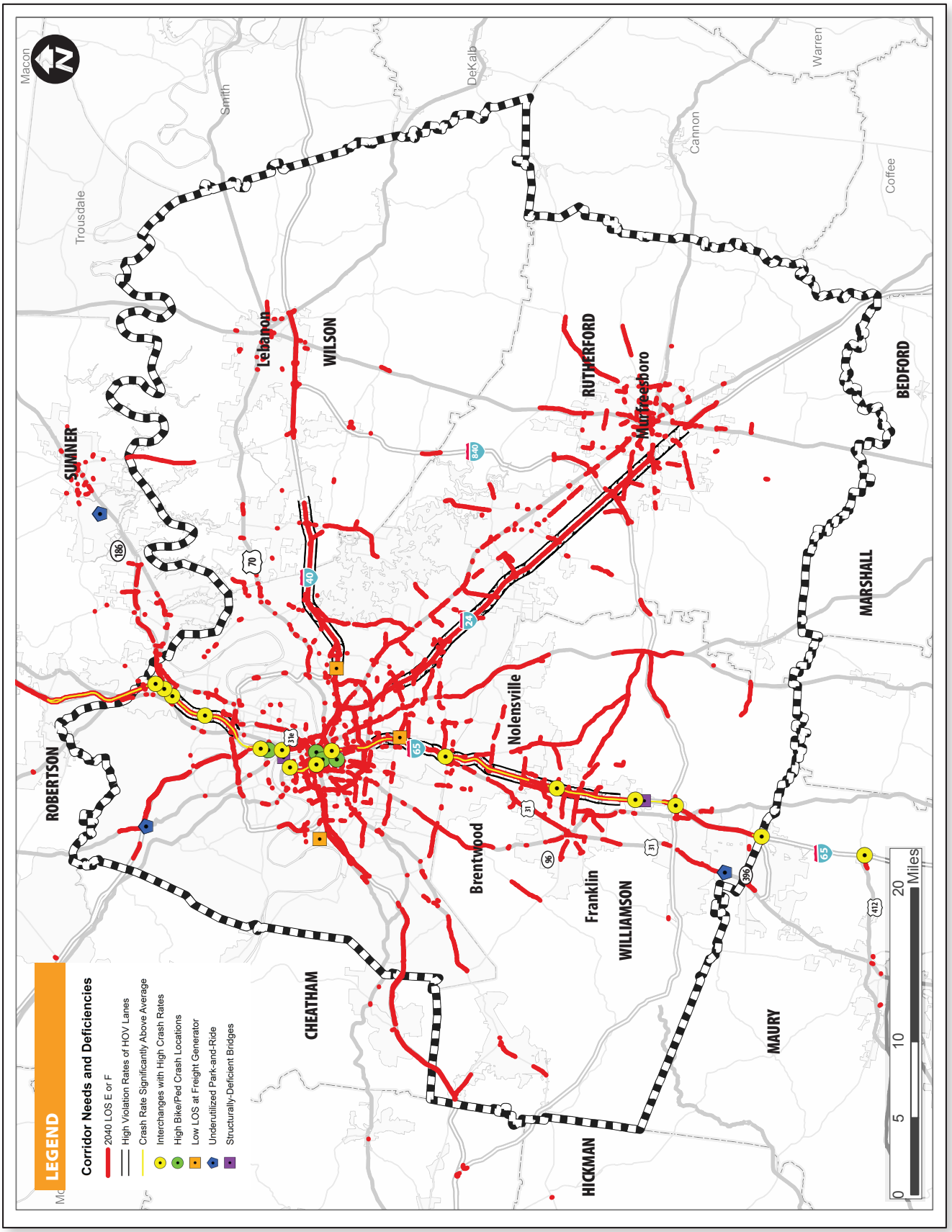
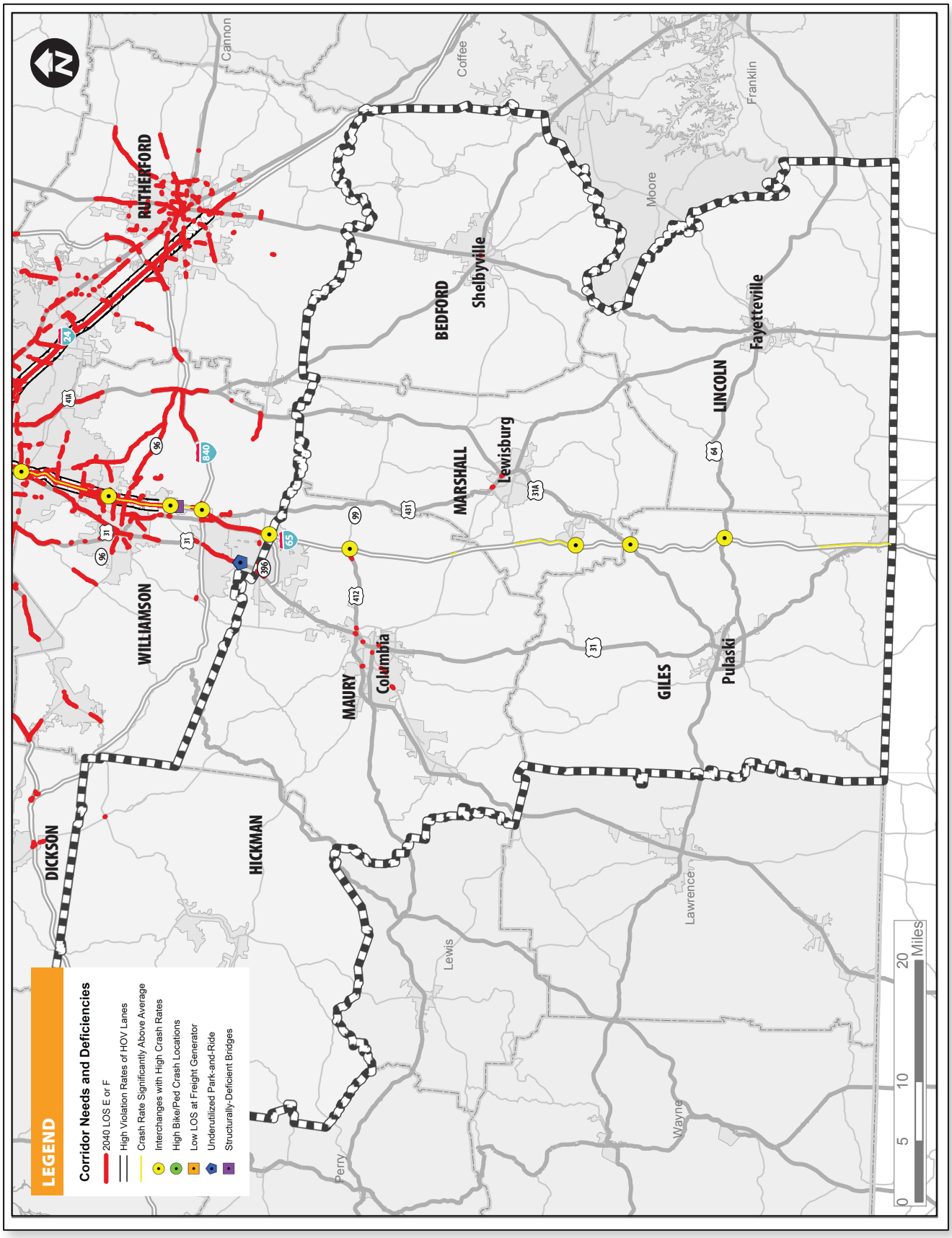


Figure ES-5. I-65 Deficiencies and Needs: South Sub-Area



While the recommended solutions address many of the identified deficiencies and needs illustrated in Figures ES-3 – ES-5, their potential impacts on the transportation system are summarized in Table ES-3. Among traditional performance measures, such as vehicle miles traveled (VMT), vehicle hours traveled (VHT), and vehicle hours of delay (VHD), the Build scenario, incorporating the recommended solutions, results in slightly better overall performance relative to the Trend scenario. Declining auto VHD and truck VHT, for example, indicate higher speeds and shorter travel times resulting from the proposed capacity improvements. It is important to note that the corridor study also recommends a series of interchange improvements that will generate travel time savings and safety benefits. Finally, the performance measures highlight the substantial potential for transit, walking, and bicycling to help reshape the transportation system in the I-65 corridor, especially in Davidson, Sumner, and Williamson Counties. Carefully planned Transit Oriented Development (TOD) around existing and planned transit stops can result in a tripling of people and jobs in station areas and nearly double the number of people within a 5-minute walk to transit – a conservative measure of transit access.

The projects in Tables ES-5 through ES-10 are listed geographically, north to south. For the I-65 Multimodal Corridor Study, project prioritization and phasing builds on the common set of guidelines from earlier corridor studies, but shifts the focus from developing a single, static list of priorities to generating data and information that can serve as a flexible decision support tool. The tool evaluates proposed improvements in each modal and strategy area across five categories, and orders the results by weighted scores (Table ES-4). Importantly, the weights for each criterion can be adjusted based on policy, planning, and programming direction, and the results of the analysis can be considered separately or compared as different scenarios. A preliminary analysis of project priorities, however, points to three areas of specific need in the I-65 corridor study:

- Downtown Nashville Interstate Loop – Improving the safety and operational efficiency of the downtown interstate loop will play a pivotal role in addressing many of the deficiencies and needs identified in the study, including high vehicle crash rates, auto and truck congestion, system to system weaving patterns, ramp operations, HOV facilities, ITS operations, transit services, and pedestrian and bicycle safety in interchange areas.
- Parallel and Intersecting Arterials – Capacity, ITS, and interchange improvements on or with parallel and intersecting arterials especially in Davidson and Williams Counties will also yield important safety and operational benefits in the I-65 corridor, particularly on or with Trinity Lane (Exit 87), Rosa Parks Boulevard (US 41A), Wedgewood Avenue (Exit 81), Hillsboro Road (US 431), Franklin Road (US 31), Nolensville Pike (US 41A), Moores Lane (SR 441), Old Hickory Boulevard (SR 254), and Murfreesboro Road (SR 96).
- Multimodal Connections to Employment Centers – From Sumner County to Maury County, transit, walking, and bicycling facilities and services that improve access to employment centers in the I-65 corridor are the least developed and yet will become increasingly important as new commercial and residential development locates close to I-65.

In conjunction with existing plans, programs, and studies, the I-65 Multimodal Corridor Study establishes a framework for improving transportation and supporting future growth and development in the corridor, whether it is major employment centers such as downtown Nashville and Cool Springs, traditional bedroom communities like Brentwood and Hendersonville, or emerging centers like the planned Portland gateway. The successful implementation of the framework and recommended solutions will, in turn, largely depend on the strategic, timely, and close coordination of the improvements by state, regional, and local stakeholders.

Table ES-3. I-65 Corridor Performance Summary

Goal	Performance Measure	Unit	Base (2010)	Trend (2040)	Build (2040)	Percent Change Trend v. Base	Percent Change Build v. Base
Moving Autos and Trucks	Auto Travel Times	Minutes	See Table 4-3			n/a	n/a
	Auto Vehicle Miles Traveled (VMT)	Miles (1,000s)	173,652	279,757	279,885	61%	61%
	Auto Vehicle Hours of Travel (VHT)	Hours (1,000s)	3,836	6,456	6,442	68%	68%
	Auto Vehicle Hours of Delay (VHD)	Hours	101,746	431,384	391,309	324%	285%
	Truck Vehicles Miles Traveled (VMT)	Miles (1,000s)	6,524	12,030	12,090	84%	85%
	Truck Vehicle Hours of Travel (VHT)	Hours	123,726	327,961	319,196	165%	158%
	Truck Vehicle Hours of Delay (VHD)	Hours	16,204	27,147	27,103	68%	67%
Moving People	Person Throughput	Persons per Day - North	177,569	252,815	259,888	42%	46%
		Persons per Day - South	205,076	275,077	290,187	34%	42%
Safety	Presence of Countermeasures at Safety Hotspots	High, Medium, or Low	See "Safety Recommendations"			n/a	n/a
Land Use Coordination	Presence of TOD at Stations	Total People and Jobs	24,968	38,456	100,520	54%	303%
Equity and Accessibility	People within a 5-Minute Walk or Bike Ride to a Station	Total People - Walk	7,329	31,880	57,544	335%	685%
		Total People - Bike	61,154	228,969	254,633	274%	316%
Air Quality/ Emissions	Carbon Intensity	Pounds per Day per Person	99.07	96.35	96.47	-3%	-3%

Table ES-4 I-65 Corridor Project Prioritization Criteria

	Prioritization Criteria and Measures				
Mode/ Strategy	Mobility/ Safety	Multimodal	Accessibility/ Economic Development	Implementation	Cost Efficiency
Highway Capacity	Base V/C	Number of Modal Projects	Base Total Employment	Cost	Benefit/Cost Ratio (Method 1)
	2040 E+C V/C		2040 Total Employment		Benefit/Cost Ratio (Method 2)
Safety	Crash Rate	Number of Modal Projects	Base Total Employment	Cost	Benefit/Cost Ratio (Method 1)
			2040 Total Employment		Benefit/Cost Ratio (Method 2)
ITS	Base V/C	Number of Modal Projects	Base Total Employment	Cost	Benefit/Cost Ratio
	2040 E+C V/C		2040 Total Employment		
Freight	Base V/C	Number of Modal Projects	Base Total Employment	Cost	Benefit/Cost Ratio (Method 1)
	2040 E+C V/C		2040 Total Employment		Benefit/Cost Ratio (Method 2)
	Truck Percentage				
Transit	LOS	Number of Modal Projects	Base Total Employment	Cost	n/a
			2040 Total Employment		
Bicycle and Pedestrian	Base Total Population	Number of Modal Projects	Base Total Employment	Cost	Benefit/Cost Ratio
	2040 Total Population		2040 Total Employment		

Figure ES-6. I-65 Recommended Multimodal Solutions: North Sub-Area

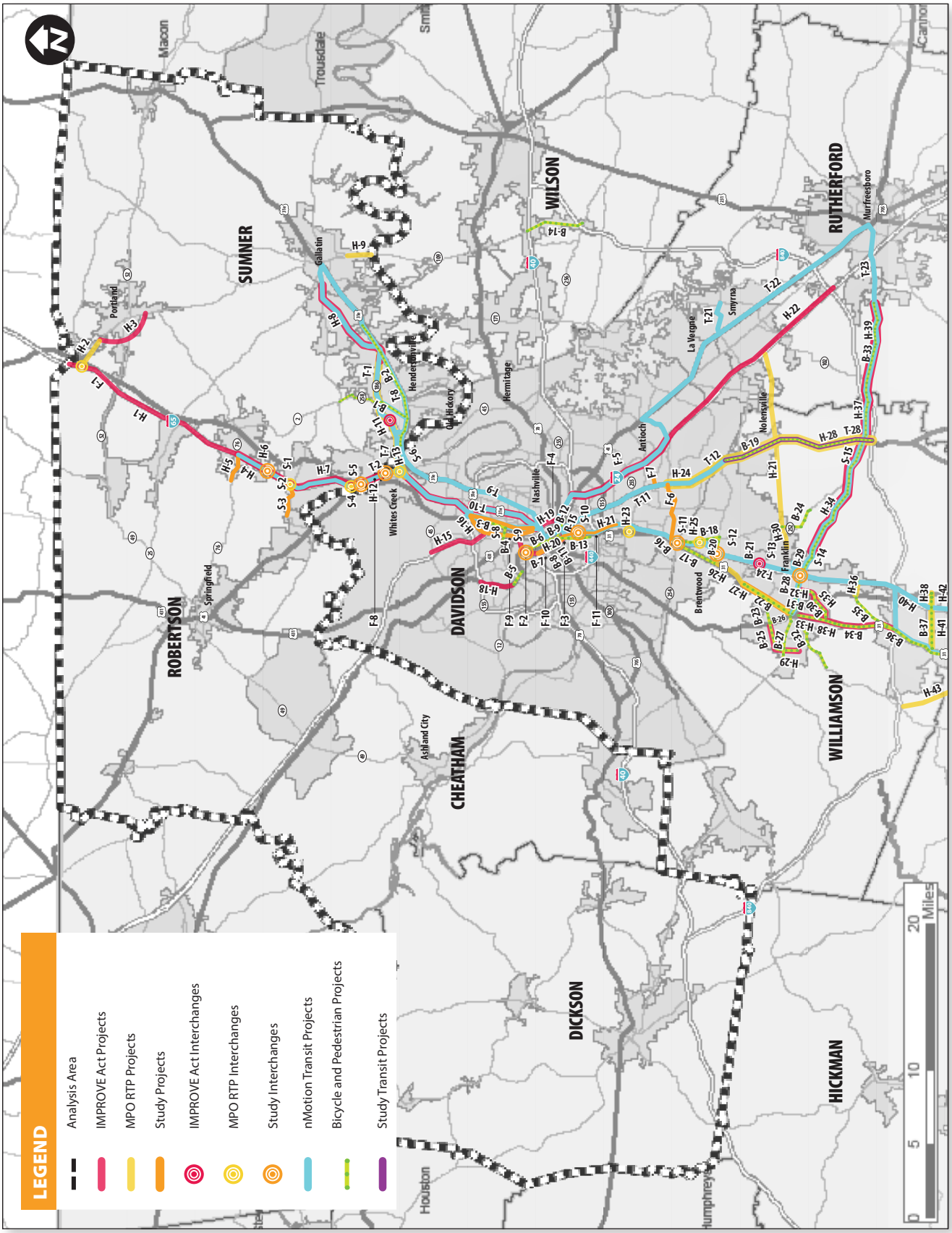


Figure ES-7. I-65 Recommended Multimodal Solutions: Central Sub-Area

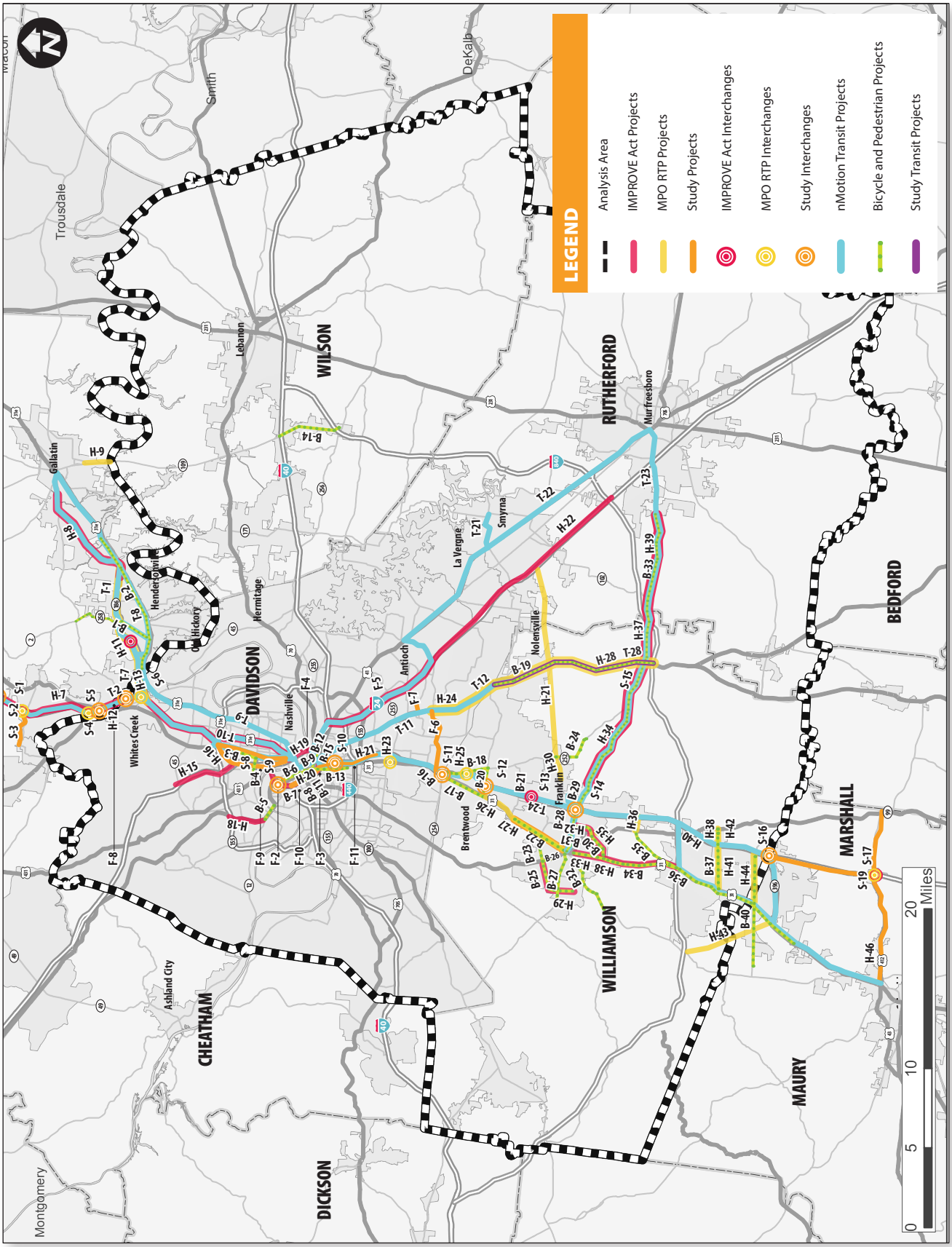


Figure ES-8. I-65 Recommended Multimodal Solutions: South Sub-Area

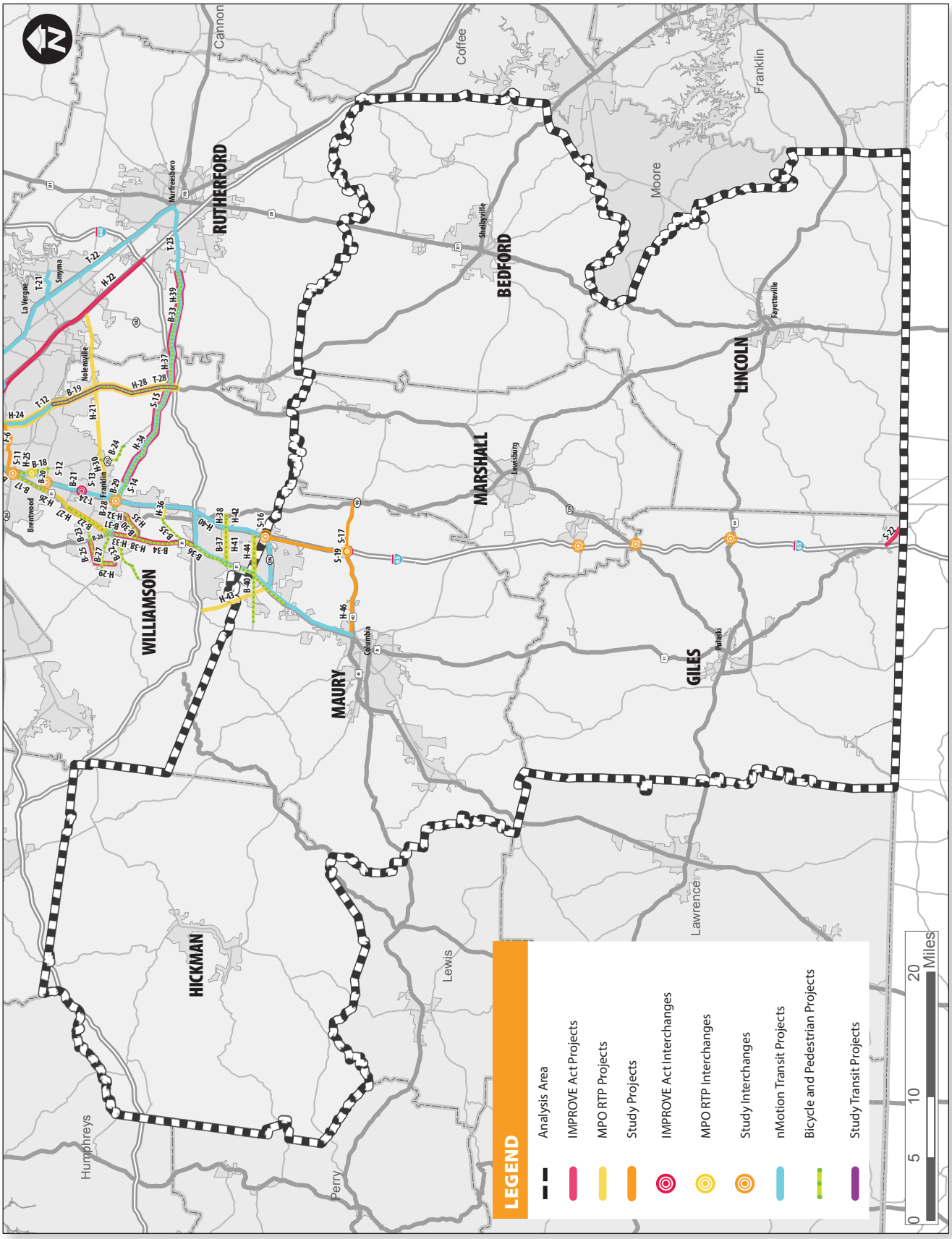


Table ES-5. Mainline Improvements: Highway Capacity

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
H-1*	I-65	SR-25	Kentucky State Line	Widening, 4 to 6 lanes	8.8	Robertson	North
H-2	I-65/SR-109 Prop/SR-41	N/A	N/A	Relocation of SR-109, new interchange at I-65, and widening of I-65 from south of new interchange to Kentucky state line	0.6	Sumner	North
H-3*	SR-109 Portland Bypass	SR-109 south of SR-76	SR-109 near Kirby Drive	Construct new 4 lane divided roadway	6.8	Sumner	North
H-4*	I-65	Bethel Road (SR-257)	SR-25	Widening, 4 to 6 lanes	8.7	Robertson	North
H-5*	SR-76	Charles Drive	New Hall Road	Widening, 2 to 4 lanes	2.1	Robertson	North
H-6	I-65	New interchange at New Hall Road in White House		New Interchange	N/A	Robertson	North
H-7	I-65 (SB only)	Blue Star Road (US-31)	Bethel Road (SR-257)	Widening, 2 to 3 lanes	5.2	Robertson	North
H-8*	NET Corridor Section 2 - Vietnam Veterans Pkwy (SR-386)	US-31E/ Saundersville Road	SR-109 Bypass	Transit Capital Expansion - Widening, 4 to 6 lanes for freeway Bus Rapid Transit service from Nashville to Gallatin (Project currently under study by TDOT)	6.9	Sumner	North
H-9	SR-109	North of the Cumberland River Bridge	SR-109 Portland Bypass south of Gallatin	Widen from 2 lanes to 4/5 lanes	1.3	Sumner	North
H-10#	I-65	Long Hollow Pike (SR-174)	Blue Star Road (US-31)	Widening, 4 to 6 lanes	1.8	Sumner	North
H-11*	Vietnam Veterans Pkwy (SR-386) at Forest Retreat Road	N/A	N/A	New Interchange (Project currently under study by TDOT.)	0.0	Sumner	North
H-12	I-65 at Springfield Highway (SR-11/US-41)	N/A	N/A	New Interchange	N/A	Davidson	Central
H-13*#	NET Corridor Section 1 - Vietnam Veterans Pkwy (SR-386)	I-65	US-31E/ Saundersville Road	Transit Capital Expansion - Widening, 4 to 6 lanes for freeway Bus Rapid Transit service from Nashville to Gallatin	8.9	Sumner	North
H-14	NET Corridor Transit - Ellington Pkwy (US 31E/ SR-6) and I-65	Ellington Pkwy (SR-6) southern terminus	SR-386	Construction of managed Lanes along Ellington Pkwy (SR-6) and I-65 for freeway Bus Rapid Transit service from Nashville to Gallatin	10.0	Davidson	Central
H-15*	I-24	I-65	Old Hickory Blvd (SR-45)	Widening, 4 to 6 lanes	4.3	Davidson	Central
H-16	I-65	Briley Parkway	Nashville Core	Extend HOV lanes	4.2	Davidson	Central
H-17	Dickerson Pike (US 41)	SR-155 (Briley Pkwy)	Spring St	Widening, 4 to 6 lanes	4.7	Davidson	Central
H-18*	Clarksville Hwy (US-41A/ SR-112)	SR-12 (Ashland City Hwy)	SR-155 (Briley Pkwy)	Widening, 2 to 5 lanes, with Multi-Use Trail	2.4	Davidson	Central

Table ES-5. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
H-19*	Downtown Nashville Loop	N/A	N/A	Roadway/Junctions Reconstruction	12.2	Davidson	Central
H-20	I-65	I-40 (Exit 210)	I-40 (Exit 208)	Weaving Patterns	2.0	Davidson	Central
H-21	I-65	Armory Drive	Nashville Core	Extend HOV lanes	3.4	Davidson	Central
H-22*	I-24	I-40	I-840	Widening, I-40 to Haywood Lane - 8 to 10 lanes; Haywood Lane to I-840 - 6 to 8 lanes	23.2	Davidson and Rutherford	Central
H-23	Battery Lane/Harding Place at Franklin Rd/ Improvements	SR-6 (Franklin Rd.) at SR-255 (Harding Pl.) and Battery Lane		Capacity improvements for intersection approaches	0.7	Davidson	Central
H-24	Nolensville Pike	South of Old Hickory Blvd (SR-245)	South of Burkitt Road	Reconstruction and widening, 2 to 5 lanes	4.5	Davidson and Williamson	Central
H-25	I-65	Old Hickory Blvd (SR-254)	Concord Road (SR-253)	New Interchange	0.0	Williamson	Central
H-26	Franklin Road (US-31/SR-6)	Concord Road (SR-253)	Moores Lane (SR-441)	Widening, 2 to 5 lanes	2.3	Williamson	Central
H-27	Franklin Road (US-31/SR-6)	SR-441 (Moore's Lane)	Harpeth River Bridge	Widening, 2 to 5 lanes	3.7	Williamson	Central
H-28	Nolensville Road (SR-11)	Burkitt Road	I-840	Widening with realignment from south of Clovercroft Road to north of Sunset Road in Nolensville	10.6	Williamson	Central
H-29*#	Mack Hatcher Pkwy (SR-397)	South of SR-96	US-431 (SR-106)	New construction, 4 lanes	3.3	Williamson	Central
H-30	East McEwen Drive	Near Cool Springs Blvd	Wilson Pike (SR-252)	Widening, 2 to 4 lanes	1.6	Williamson	Central
H-31	Smyrna/Williamson County Connector	I-24 at Rocky Fork Road	McEwen Drive Extension	New Roadway	12.0	Williamson and Rutherford	Central
H-32*	Mack Hatcher Pkwy (SR-397)	SR-96 east of Franklin	Columbia Pike (US-31/SR-6) south of Franklin	Widening, 2 to 4 lanes	3.2	Williamson	Central
H-33*	Columbia Pike (US-31/SR-6)	Fowlkes Street	Mack Hatcher Pkwy (SR-397)	Widening, 2 to 4 lanes	1.9	Williamson	Central
H-34*#	Murfreesboro Road (SR-96)	East of Arno Road	Wilson Pike (SR-252)	Widening, 2 to 5 lanes	5.8	Williamson	Central
H-35	Lewisburg Pike (SR-106/ US-431)	Mack Hatcher Pkwy (SR-397)	Donelson Creek Pkwy	Widening, 2 to 4 lanes	0.8	Williamson	Central
H-36	Peytonsville Road/Goose Creek Bypass (SR-248)	SR-106 (Lewisburg Pike)	West of I-65	Widen existing 2 lane road to 4/5 lane	0.8	Williamson	Central
H-37*#	Murfreesboro Road (SR-96)	East of Wilson Pike (SR-252)	I-840	Widening, 2 to 5 lanes	5.5	Williamson	Central
H-38*	Columbia Pike (US-31/SR-6)	I-840	Mack Hatcher Pkwy (SR-397)	Widening, 2 to 4 lanes	5.0	Williamson	Central

Table ES-5. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
H-39*	Murfreesboro Road (SR-96)	I-840	Veterans Pkwy	Widening, 2 to 5 lanes	6.9	Williamson and Rutherford	Central
H-40	I-65	I-840	SR-396 (Saturn Parkway)	Widening, 4 to 6 lanes	5.8	Williamson	Central
H-41	Buckner Road Widening	Columbia Pike (SR-6/US-31)	Buckner Lane	Widening	1.9	Williamson	Central
H-42	Buckner Road Extension	Buckner Road	Lewisburg Pike (SR-106/US-431)	New Roadway with New Interchange at I-65	2.1	Williamson	Central
H-43	Saturn Pkwy (SR-396) Extension	US-31	Carters Creek Pike (SR-246) at I-840	New Roadway	6.0	Maury and Williamson	Central
H-44	Duplex Road (SR-247)	SR-6/US-31	0.1 mile west of I-65	Widen Duplex Rd. from 2 to 3 lanes with add'l improvements	3.1	Maury and Williamson	Central
H-45	I-65	Saturn Parkway (SR-396)	Bear Creek Pike (SR-99/US-412)	Widening, 4 to 6 lanes	6.9	Maury	South
H-46	Bear Creek Pike (SR-99/ US-412)	Nashville Highway (US-31)	US-431	Widening, 2 to 4 lanes	11.1	Maury	South

* Project included on IMPROVE Act project list
Project included in 2018-2020 Comprehensive Multimodal Program

Table ES-6. Mainline Improvements: Highway Safety

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
S-1	I-65 at SR-257 (Exit 104)	I-65 at SR-257 (Exit 104)		NB/Off Ramp Queuing	0.0	Robertson	North
S-2	I-65 at Bethel Road (SR-257) Interchange Lighting Improvements	I-65 at SR-257 (Exit 104)		Install interchange lightning	0.0	Sumner	North
S-3	Bethel Road (SR-257)	Lake Road	I-65	Widen shoulders and correct substandard horizontal geometries	2.3	Robertson	North
S-4	I-65 at US 31W Louisville Hwy (Exit 98)	I-65 at US 31W Louisville Hwy (Exit 98)		NB/Off Turn Lanes, SB/On Auxiliary Lane, NB/SB Signal Timing	0.0	Sumner	North
S-5	I-65 at US-31W (Exit 98)	I-65 at US-31W (Exit 98)		NB to WB Flyover	0.0	Sumner	North
S-6	I-65 Interchange Lighting at Rivergate Pkwy, Long Hollow Pk, US-31W	N/A	N/A	Interchange Lighting	N/A	Davidson	Central
S-7	I-65 at SR 174 Long Hollow Pike (Exit 97)	I-65 at SR 174 Long Hollow Pike (Exit 97)		SB/Off Turn Lanes, NB/SB Signal Timing	0.0	Davidson	North
S-8	I-65 at Trinity Lane (Exit 87)	I-65 at Trinity Lane (Exit 87)		NB/Off Ramp Auxiliary Lane Length	0.0	Davidson	Central
S-9	I-65 at Rosa L Parks Blvd (Exit 85)	I-65 at Rosa L Parks Blvd (Exit 85)		NB/Off Turn Lanes, SB/Off Turn Lanes, SB/On Turn Lanes	0.0	Davidson	Central
S-10	I-65 at Wedgewood Ave (Exit 81)"	I-65 at Wedgewood Ave (Exit 81)		SB/On Auxiliary Lane, NB/SB Signal Timing	0.0	Davidson	Central
S-11	I-65 at SR 254 Old Hickory Blvd (Exit 74)	I-65 at SR 254 Old Hickory Blvd (Exit 74)		Convert to to Diverging Diamond Interchange	0.0	Davidson	Central
S-12	I-65 at SR 253 Concord Rd (Exit 71)	I-65 at SR 253 Concord Rd (Exit 71)		NB/On Auxiliary Lane, SB/On Auxiliary Lane, NB/SB Signal Timing	0.0	Williamson	Central
S-13*	I-65 at Moores Lane	I-65 at Moores Lane		Interchange Modification	0.0	Williamson	Central
S-14	I-65 at SR 96 Murfreesboro Rd (Exit 65)	I-65 at SR 96 Murfreesboro Rd (Exit 65)		NB/Off Turn Lanes, SB/Off Turn Lanes, NB/SB Signal Timing	0.0	Williamson	Central
S-15	SR-96	Intersection with US-41A		Intersection Improvements	0.0	Williamson	Central
S-16	I-65 at SR 396 Saturn Parkway (Exit 53)	I-65 at SR 396 Saturn Parkway (Exit 53)		NB to WB Flyover	0.0	Maury	South
S-17	I-65 at US 412/SR 99 (Exit 46)	I-65 at US 412/SR 99 (Exit 46)		NB/SB Signalized Intersection	0.0	Maury	South
S-18	I-65 at SR 129 Lynnville Highway (Exit 27)	I-65 at SR 129 Lynnville Highway (Exit 27)		NB/On Turn Lane, SB/On Turn Lane	0.0	Marshall	South
S-19*	SR-99 (US-412) Interchange Modification	I-65 at SR 99 (US-412)		Interchange Modification	0.0	Maury	South
S-20	I-65 at SR 11/US 31A (Exit 22)	I-65 at SR 11/US 31A (Exit 22)		NB/SB Signalized Intersection	0.0	Giles	South
S-21	I-65 at SR 15/US 64 (Exit 14)	I-65 at SR 15/US 64 (Exit 14)		NB/SB Signalized Intersection	0.0	Giles	South
S-22*	Main Street (SR-7)	Union Hill Road (Ardmore)	Morrow Road (Ardmore)	Safety Improvements	0.9	Giles	South

* Project included on IMPROVE Act project list

Table ES-7. ITS Improvements

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
0-1	Rapid Incident Scene Clearance (RISC)	Kentucky	Alabama	Contractual incentive-based program and operational policy to support open roads initiative related to truck crashes; North and South options	122.0	All	North, Central, and South
0-2	Conversion to Virtual Weigh Stations	Kentucky	Alabama	Portland weigh station	122.0	All	North, Central, and South
0-3	Smart Truck Parking	Kentucky	Alabama	Location TBD; Potential sites include the existing rest areas near Exit 22, Exit 46, and the Kentucky state line	122.0	All	North, Central, and South
0-4	I-65 Traffic Incident Management (TIM) Team	Kentucky	Alabama	North and South options	122.0	All	North, Central, and South
0-5	I-65 North ITS	Exit 108	Kentucky border	Install CCTV, DMS, and detection devices including fiber optic connections on I-65; Suggested DMS locations: SR-25/Main St (Exit 112) NB and SB, and SR-52 (Exit 117) SB.	13.0	Sumner	North
0-6	Connected Vehicle Technology Deployment	I-840	SR-76 (Exit 108)	Install DSRC radios	49.0	Davidson, Robertson, Sumner, and Williamson	North and Central
0-7	Adaptive Ramp Metering (ARM)	Exit 108 (SR-76)	Exit 90 (SR-155)	Install adaptive ramp metering devices and additional detection at 6 ramp locations in each direction	18.0	Davidson, Robertson, and Sumner Counties	North and Central
0-8	Adaptive Ramp Metering (ARM)	Exit 88 (I-24)	Exit 80 (US-440)	Install adaptive ramp metering devices and additional detection at 6 ramp locations in each direction	8.0	Davidson	Central
0-9	Dynamic on-ramp assignment - Southbound	Charlotte Ave	I-40/I-65 Split	Add arterial DMS along 14th Ave, add interstate shields or use gantries for junction pre-positioning on on-ramps and interstate facilities	1.0	Davidson	Central
0-10	Dynamic on-ramp assignment - Northbound	Broadway (US-70A)	I-40/I-65 Split	Add arterial DMS along 14th Ave, add interstate shields and deploy lane control gantries for junction pre-positioning on on-ramps and interstate facilities	1.0	Davidson	Central
0-11	Adaptive Ramp Metering (ARM)	Exit 80 (US-440)	Exit 53 (SR-396)	Install adaptive ramp metering devices and additional detection at 9 ramp locations in each direction	27.0	Davidson and Williamson	Central and South
0-12	Active Arterial Management US 31 E/Gallatin Pike	Rivergate Pkwy	Spring Street	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	10.0	Davidson	North and Central
0-13	Active Arterial Management (AAM) Dickerson Pike	US-31 W/ Louisville Hwy	US-431/ Trinity Ln	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	10.0	Davidson and Sumner	North and Central
0-14	Active Arterial Management (AAM) Franklin Rd	Demonbreun	Mack Hatcher	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	18.0	Davidson and Williamson	Central
0-15	Active Arterial Management (AAM) Nolesville Pike (US-41)	Korean Veterans Blvd	Old Hickory Blvd	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	9.0	Davidson	Central

Table ES-7. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
O-16	Active Arterial Management (AAM) Old Hickory Blvd	Hillsboro Rd (US-431)	US-41	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	15.0	Davidson	Central
O-17	Active Arterial Management (AAM) Hillsboro Rd (US-431)	Broadway (US-70A)	Mack Hatcher	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	16.0	Davidson and Williamson	Central
O-18	Active Arterial Management (AAM) Nolensville Pike (US-41)	I-840	US-231/ Colloredo Blvd/Lane Pkwy	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	28.0	Williamson, Rutherford, and Bedford	South
O-19	I-65 South ITS	MM 57.6	Alabama border	Install CCTV, DMS, and detection devices including fiber optic connections on I-65; Suggested DMS locations: SR-396/Saturn Pkwy (Exit 53) NB and SB, SR-50/New Lewisburg Hwy (Exit 37) NB and SB, and SR-11/Alt US-31/Sam Davis Hwy (Exit 22) NB.	67.0	Maury and Giles	South

Table ES-8. Freight Improvements

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
F-1	I-65 Weight Station near TN/KY State Line	N/A	N/A	Roadway Reconstruction and New Weigh Station	0.0	Sumner	North
F-2	I-65	Northbound direction - Diverging area of I-40 and I-65 (West of Nashville Loop)		Diverging area geometry correction - Adding lane(s)	0.2	Davidson	Central
F-3	I-65	Nortbound direction - Merging area of I-40 and I-65 (South of Nashville Loop)		Merge area geometry correction - Adding lane (s)	0.3	Davidson	Central
F-4	Ramp Improvement	Northbound ramp from I-24 to Hermitage Ave		Diverging area geometry correction - Adding lane(s)	0.2	Davidson	Central
F-5	Harding Place (SR-255)	McGavock Pike	Donelson Pike	Widening	0.4	Davidson	Central
F-6	Old Hickory Blvd (SR-254)	I-65	Nolensville Road (US-41A/SR-11)	Widening	4.1	Davidson	Central
F-7	Harding Place (SR-255)	Nolensville Road (US-41A/SR-11)	Jonquil Drive	Widening	0.5	Davidson	Central
F-8	I-65 (NB only)	Rivergate Parkway	US-31W/SR-41	Widen from 4/6 to 8 lanes	5.7	Davidson and Sumner	Central
F-9	I-65/I-24	I-24 junction, south of Fern Avenue	Trinity Lane (US-431)	Replace underpass to accommodate 6 lanes in each direction	1.7	Davidson	Central
F-10	I-65/I-40	I-65 junction (east of Demonbreun Street)	I-40 junction (west of Charlotte Avenue)	Widen to 8 lanes	4.3	Davidson	Central
F-11	I-65	Harding Place (SR-255)	I-40	Widen from 6 to 8 lanes	9.7	Davidson	Central

Table ES-9. Transit Improvements

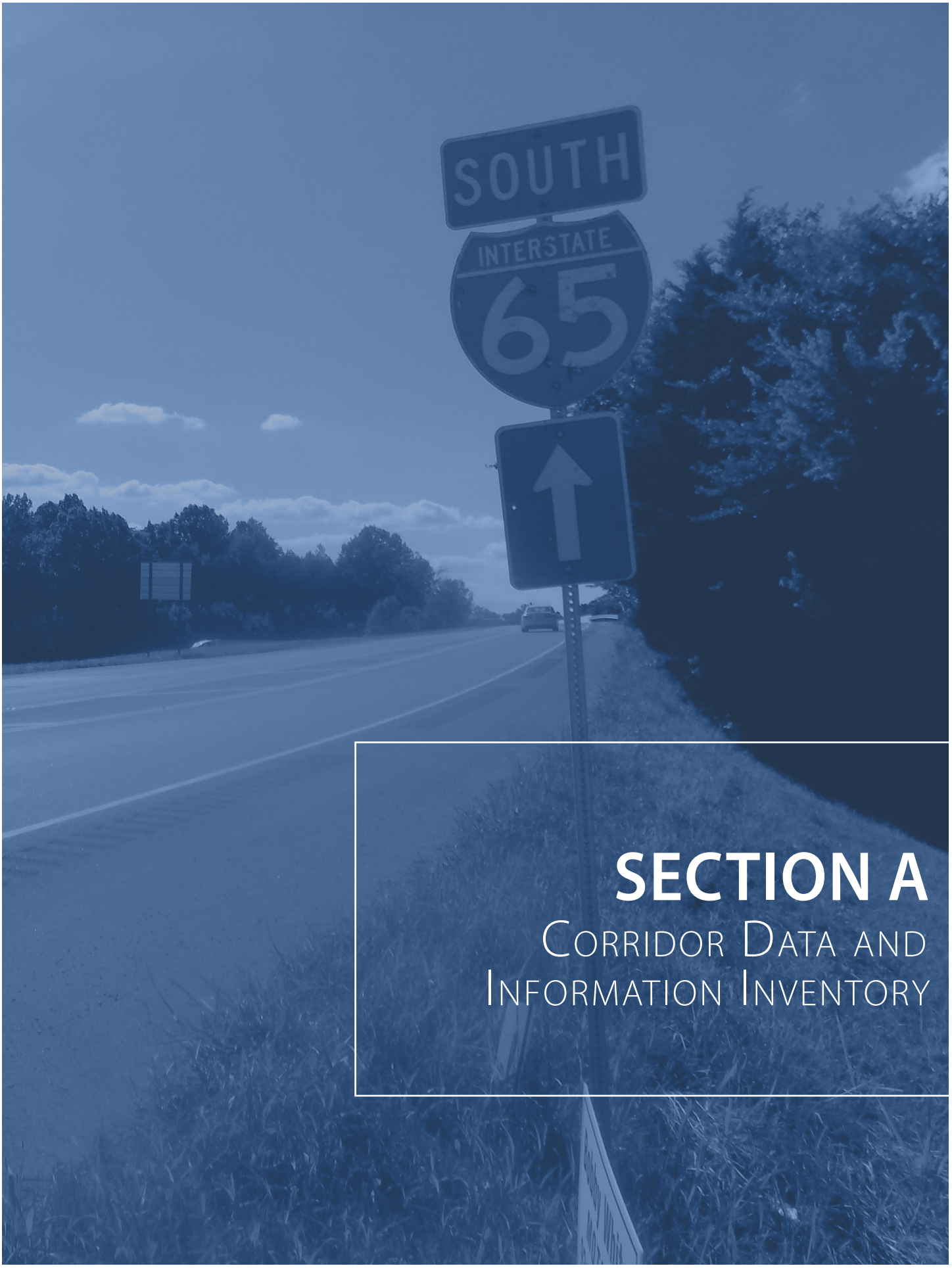
ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
T-1	NET Corridor Regional Express Bus Service	Several routes between Nashville and Gallatin		Provide new and expanded service to Sumner County, including additional express trips, additional service hours, and new park-and-ride opportunities	29.0	Davidson and Sumner	North
T-2	White House Express Service	SR-76	SR-386	Widening and strengthening of shoulders to 12-ft for bus on shoulder service. Further study of ramp metering for SR-174 (Long Hollow Pike), US-31W, and SR-257 (Bethel Road) to determine if necessary for safe routing	12.4	Robertson	North
T-3-5	I-65 North Freeway BRT Stations (3)	Goodlettesville	Gallatin	Construction of freeway BRT transit stop and park-and-ride lot	0.0	Davidson and Sumner	North
T-6	NET Corridor Interchange 2	Vietnam Veterans Pkwy (SR-386) at Conference Drive		Interchange modification for Traffic NB onto Conference Drive	0.0	Davidson	Central
T-7	NET Corridor Interchange 1	Vietnam Veterans Pkwy (SR-386) at I-65		Interchange modification WB to NB and SB to EB Traffic	0.0	Davidson	Central
T-8	Rapid Bus Service - Route 80R Gallatin	Outer end of Gallatin Pike LRT	Gallatin	Provide new rapid bus service to Gallatin	15.6	Davidson/ Sumner	Central
T-9	US-31E (Gallatin Pike) LRT	Downtown Nashville	Conference Drive	Construction of light-rail transit along US-31E (Gallatin Pike)	12.0	Davidson	Central
T-10	Dickerson Pike (US-31W) BRT	Hunters Lane	Downtown Nashville	Construction of bus rapid transit amenities along US-31W (Dickerson Pike). Project include dedicated bus lanes and improved pedestrian facilities.	7.2	Davidson	Central
T-11	Nolensville Pike (US-31A) LRT	Downtown Nashville	Lenox Village Drive	Construction of light rail transit along US-31A (Nolensville Pike)	8.8	Davidson	Central
T-12	Rapid Bus Service - Route 81R Nolensville	Outer end of Nolensville Pike LRT	Nolensville	Provide new rapid bus service to Nolensville	7.2	Davidson/ Williamson	Central
T-13-18	I-65 South Freeway BRT Stations (6)	Downtown Nashville	Franklin	Construction of freeway BRT transit stop and park-and-ride lot	0.0	Davidson and Williamson	Central/ South
T-19	Transit-Pedestrian Network Improvements	Various Locations		Construction of transit-supportive pedestrian amenities, including sidewalks, landscaping, lighting, crosswalks, and ADA ramps	0.0	Davidson and Williamson	Central
T-20	Rapid Bus Service - Route 81R Nolensville	Nolensville	Murfreesboro Road (SR-96)	Provide new rapid bus service to Triune	7.0	Williamson	Central
T-21	Rapid Bus Service - Route 86R Smyrna/ LaVergne	Downtown Nashville	Smyrna/ LaVergne	Provide new rapid bus service to Smyrna and LaVergne	24.7	Davidson/ Rutherford	Central
T-22	Rapid Bus Service - Route 96R Murfreesboro	Downtown Nashville	Murfreesboro	Provide new rapid bus service to Murfreesboro	35.7	Davidson/ Rutherford	Central
T-23	Franklin to Mufreesboro Express Bus Service	Routes between Franklin and Mufressboro		Provide new service express service to from Franklin (Cool Springs) to Murfreesboro	26.0	Williamson and Rutherford	Central
T-24	South Corridor Regional Express Bus Service	Several routes between Nashville, Franklin, Spring Hill, and Columbia		Provide new and expanded service to Williamson and Maury County, including additional express trips, reverse commute trips, additional service hours, and new Park-and-Ride opportunities	43.0	Maury and Williamson	Central and South
T-25	Rapid Transit/Managed Lanes between Nashville and Franklin	Downtown Nashville	Murfreesboro Road (SR-96)	Construction of managed lanes for freeway Bus Rapid Transit along I-65 from Nashville to Murfreesboro Road (SR-96)	18.6	Davidson and Williamson	Central/ South

Table ES-10. Walking and Bicycling Improvements

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
B-1	New Shackle Island Road (SR-258)	Johnny Case Parkway (US-31E)	Long Hollow Pike (SR-174)	Construction of Buffered Bike Lanes	5.2	Sumner	North
B-2	Johnny Cash Parkway/East Main Street (US-31E)	Big Station Camp Road	Center Point Road South	Construction of Paved Shoulders	8.8	Sumner	North
B-3	US-41 (Dickerson Pike)	US-431 (Trinity Lane)	Hart Lane	Safety - Construction of sidewalks along US-41. Project includes landscaping, crosswalks, and pedestrian amenities.	2.0	Davidson	Central
B-4	US-431 (Trinity Lane)	US-431 (Whites Creek Pike)	US-41 (Dickerson Pike)	Safety - Reconstruction of sidewalks along US-431 (Trinity Lane). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	1.3	Davidson	Central
B-5	Clarksville Pike (SR-12)	Ashland City Highway (SR-12)	Rosa Parks Boulevard (US-41 Alt)	Construction of Bike Lanes	1.1	Davidson	Central
B-6	Rosa Parks Boulevard (SR-12)	Buchanan Street	James Robertson Parkway (US-31)	Construction of Separated Bike Lanes	1.2	Davidson	Central
B-7	James Robertson Parkway (US-31)	Rosa Parks Blvd (SR-12)	Church Street	Construction of Separated Bike Lanes	0.5	Davidson	Central
B-8	US-70 (Charlotte Pike)	14th Avenue North	George L. Davis Blvd.	Safety - Pedestrian improvements at interchange of US-70 and I-40/I-65. Project includes landscaping, lighting, crosswalks, in-roadway warning lights at ramps, and pedestrian amenities.	0.1	Davidson	Central
B-9	Rosa Parks Blvd/ 8th Ave S.(US-31)	Church Street	Korean Veterans Boulevard	Construction of Separated Bike Lanes	0.5	Davidson	Central
B-10	Broadway (US-70)	1st Avenue	14th Avenue North	Construction of Separated Bike Lanes	1.0	Davidson	Central
B-11	US-431 (Broadway)	George L. Davis Blvd.	14th Avenue South	Reconstruction of sidewalks along US-431 (Broadway). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	0.1	Davidson	Central
B-12	Lafayette Street (US-31)	8th Avenue S (US-31)	Fairfield Avenue	Construction of Separated Bike Lanes	1.3	Davidson	Central
B-13	8th Avenue South (US-31)	Korean Veterans Boulevard	Bradford Avenue	Construction of Separated Bike Lanes	1.8	Davidson	Central
B-14	SR-109	I-40	I-840	Network - Construction of shared roadway facility	4.0	Wilson	Central
B-15	US-41 (Lafayette Street)	US-31 Alt/SR-11	1st Avenue South	Safety - Reconstruction of sidewalks along US-41 (Lafayette Street). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	0.3	Davidson	Central
B-16	SR-254 (Old Hickory Blvd)	Franklin Pike Circle	Franklin Pike	Safety - Reconstruction of sidewalks along SR-254 (Old Hickory Blvd). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	0.5	Davidson	Central
B-17	Main Street/Carters Creek Pike (SR-246)	Southall Road	Natchez Street	Construction of Multi-Use Path	3.1	Williamson	Central
B-18	Concord Road (SR-253)	Franklin Road (US31/SR 6)	Wilson Pike (SR-252)	Construction of Multi-Use Path	1.7	Williamson	Central

Table ES-10. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
B-19	Nolensville Road (SR-11)	Burkitt Road	I-840	Network - Construction of on-road or off-road bicycle facilities	10.6	Williamson	Central
B-20	Franklin Road (US31/SR 6)	Concord Road (SR-253)	Maryland Way	Construction of Multi-Use Path	2.6	Williamson	Central
B-21	SR-441 (Moore's Lane)	Mallory Lane	Carrothers Parkway	Network - Construction of on-road facility or multi-use trail	0.8	Williamson	Central
B-22	Franklin Road (US31/SR 6)	SR-441 (Moore's Lane)	Harpeth River Bridge	Construction of Multi-Use Path; Can be constructed in concert with H-37	3.7	Williamson	Central
B-23	Mack Hatcher Pkwy (SR-397)	Hillsboro Road (SR-106/US-431)	Franklin Road (Sr-6/US-31)	Construction of Multi-Use Path	1.5	Williamson	Central
B-24	Wilson Pike (SR-252)	McEwan Drive	Trinity Lane	Network - Construction of Multi-Use Path	2.9	Williamson	Central
B-25	Mack Hatcher Pkwy (SR-397)	South of SR-96	US-431 (SR-106)	Construction of Multi-Use Path; Can be constructed with in concert with H-28	3.3	Williamson	Central
B-26	Hillsboro Road (SR-106/US-431)	Mack Hatcher Pkwy (SR-397)	Del Rio Pike	Construction of Bike Lanes with Sidewalks	1.0	Williamson	Central
B-27	SR-96	7th Ave North	Old Charlotte Pike	Construction of Multi-Use Path	4.4	Williamson	Central
B-28	SR-96	Harpeth River Bridge	Arno Road	Construction of Multi-Use Path; Portion could be constructed in concert with B-5	3.9	Williamson	Central
B-29	SR-96 (Murfreesboro Road)	Southwinds Drive	Carothers Parkway	Safety - Construction of sidewalks or multi-use path along SR-96. Project includes landscaping, crosswalks, and pedestrian amenities.	1.0	Williamson	Central
B-30	Mack Hatcher Pkwy (SR-397)	SR-96 east of Franklin	Columbia Pike (US-31/SR-6) south of Franklin	Network - Construction of Multi-Use Path; Can be constructed with in concert with H-30	3.2	Williamson	Central
B-31	Columbia Pike (US-31/SR-6)	Fowlkes Street	Mack Hatcher Pkwy (SR-397)	Construction of Bike Lanes; Can be constructed in concert with H-31	1.9	Williamson	Central
B-32	Wilson Pike (SR 252)	Concord Road (SR-253)	Church Street East	Construction of Multi-Use Path	2.6	Williamson	Central
B-33	SR-96 (Murfreesboro Rd)	East of Arno Road	Veterans Pkwy	Network - Construction of on-road or off-road bicycle facilities	18.3	Williamson/ Rutherford	Central
B-34	Columbia Pike (US-31/SR-6)	Goose Creek Bypass	Mack Hatcher Parkway (SR-397)	Construction of Multi-Use Path	3.9	Williamson	Central
B-35	Goose Creek Bypass (SR-248)	Columbia Pike (US-31/SR-6)	Long Lane	Construction of Bike Lanes with Sidewalks	4.1	Williamson	Central
B-36	US-31	SR-248 (Goose Creek Bypass)	North of Buckner Lane	Network - Construction of bike lane(s) or multi-use path	3.8	Williamson	Central
B-37	Buckner Road	Columbia Pike (SR-6/US-31)	Buckner Lane	Network - Construction of bike lane(s) or multi-use trail; can be constructed in concert with H-24	1.9	Williamson	Central
B-38	Buckner Road	Buckner Road/I-65 Interhchange	Lewisburg Pike (SR-106/US-431)	Network - Construction of bike lane(s) or multi-use trail; can be constructed in concert with H-22	2.1	Williamson	Central
B-39	US 31	Buckner Road	Carters Creek Station Road	Construction of Bike Lanes	6.2	Maury/ Williamson	Central/ South
B-40	SR-247 (Duplex Road/ Beechcroft Rd.)	I-65	SR-246 (Carters Creek Rd.)	Construction of Multi-Use Path	7.8	Williamson	Central



SECTION A
Corridor Data and Information Inventory

SECTION A: CORRIDOR DATA AND INFORMATION INVENTORY

1. Introduction

The interstate system carries a disproportionate amount of traffic and freight in Tennessee. Representing just over one percent of all centerline mileage in the state, the interstate system supports roughly 30 percent of all vehicle miles traveled (VMT) and 80 percent of all truck VMT in the state. The dynamic role that the Interstate 65 (I-65) corridor plays in interregional travel in Tennessee will only continue to expand. The Middle Tennessee region is projected to add another one million people over the next 20 years and communities throughout the corridor will continue to rely on the interstate to fuel economic growth. How the I-65 corridor should develop as a multimodal corridor, then, will become an increasingly important question to answer.

The purpose of the I-65 Multimodal Corridor Study is to examine potential multimodal transportation improvements that would address existing and emerging transportation system issues associated with this corridor, which serves Middle Tennessee and rural counties north and south near the Kentucky and Alabama state lines. The planning process for the study focuses on three primary tasks:

1. Identification of existing deficiencies and future needs through the year 2040;
2. Development and refinement of feasible multimodal solutions; and
3. Prioritization and phasing of recommendations.

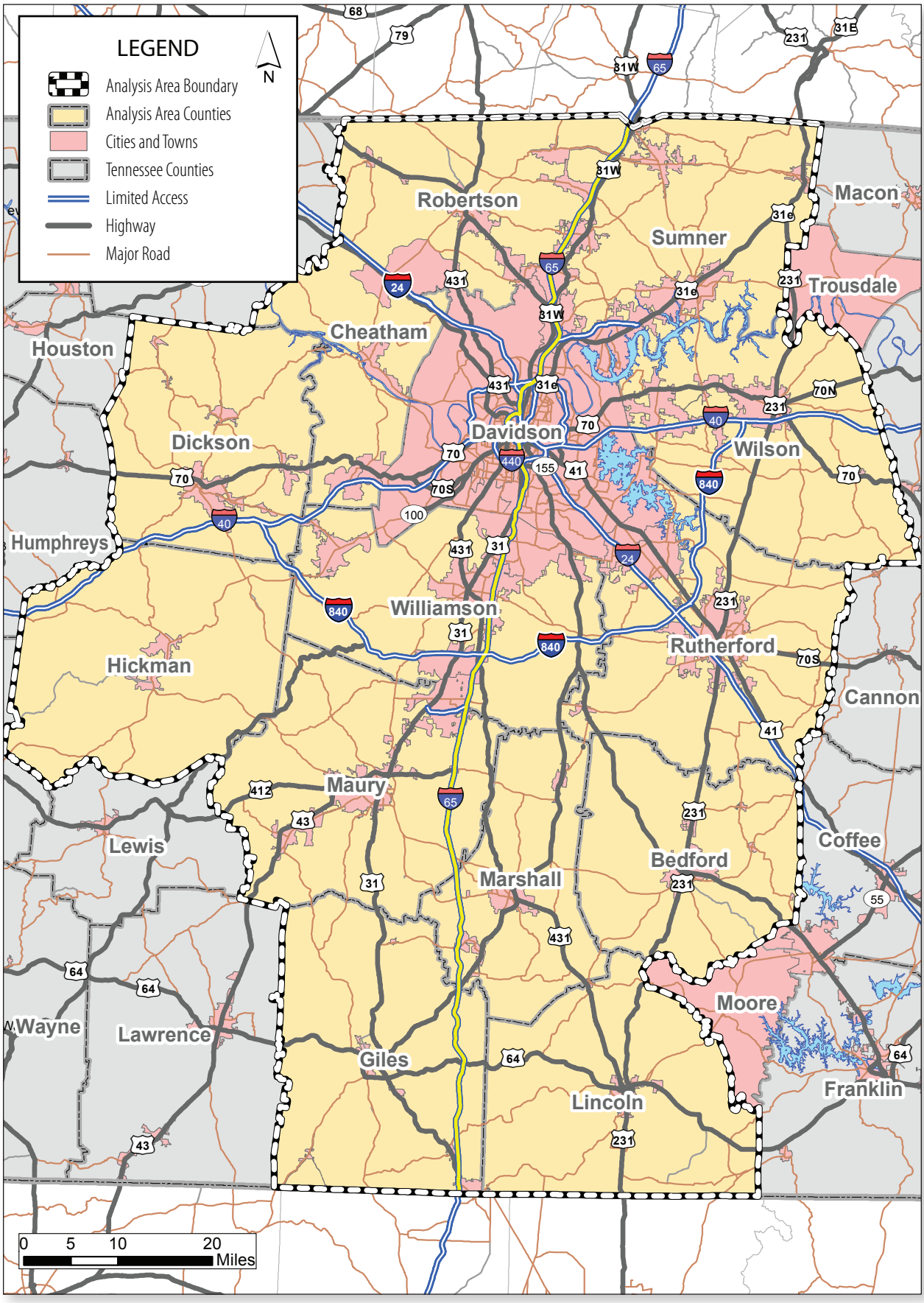
The study's findings and recommendations will directly inform the Tennessee Department of Transportation's (TDOT) planning and project development processes.

1.1 Purpose of Corridor Data and Information Inventory

The I-65 Multimodal Corridor Study is a complex undertaking. Spatial and tabular data, policies, plans, and studies are needed from multiple local, regional, state, and federal agencies. In order to ensure that the study utilizes the most current and appropriate data and information, this section highlights both the data sources being used and the base information for different system elements. The information will set the stage for the analytical discussions of existing and future transportation system deficiencies in the study's subsequent task. Following are descriptions of the data and high-level overviews of system information where applicable. The project study area is shown in Figure 1-1.



Figure 1-1. I-65 Corridor Study Area



2. Previous and Current Plans and Studies

Transportation and land use are inherently interconnected and interdependent. Decisions regarding one will inevitably influence the policy and investment decisions of the other. The I-65 Multimodal Corridor Study recognizes this connection and includes a review of both transportation and land use plans as part of the systems inventory and data collection process. While local land use planning is outside of the purview of TDOT, decisions made at the state, regional, and local levels impact and influence one another. Analysis and proposed improvements in this study will be evaluated in light of related state, regional, and local planning activities.

Transportation and land use plans, programs, and studies within the study area were compiled and reviewed. The TDOT and the Nashville Area Metropolitan Planning Organization's (MPO) Long Range Transportation Plans (LRTP) and Transportation Improvement Programs (TIP) were reviewed to identify projects and studies in the vicinity of the I-65 corridor. Additionally, regional transportation and land use studies were examined to determine other long-term project recommendations that may not yet be reflected in the LRTPs or TIPs. Table 2-1 shows the complete list of previous and current plans, programs, and studies.



Table 2-1. Previous and Current Plans, Programs, and Studies

State and Regional Plans, Programs, and Studies	Local Transportation Plans and Studies	Local Land Use/ Comprehensive Plans
• Nashville Area MPO 2016-2040 Regional Transportation Plan (2015) • Nashville Area MPO Southeast Area Transportation and Land Use Study (2016) • Nashville Area MPO Southwest Area Transportation and Land Use Study (2010) • Nashville Area MPO Transportation Improvement Program, 2014-2017 (2013) • Nashville Area MPO Tri-County Transportation and Land Use Study (2010) • Nashville Area MPO Regional Bicycle and Pedestrian Study (2008) • TDOT 25-Year Long Range Transportation Plan (2015) • TDOT Transportation Improvement Program, 2014-2017 (2013) • TDOT Statewide Multimodal Freight Plan (2018)	• City of Lebanon, City of Mt. Juliet, Wilson County: Bicycle and Pedestrian Master Plan (2002) • Cool Springs Multimodal Transportation Network Study (2015) • Nashville Metropolitan Transit Authority/ Regional Transportation Authority Strategic Plan: nMotion (to be completed 2016) • Metro Nashville and Davidson County Access Nashville 2040 (2015) • Spring Hill Bicycle and Greenway Plan (2015) • Williamson County Major Thoroughfare Plan Update (2011)	• Brentwood 2020 Plan Update (2008) • City of Portland Future Land Use Plan • Franklin Land Use Plan (2004) • Maury County Comprehensive Plan (2011) • Metro Nashville and Davidson County NashvilleNext (2015) • Robertson County 2040 Comprehensive Growth and Development Plan (2013) • Rutherford County Comprehensive Plan (2011) • Spring Hill Comprehensive Plan (2011) • Sumner County 2035 Comprehensive Plan (2010) • Thompson's Station General Plan • White House Comprehensive Plan 2025 (2008) • Williamson County Comprehensive Land Use Plan (2007) • Wilson County Land Use Master Plan (2006)

3. Existing Data and Information

3.1 Transportation Capacity, Travel Demand, and Congestion

Evaluating roadway performance, capacity, travel demand, and congestion are critical topics for understanding the existing and projected conditions in the I-65 corridor.

Existing Highway Network

Geographic Information System (GIS) files for all streets in the study area are from the US Census 2010 Streets. This dataset contains only basic attributes such as road name and functional classification, but does provide a helpful network showing all public roads down to local streets. In addition, TDOT provided Transearch Data, which includes highway and rail network geometrics. The highway data includes road names, cardinal direction headings, number of lanes, and functional class, and the rail data includes owner and classification. TDOT also provided highway ramp GIS files detailing ramp length. Highway Performance Management System (HPMS) data was obtained from TDOT and describes roadway performance and geometric characteristics. Finally, existing Intelligent Transportation Systems (ITS) facilities and resources were provided by TDOT.

Existing Travel Volumes

Average annual daily traffic (AADT) counts were provided by TDOT for streets classified as minor arterials and above. AADT volumes along the I-65 corridor range from 18,460 vehicles per day near the Alabama-Tennessee state line to 172,400 vehicles per day near Nashville. Traffic counts are available for the 10 counties in the study area surrounding I-65. TDOT further provided truck traffic counts by classification and American Transportation Research Institute (ATRI) origin-destination traffic volumes for freight movement in the study area. InfoUSA employment and business establishment data was obtained from TDOT, which details the square footage, NAICS employment codes, sales volume, office size, and number of employees (by range) for every business in the study area.

Existing Areas of Travel Congestion

The study will utilize two travel demand models (TDM) to analyze existing and future travel demand. The Nashville Area Metropolitan Planning Organization's (MPO) TDM analyzes Metro Nashville-Davidson County and surrounding counties, including Maury, Robertson, Rutherford, Sumner, Williamson, and Wilson. The MPO TDM forecasts travel in years 2010 and 2015 using TransCAD version 6. The following counties fall outside of the MPO's limits: Cheatham, Dickson, Hickman, Marshall, Bedford, Giles, and Lincoln. The Tennessee Statewide Travel Model (TSTM) from TDOT will be used to analyze the counties outside of the MPO's limits. The TSTM has a base year of 2010, and also runs in TransCAD. Figure 3-1 displays the data coverage of the MPO TDM model. Again, data for counties outside of this coverage area will be obtained from the TSTM. TDOT will issue an update of the TSTM in the summer of 2016, after the publication date of this report. Data and output from the new model will be incorporated into the study where applicable.

During future work tasks, the analysis will rely on the travel models plus data from the National Performance Management Research Data Set (NPMRDS), Air Sage data, and crash data provided by TDOT. The NPMRDS comes with a GIS shapefile identifying Traffic Management Center (TMC) locations, and a table of average travel time between different sites. The Air Sage data provides origin-destination traffic volumes for the study area. TDOT provided crash data for 2015 and 2016 for the 10 counties in the study area surrounding I-65.

3.2 System Operations and Maintenance

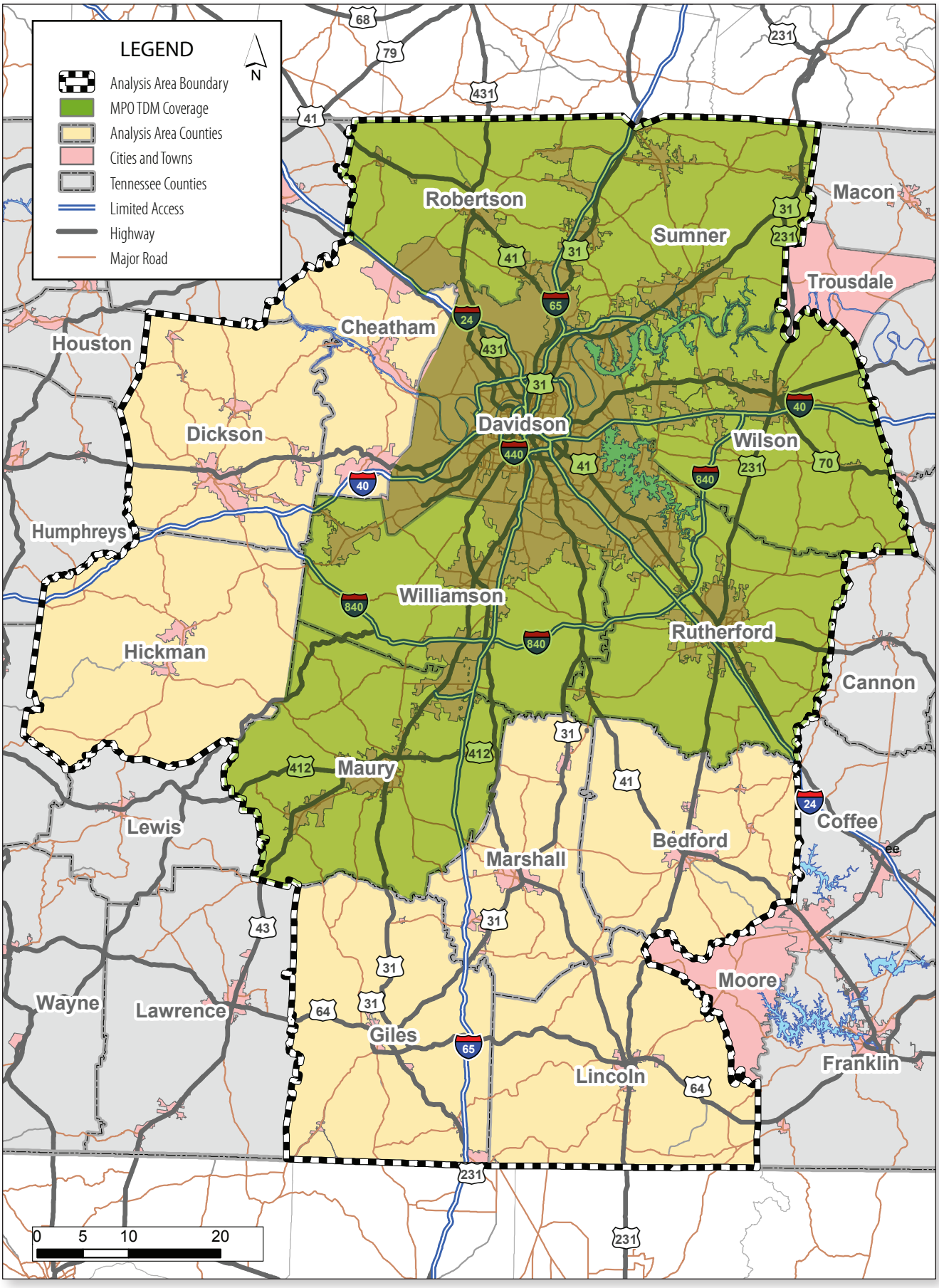
A high level of coordination among various agencies and jurisdictions is required to ensure the proper operation and maintenance of the transportation system.

Jurisdictions and Coordination

TDOT coordinates with various local, state, and federal agencies to accomplish a number of operations and maintenance objectives. These include signage and marking, emergency management planning, facility maintenance, and systematic inspections. Highlighted below are some of the major coordination activities.

The Regional Operations Office in each of the four TDOT Regions are responsible for directing

Figure 3-1. MPO TDM Coverage



operations and maintenance activities. Operations and maintenance responsibilities at the regional level include highway maintenance and repair, bridge inspection and repair, traffic and highway pavement markings, materials and testing, highway beautification, traffic engineering, incident response, and intelligent transportation systems.

The Maintenance Policy Office of TDOT is responsible for developing and refining the procedural guidelines for field maintenance activities. The guidelines ensure high quality and uniformity of maintenance activities within TDOT right-of-way. The guidelines are supported by national best management practices and effective procedures from peer departments. The office also coordinates special maintenance programs such as the Emergency Preparedness Plan, Vegetation Management Program, and other special programs. The office works with the TDOT Environmental Compliance Office on issues related to Municipal Stormwater Sewer System documents and other environmental issues as needed.

Local maintenance contracts are agreements with local agencies for maintenance of the paved surface on state-owned highways that fall within urban local jurisdiction limits. Through these contracts, an agreement between the local jurisdiction and the state ensures that maintenance of the roadway will be completed by the local jurisdiction on behalf of the state. Municipalities and counties within the study area with maintenance contracts in place are:

- La Vergne
- Lebanon
- Metropolitan Nashville-Davidson County
- Pulaski
- Rutherford County
- Shelbyville
- Smyrna

TDOT also coordinates with state and federal agencies in the development and implementation of transportation safety, security, and resiliency programs and projects. While multiple divisions of the department coordinate externally, the coordination flows through a single conduit, TDOT's Office of Emergency Management. The TDOT Office of Emergency Management and the TDOT coordinator stationed at the Tennessee Emergency Management Agency (TEMA) are responsible for emergency preparedness coordination with external agencies.

ITS Features and Operation

Intelligent Transportation Systems (ITS) improve transportation safety and mobility and enhance productivity through advanced management and communication technologies. TDOT's Intelligent Transportation System, referred to as TDOT SmartWay, uses live video cameras to monitor highways from TMCs across the state, sensors to gauge traffic flow, and large electronic message boards to provide urgent traffic notices and safety messages to drivers. The primary ITS program components include the following:

- Camera video surveillance by way of closed-circuit television (CCTV) that monitors congested freeways and provides improved incident management capabilities;
- Radar and video detection systems that monitor traffic flow and help calculate travel times for routes;
- Roadway traffic sensors that report traffic counts, speed, and travel time;
- Dynamic Message Signs (DMS) mounted over interstate travel lanes that provide traffic and construction information to motorists, as well as other key messages about driving;
- TMCs that serve as focal points for traffic management operations and communications in Memphis, Nashville, Chattanooga, and Knoxville;
- HELP freeway service patrols that reduce congestion by removing minor incidents in a timely fashion in the four urban areas;
- TN 511, a voice activated phone system, that provides up to date traffic information about conditions on Tennessee roadways as well as weather information from the National Weather Service;
- The Smartway mobile app, which provides real-time traffic information to the traveling public.; and
- An extensive fiber-optic and wireless communications and power network that connects and communicates all elements of the system.

The Nashville Area Regional ITS Architecture is coordinated with the statewide architecture and was developed through the Nashville Area MPO in June of 2010. This regional ITS architecture provides a framework for implementing ITS projects, encourages interoperability and resource sharing among agencies, identifies applicable standards to apply to projects,

and allows for cohesive long-range planning among regional stakeholders. Any ITS project in the Nashville region must show conformance with this regional ITS architecture in order to be eligible for federal funding. The Nashville Area MPO will be updating the Regional ITS Architecture in 2016.

To meet the growing needs of motorists, TDOT continues to expand the SmartWay system. The following SmartWay expansion projects for I-65 in TDOT Region 3 (Middle Tennessee) are currently under construction as of April 2016.

- North of Nashville - Davidson, Sumner, Robertson Counties – from Milemarker (MM) 96.6 to 110.2 (13.6 miles) - adding 9 CCTV and 4 DMS
- South of Nashville - Davidson, Williamson Counties – from MM 57.6 to 76 (includes I-840 MM 50 to 57) (25.4 miles) –adding 13 CCTV and 4 DMS and 29 RDS

HELP Program routes ultimately share the same boundaries as the rest of the TDOT SmartWay system. Region 3 HELP currently consists of 24 highway response operators staffing six major established high-volume routes. The proposal of three additional routes under this expansion will allow two of the heaviest traveled corridors to be extended where daily traffic is in excess of 90,000 vehicles per day. The proposed routes include:

- I-65 north of Nashville - extend coverage to mile marker 110 in Robertson and Sumner County
- I-65 south of Nashville - extend coverage to end at Exit 65 (SR 96) in Franklin, Williamson County

With the pending completion of the two current system expansion projects, the I-65 SmartWay system will extend from Milemarker 110.2 (approximately two miles north of Exit 108 at SR 76) to Milemarker 57.6 (approximately one mile south of the I-840 interchange), a total distance of approximately 53 miles. ITS infrastructure included along these 53 miles of I-65 will include 62 CCTV cameras, 152 speed detectors, and 23 DMS. The current ITS system coverage of the I-65 corridor is shown in Figure 3-2.

Table 3-1. ITS Resources on I-65

ITS Resource	Count
TMC Operators	22
HELP Operators	24
HELP Vehicles	30
IT Technicians	3
Interstate Miles (SmartWay)	183
Interstate Miles (HELP Routes)	146
CCTV Cameras	178
Speed Detectors	234
Dynamic Message Signs (DMS)	70
Highway Advisory Radio (HAR) Transmitters	14
HAR Signs w/Beacons*	47
Portable Variable Message Signs (PVMS)	3

** HAR systems are in the process of being removed*

3.3 Multimodal Facilities and Services

Increasingly, transportation agencies across the nation are recognizing the important role of multiple transportation modes to achieve access and mobility goals.

Public Transportation and Transportation Demand Management

Public transportation throughout the I-65 study area is provided by a number of different fixed route, commuter, and demand response providers (Figure 3-3), including Nashville Metropolitan Transit Authority (MTA), Middle Tennessee Regional Transportation Authority (RTA), Transportation Management Association (TMA) Group, Franklin Transit Authority, Murfreesboro Rover, Mid-Cumberland Human Resource Agency (MCHRA), and South Central Tennessee Development District (SCTDD).

Metropolitan Transit Authority

The Nashville MTA provides public transportation services within Metropolitan Nashville-Davidson County. Nashville MTA currently operates 43 fixed route bus routes. In addition, the Nashville MTA provides door-to-door paratransit services, known as AccessRide, for seniors and people with disabilities in Davidson County within 1.5 miles of the fixed routes. Fares for local service are $1.70 with seniors and people with disabilities receiving a discounted rate of $0.85. Ridership on fixed routes totaled over 9.2 million in 2014. Demand response services provided nearly 406,000 passenger trips in 2014.

Figure 3-2. Nashville SmartWay, 2016

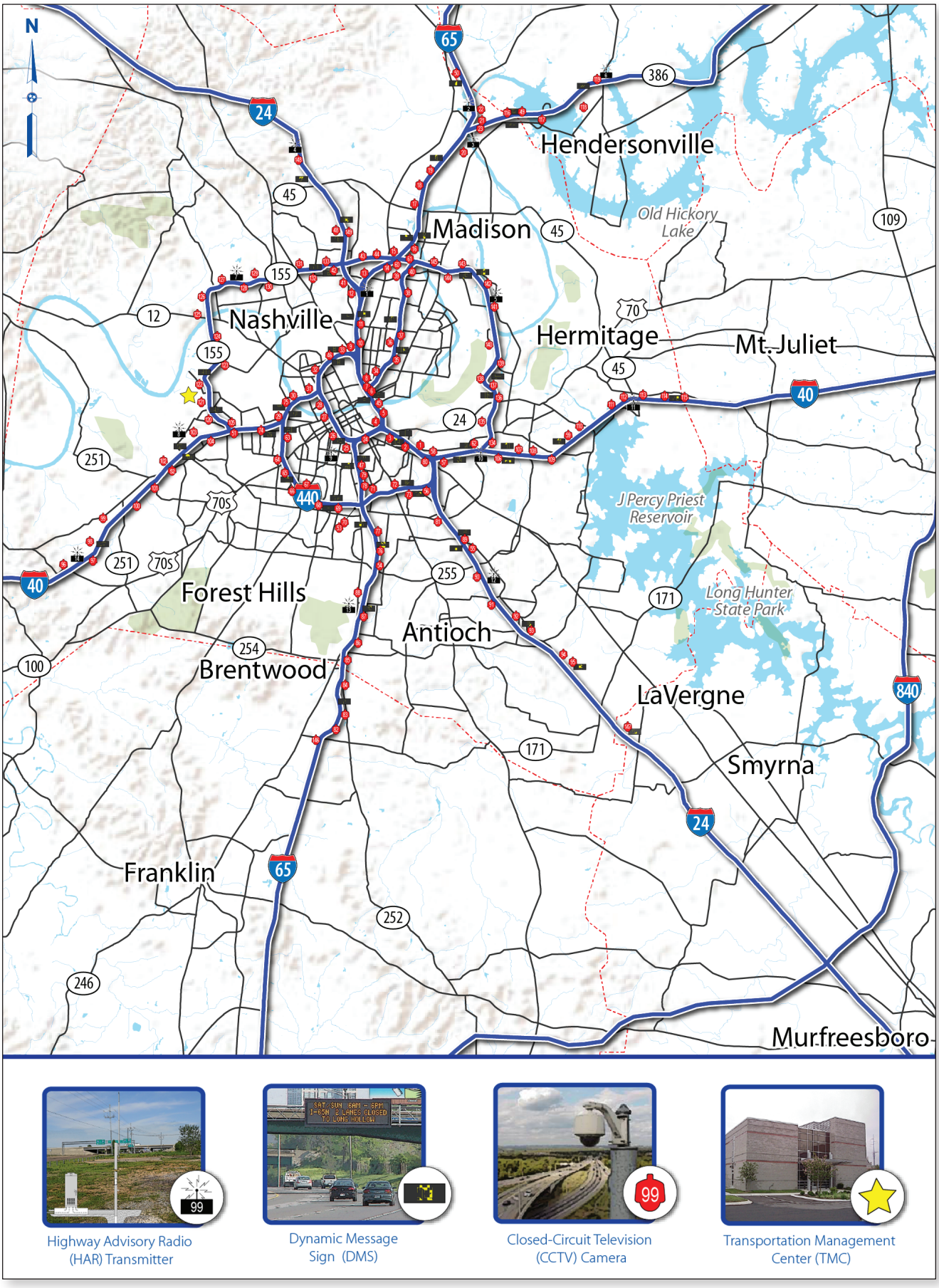


Figure 3-3. Public Transportation Providers and Routes

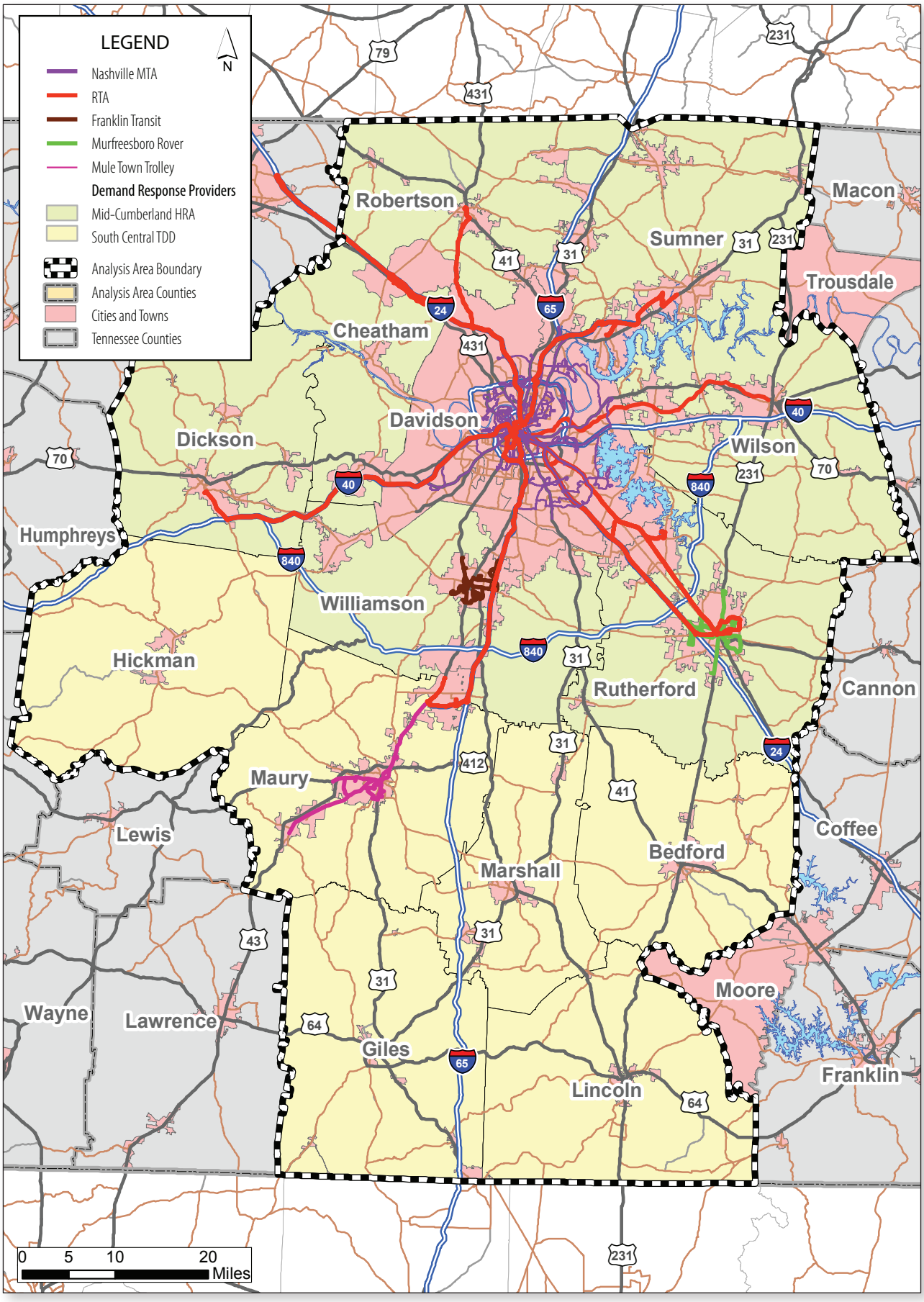
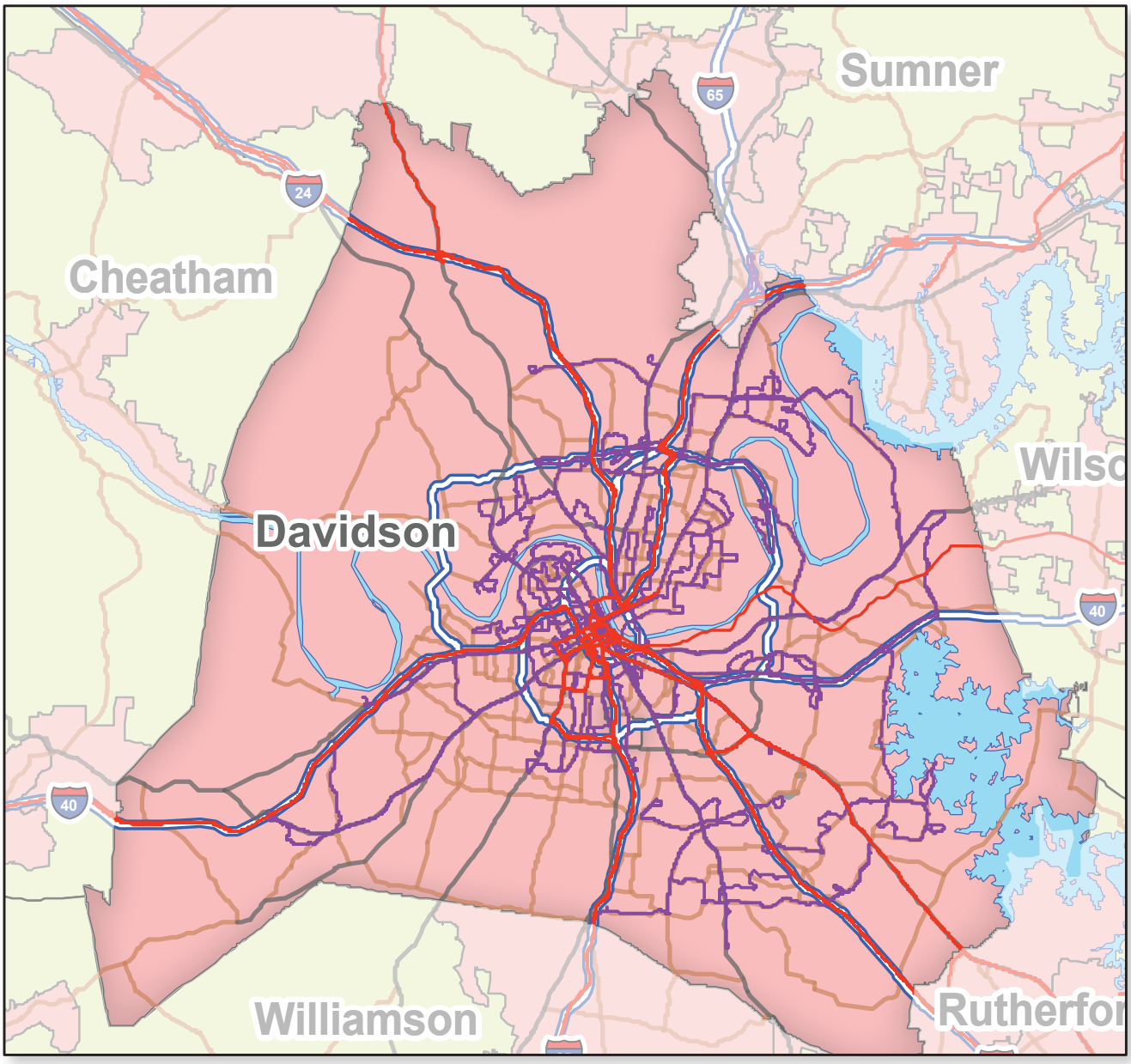


Figure 3-3b. Public Transportation Providers and Routes – Davidson Co.



Regional Transportation Authority

The RTA is a nine county authority that oversees the operation of a variety of regional commuter transit services including a commuter rail service. The RTA operates nine regional bus routes in collaboration with the Nashville MTA between downtown Nashville and Clarksville, Franklin, Gallatin, Hendersonville, Joelton, La Vergne, Murfreesboro, Smyrna, Springfield, Spring Hill, and Thompson's Station. Fares for all express routes are $4.25 each way. Ridership on all commuter bus routes totaled nearly 198,000 in 2014.

Two commuter fixed routes travel via I-65 north to and from Sumner County for a portion of their service:

- **87X – Gallatin Express** operates two morning trips to downtown Nashville and three afternoon trips from downtown Nashville each weekday; and
- **92X – Hendersonville Express** provides two morning trips to downtown Nashville and three afternoon trips from downtown Nashville each weekday.

Two commuter fixed routes travel entirely via I-65 south to and from Williamson County:

- **91X – Franklin Express** operates three morning trips to downtown Nashville and three afternoon trips from downtown Nashville each weekday.
- **95X – Spring Hill Express** provides two morning trips to downtown Nashville and two afternoon trips from downtown Nashville each weekday.

Finally, one commuter fixed route travels a portion of its route via I-65 to and from Robertson County:

- **89X – Springfield/Joelton Express** operates two morning trips to downtown Nashville and two afternoon trips from downtown Nashville each weekday.

In addition, the RTA's rideshare program organizes vanpools and carpools for commuters. Vanpool services provided approximately 178,000 passenger trips in 2014.

Additionally, both MTA and RTA operate park-and-ride lots throughout the region to serve commuters. These lots are shown in Figure 3-4

Transportation Management Association Group

The TMA Group provides transportation in fourteen middle Tennessee counties throughout the I-65 study area. The TMA Group operates and manages VanStar, a commuter vanpool service, on behalf of the RTA and Williamson County. The average cost to participate in a vanpool is $85.00 per month plus a percentage of actual fuel usage. The TMA Group provided nearly 63,000 passenger trips in 2014 through its vanpool service. There are no limitations on the origins or destinations of the van pools, provided that the trip passes through the Nashville Area MPO boundaries.

Franklin Transit Authority

The Franklin Transit Authority provides public transportation services in the Franklin area. Service is provided from 6:00 AM to 6:00 PM along three fixed routes. Transit On DemanD (TODD) is a pre-arranged, curb-to-curb service that also provides all-day, same-day access to Franklin's fixed route services. Both services are managed and operated by the TMA Group. Fares for local service are $1.00 with seniors and people with disabilities receiving a discounted rate of $0.50. Ridership on fixed routes totaled almost 50,000 in 2014. Meanwhile, demand response passenger trips were nearly 26,000 in 2014.

Mid-Cumberland Human Resource Agency

The MCHRA provides demand response public transportation services to 12 counties. Within the study area, MCHRA provides transportation to Cheatham, Dickson, Robertson, Rutherford, Sumner, Williamson, and Wilson counties. As a demand response system, riders must make advance reservations to use the service. Transportation services are available to anyone regardless of age or income on a first-call, first-served basis. MCHRA operates Monday through Friday from 6:00 AM to 6:00 PM. Fares vary depending on county of origin and destination. MCHRA provided over 267,000 passenger trips in 2014.

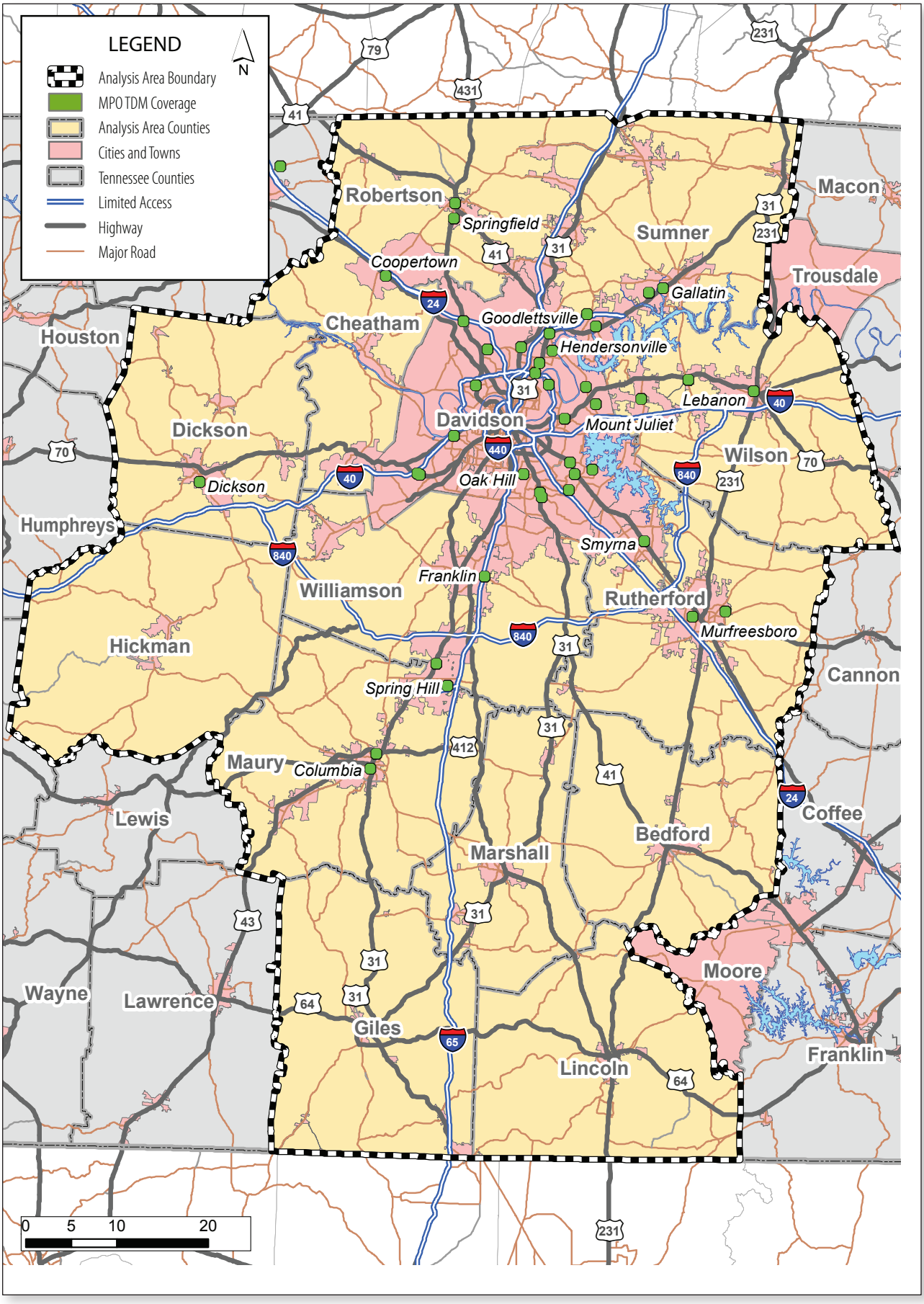
South Central Tennessee Development District

The SCTDD is an association of 35 municipal and 13 county governments in southern middle Tennessee. SCTDD contracts with transit agencies in each of the counties within the district to provide demand response services. Within the study area, SCTDD provides transportation to Bedford, Giles, Lincoln, Marshall, and Maury counties. Rural public transportation is available for everyone. Passengers must call their county transportation office at least 24 hours in advance for a reservation request. Service is provided within each county at a minimum of Monday through Friday from 6:00 AM until 6:00 PM. Fares vary depending on county of origin and destination.

SCTDD also offers deviated fixed route service for Maury County to surrounding areas. The service includes a total of four routes running hourly. Two routes provide services from the Columbia area to Mt. Pleasant and to Spring Hill. These routes connect to two routes in downtown Columbia. Deviated service is offered to anyone within 3/4 mile radius of the regular scheduled route. Fares for local service are $1.00 with seniors and people with disabilities receiving a discounted rate of $0.50. SCTDD provided over 271,000 passenger trips on their demand response and deviated route services in 2014.

Finally, SCTDD offers fixed route commuter bus service from Lawrenceburg to Nashville and Murfreesboro and from Linden to Nashville. Two daily round trips from Lawrenceburg to Nashville are made on Monday, Tuesday, Thursday, and Friday. Trips from Lawrenceburg to Murfreesboro are scheduled on Wednesdays. Round trip tickets range from $12.00 to

Figure 3-4. Regional Park & Ride Lots



$20.00 depending on origin and destination. SCTDD provided nearly 14,000 passenger trips on their commuter bus routes in 2014.

Bicycle and Pedestrian Facilities

Bicycle and pedestrian facilities expand travel options and support more efficient development patterns. Figure 3-5 shows the existing state bicycle routes within the I-65 study area. With over 1,000 miles of signed bicycle routes, significant progress has been made on making the area accessible by bicycle. In particular, existing state bicycle routes parallel I-65 on the following roadways:

- US 31, Robertson and Sumner County line;
- Dickerson Pike (US 31W), Davidson County;
- State Route 6 (SR 6), Williamson County and Maury County; and
- SR 11 and SR 272, Giles and Marshall Counties.

Planned state highway bicycle routes are illustrated in Figure 3-6. The Kentucky to Natchez Trace Parkway route runs alongside I-65 north of Nashville. The route veers away from I-65 south of Nashville as it becomes the Natchez Trace near the border of Williamson County. Four proposed routes run perpendicular to I-65:

- Reelfoot Lake to Nashville;
- Memphis to Nashville/Nashville to Bristol;
- Natchez State Park to Alabama; and
- Memphis to Chattanooga.

Of note, in 2013 the American Association of State Highway and Transportation Officials (AASHTO) designated a 154-mile route from the Kentucky border to Alabama as U.S. Bike Route 23 (USBR 23) in Tennessee. USBR 23 travels parallel to I-65 for the majority of its route as it begins in rural Robertson County before entering metropolitan Nashville. The route then goes through downtown Nashville and continues south through Franklin. The route south of Franklin is rural and connects to Henry Horton State Park, Chapel Hill, and Lewisburg before heading into Alabama.

Passenger Air and Rail Services

Two airports provide a majority of the aviation capacity in the study area. The Nashville International Airport (BNA) is a commercial and military airport located to the east of I-65. The current terminal was constructed in 1987 and has four runways. The airport is currently served by 10 airlines with an average of 410 daily arriving and departing flights. According to the Nashville Airport Authority, nearly 11.2 million passengers traveled into and out of BNA during 2015.

Generally, flights from BNA provide access to the larger cities connected via the I-65 corridor including Chicago and Indianapolis. Cities accessible off the I-65 corridor such as Cincinnati and New Orleans also have direct flights from BNA. However, flights to Birmingham from Nashville are typically routed through Atlanta and flights to Louisville from Nashville are typically routed through Atlanta or Chicago (O'Hare). Many communities within the study area use I-65 as the primary route for most (Brentwood, Franklin, Columbia) or a significant part (Gallatin, Hendersonville) of their trip to access the airport.

The Middle Tennessee RTA operates the Music City Star passenger rail service that connects downtown Nashville with Lebanon to the east. Currently there is no passenger rail service providing north-south mobility within the corridor

3.4 Safety and Security

Jurisdictions and Coordination

Tennessee Highway Patrol (THP) is the highway patrol agency throughout the state. They are responsible for enforcing all federal and state traffic laws on the state's federal and state highways, including the Interstate system. THP also has a Commercial Vehicle Enforcement Division that inspects commercial vehicles and driver logs, weighs commercial vehicles, and patrols highways with a focus on truck traffic violations.

The Tennessee Highway Safety Office (THSO) works with the National Highway Traffic Safety Administration, Tennessee Highway Patrol, and other law enforcement personnel to develop, execute, and evaluate programs to reduce traffic fatalities, injuries, and economic losses. As part of their mission, they coordinate the collection and tabulation of vehicle crash data and statistics. The latest available crash data was provided by TDOT for the entire state. This spatial data provides the location and basic information about crashes along the study corridor, including date, time of day, crash type, weather and light conditions, and number of vehicles involved. This data will be used in this study to identify crash hotspots and potential patterns.

The TDOT Strategic Transportation Investments Division conducts regular Road Safety Audits, which

Figure 3-5. Existing State Bicycle Routes

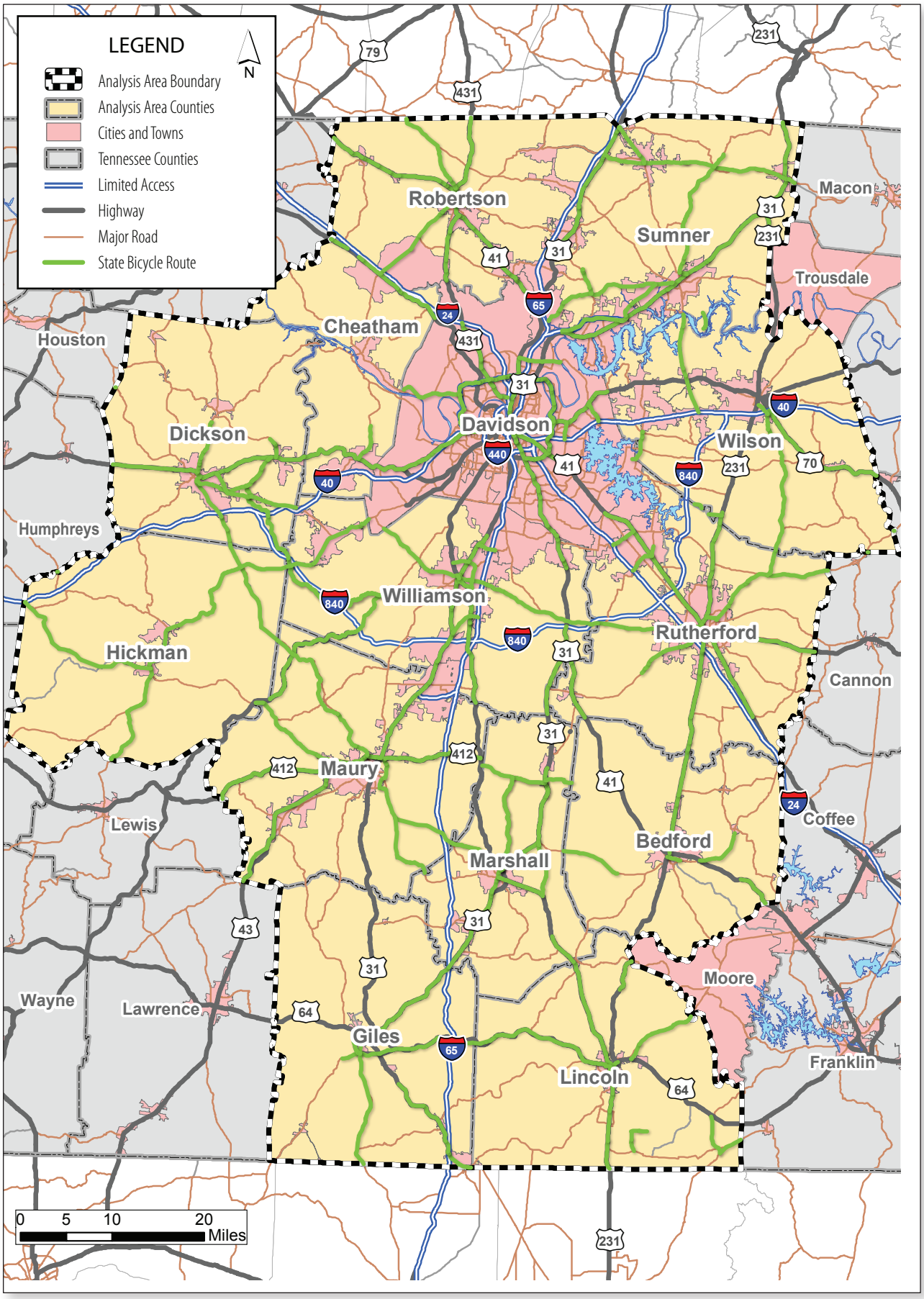
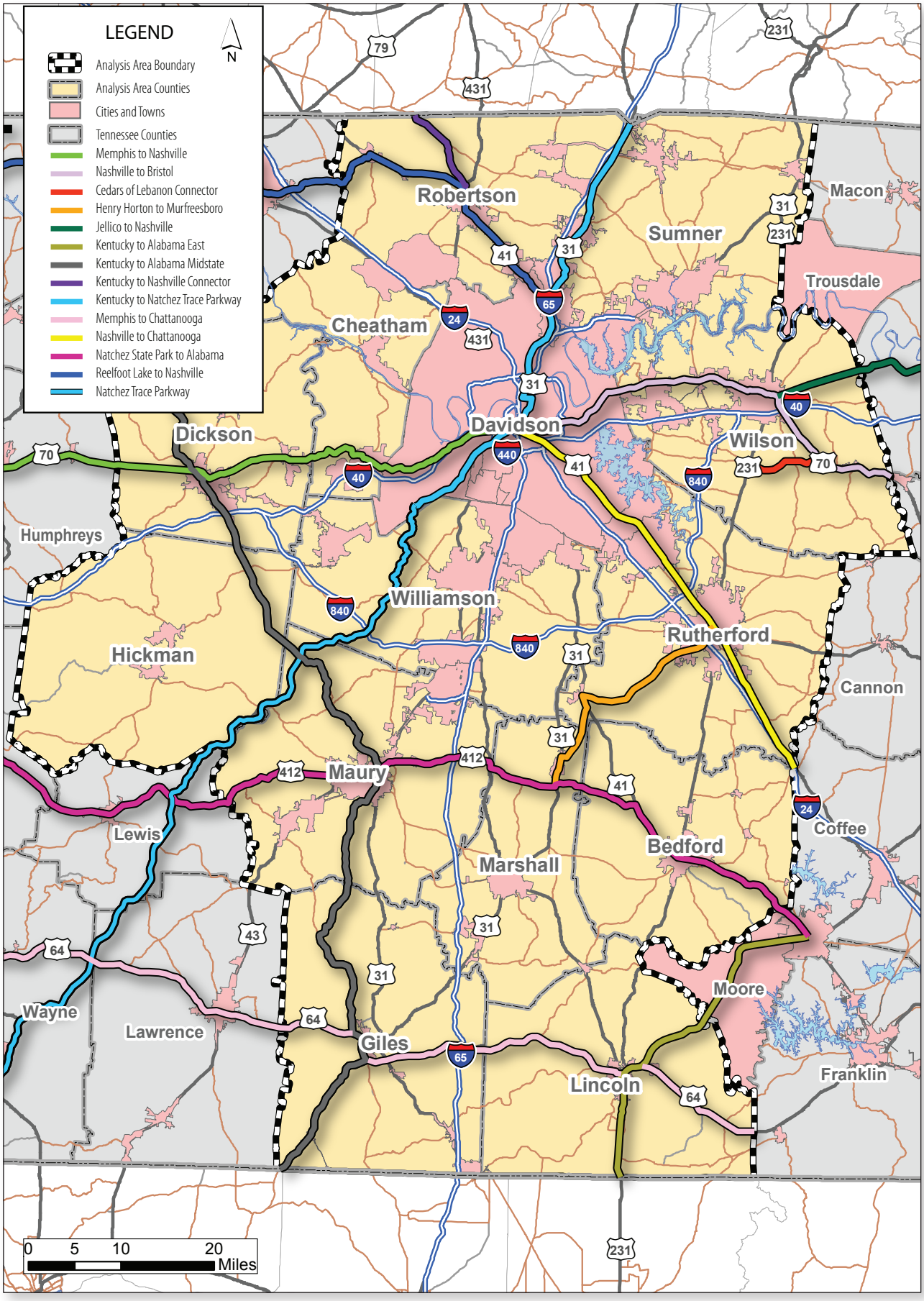


Figure 3-6. Planned State Bicycle Routes



address spot safety improvements on state roads. Issues identified are addressed quickly, often within one year of the final report. Recently-completed reports were provided by the division for review.

The division also houses Tennessee's Strategic Highway Safety Plan (SHSP) and creates the Highway Safety Improvement Program (HSIP) annual report.

Monitoring and Response

As discussed earlier, TDOT's SmartWay Program monitors traffic in Chattanooga, Knoxville, Memphis, and Nashville. The Nashville TMC began in 2003 and operates at all times monitoring traffic conditions and reacting and coordinating response. The Nashville TMC is instrumental in providing information and coordinating between local (fire, EMS, police) and state (THP) entities who may be responding to incidents along the I-65 corridor.

TDOT's HELP Program provides highway incident response, and patrols I-65 in the Nashville area. These units are staffed with trained emergency response personnel who are often first on the scene to provide assistance, traffic control, emergency medical response, cleanup, and other duties. They are a critical component to a quick response and clearing of most incidents.

While THP responds, investigates, and reports most traffic incidents along the corridor, THP's Critical Incident Response Team (CIRT) is also available to assist in investigation and reconstruction of motor vehicle traffic crashes. CIRT provides a higher level of crash investigation when necessary to investigate serious and/or fatal crashes.

3.5 Freight Data and Models

Goods and commodities movement is a critical role that all transportation systems must support. Building on the more general highway network data sources, this section discusses some of the data sources and data points that will be analyzed in order to better understand the implications of freight movement in the I-65 corridor.

Tennessee Statewide Travel Model

In the TSTM, truck trips are estimated based on truck GPS data (RSG, Inc. & RPM, Inc., 2013) provided by the American Transportation Research Institute (ATRI). Truck origins and destinations are identified based on the spot speed and time, and the number of trips between origins and destinations is adjusted based on traffic counts. The estimates use a historical count database within Tennessee, which includes 12,297 count stations and contains traffic counts from 1983 through 2013. The TSTM also provides a 30-year forecast of traffic flows. The population growth is forecasted using the data from the University of Tennessee's Center for Business and Economic Research (CBER), Woods & Poole, Inc., MPO forecasts, and historical growth rates.

Transearch

Transearch is an annual database of the U.S. county-level freight movement data, which is used for freight modeling and forecasting. The first generation of the database was developed in 1995. Transearch is composed using various data sources, including government regulatory agencies, the largest truck companies, and different transportation agencies. The database includes information for more than 450 individual commodities and seven transportation modes, including:

- For-hire truckload;
- For-hire less-than-truckload;
- Private truck;
- Conventional rail carload;
- Rail/highway intermodal;
- Air; and
- Water.

The commodity flows are presented in terms of annual sort tons and can be further converted to units (e.g., truck counts), dollar value, vehicle miles traveled, and ton-miles. The Standard Transportation Commodity Codes (STCC) system is used to represent the commodity groups. A total of four groups of freight flows are considered:

- Intra-market (internal);
- Inbound (external-to-internal);
- Outbound (internal-to-external); and
- Overhead or through (external-to-external).

Development of an annual version of the database is based on market specific outputs by industry or commodity. For the majority of commodities, market specific outputs are retrieved from IHS Economics' Business Markets Insights (BMI) database. The data for certain commodity types are not taken from BWI, including the following: agricultural products and livestock, coal and automobiles, selected chemicals, and minerals.

Along with freight flows for all counties by mode, the database also includes a 30-year forecast. The forecast is based on supply and demand side factors including employment, output, and purchases by industry and county. The process involves predicting supply projections (originating flows) and demand (destination flows) by county and 4-digit commodity code. The World Trade Service data are used to forecast international flows (e.g., flows to/from Canada and Mexico, imports/exports from the U.S. seaports). Transearch does not provide information for the following types of freight movements:

- Drayage for inland waterways, pipelines, international air, and rail carload transfers;
- Small package and mail shipments moved entirely over-the-road;
- Non-manufactured goods;
- Military and other government trucks;
- Household goods and local service trucks; and
- Domestic pipeline flows.

Freight Analysis Framework (FAF)

The FAF database was developed by the Federal Highway Administration (FHWA) in 2002. It is composed using information from various sources. FAF4 provides commodity flows expressed in tonnage and value by regions of origin and destination for seven transportation modes, including:

- Multiple modes and mail (e.g., parcel delivery by multiple modes);
- Truck;
- Rail;
- Water;
- Air;
- Pipeline; and
- Other and unknown (i.e., movements not falling under the other categories).

The database includes flows for a total of 43 commodity types. The commodities are classified at the 2-digit level of the Standard Classification of Transported Goods (SCTG).

Inland Waterways

Data for freight movements on barge are available from the U.S. Army Corps of Engineers Navigation Data Center. Waterborne commodity flows for the Cumberland and Tennessee Rivers are available and include tonnage by commodity type for river segments. Data for other parts of the inland waterway system can be obtained if required (e.g., the TN-TOM Bigbee, the Mississippi, etc.). Data is also available for the total tonnage by commodity moved through the Port of Nashville and other ports in Tennessee. These data include tonnage by commodity.

Shortline Railroads

All railroads are located in GIS format for mapping purposes. However, no data on commodity movements on shortline railroads is available.

3.6 Economic Access

The locations of economic activity centers, and the commodity flows that connect them, are influenced by many factors, including demographics, development patterns, land use plans and policies, and environmental constraints. The I-65 Multimodal Corridor Study will consider all of these influences and constraints in the transportation analysis.

Population, Employment, and Demographics

Using socioeconomic data contained in both the Nashville Area MPO and TDOT statewide travel demand models (TDM) traffic analysis zones (TAZ), a high-level overview of key demographic indicators is presented in Table 3-2. These data are compiled for the two TDM base years, which is 2010. The base year typically represents the most recent year for which actual data is available.

In 2010, over one-third of the study area's population and households were located within Metropolitan Nashville-Davidson County, with other significant concentrations in Rutherford, Sumner, and Williamson Counties. Collectively, these four counties comprised over two-thirds of the population, or 70 percent, in the study area.

Employment within the study area was much more concentrated in 2010, with approximately 50 percent of all jobs located within Metropolitan Nashville-Davidson County. An additional 23 percent of the area's jobs were located in Rutherford and Williamson Counties. Five counties, Cheatham, Giles, Hickman, Lincoln, and Marshall, collectively accounted for five percent or less of the area's total employment in 2010.

Environmental Justice Populations

Title VI of the Civil Rights Act and Executive Order 12898 on Environmental Justice relate to the programs and projects of federal agencies and their impacts to minority and low-income populations. As such, TDOT must consider the environmental, social, and health impacts of any federally-funded transportation projects on these populations, particularly any impacts that could be considered disproportionately high and/or adverse. To this end, the I-65 Multimodal Corridor Study will consider these populations as recommendations are drafted.

U.S. Census Bureau American Community Survey (ACS) data for the most recent year available (2014) are examined to determine the distribution of potential Environmental Justice (EJ) populations within the study area. Potential EJ populations are identified where the census tract contains a minority or low-income population that, as a percentage of the tract's total population, exceeds the state average. Minorities comprise approximately 22 percent of all state residents while low-income residents comprise approximately 18 percent of all state residents. Minority populations are defined as non-white populations, and low-income populations are defined as individuals whose income was under the federal poverty line in the last 12 months.

Figures 3-7 and 3-8 show the distribution of potential EJ populations within the analysis area.

Existing Land Use Character

A high-level review of existing land use conditions and plans and policies was conducted in order to understand the existing character of the study area as well as identify areas where major residential, commercial, or industrial growth is planned. Given the large size of the study area, the discussion of land use characteristics, plans, and policies is limited to those counties that include I-65.

In the northern section of the corridor, land use immediately adjacent to I-65 is predominantly rural. Several intersecting highways connect the route to smaller communities such as Portland and White House. This pattern of mostly rural character continues as the route moves southward through the Highland Rim. Once the route moves out of the Highland Rim and into the Nashville Basin, the land use character abruptly changes from rural to more suburban character in the communities of Millersville and Goodlettsville.

Table 3-2. 2010 Population, Households, and Employment

	Population		Households		Employment	
County	Total	Percent	Total	Percent	Total	Percent
Bedford	45,058	3%	16,530	2%	25,809	2%
Cheatham	39,107	2%	14,521	2%	15,899	1%
Davidson	626,682	36%	259,500	38%	542,773	50%
Dickson	49,664	3%	19,106	3%	22,469	2%
Giles	29,485	2%	11,875	2%	14,153	1%
Hickman	24,690	1%	8,976	1%	6,543	1%
Lincoln	33,361	2%	13,382	2%	14,892	1%
Marshall	30,617	2%	11,850	2%	12,004	1%
Maury	80,956	5%	31,663	5%	39,996	4%
Robertson	66,283	4%	24,197	4%	28,067	3%
Rutherford	262,604	15%	96,232	14%	133,803	12%
Sumner	160,645	9%	60,975	9%	55,354	5%
Williamson	183,182	10%	64,886	10%	120,266	11%
Wilson	113,993	7%	42,563	6%	51,640	5%
TOTALS	1,746,327	100%	676,256	100%	1,083,668	100%

Entering the central section of the corridor, the land use character transitions to more intense suburban-type development patterns through Goodlettsville and entering into Metropolitan Nashville-Davidson County. South of the interstate's intersection with Briley Parkway (SR 155), the land use character intensifies to general urban, remaining generally static until reaching the center of downtown Nashville. South of downtown Nashville, land use character is general urban with some high intensity industrial and logistics locations. Southern Metropolitan Nashville-Davidson County is more suburban in nature as the route transitions into Brentwood and Williamson County.

Approaching Brentwood, the land use character remains generally suburban with a major activity node at the Old Hickory Boulevard interchange. Land uses intensify north of Moores Lane (SR 441) as the route bisects the Cool Springs regional activity center, remaining relatively intense until south of State Route 96, at which point land uses quickly transition back to low-density suburban. It is important to note that the Goose Creek interchange (Exit 61), just south of I-65, is in the process of transitioning as Berry Farms, a major residential and employment center, takes shape. Slightly more intense suburban development is encountered in the Thompson's Station and Spring Hill communities.

Land use character in the south section of the corridor quickly transitions from suburban to rural character as the route moves south of Spring Hill. This rural character remains largely static along the remainder of the route, with some highway connections to major towns in the area, such as Columbia and Lewisburg. Topography in the southern portion of the state becomes more varied, and land use character near the Alabama state line is highly rural with limited development.

Land Use Policies, Plans, and Studies

At the regional level, the Nashville Area MPO and member jurisdictions have teamed to undertake a number of transportation and land use studies incorporating the I-65 corridor. These studies have included the development of character area maps that summarize each municipality's future land use policy. Maps depicting these for the counties within the MPO planning area are shown in 3-9, 3-10, and 3-11. Additionally, a number of counties and municipalities (discussed from north to south) have comprehensive plans affecting the I-65 corridor.

Robertson County

The Robertson County 2040 Comprehensive Growth and Development Plan calls for expanded suburban development along I-65 west and south of the Portland area, as well as around the existing footprints of White House and Millersville. General urban and suburban development are envisioned for the White House area. Employment center development is planned for the area west of I-65 between SR 76 (Exit 108) and SR 25 (Exit 112).

Sumner County

The Sumner County 2035 Comprehensive Plan calls for expanded suburban development patterns around Portland, extending all the way to I-65 to the west. The areas around and between White House and Millersville are planned for expanded suburban development as well. An activity center node is planned for the area immediately east of the interchange with SR 25 (Exit 112). The development would likely include the SR 25/US 31E intersection.

The White House Comprehensive Plan identifies the land adjacent to the SR 76 (Exit 108) interchange as a "potential I-65 interchange commercial activity node." The interchange area is intended to be developed as a typical highway commercial activity center, with the potential additions of regional offices or office headquarters and park-and-ride lots.

Metropolitan Nashville-Davidson County

NashvilleNext, the comprehensive plan for Metro Nashville, includes a land use vision that will largely preserve the general urban character along the I-65 corridor. Development centers are identified at the I-65 interchanges with Vietnam Veterans Boulevard (SR 386), Briley Parkway (SR 155), Harding Place (SR 255), and Old Hickory Boulevard (SR 254). Additionally, I-65 from the downtown loop to Harding Place (SR 255) is identified as an "immediate need" priority corridor, meaning that more intense housing and commercial areas may be developed along the corridor in concert with improvements to high capacity transit service.

Williamson County

The Brentwood 2020 Plan Update largely preserves the existing low-density residential development within the City of Brentwood. The Old Hickory interchange area will remain a major employment center within the city, and additional office and

Figure 3-7. Minority Populations

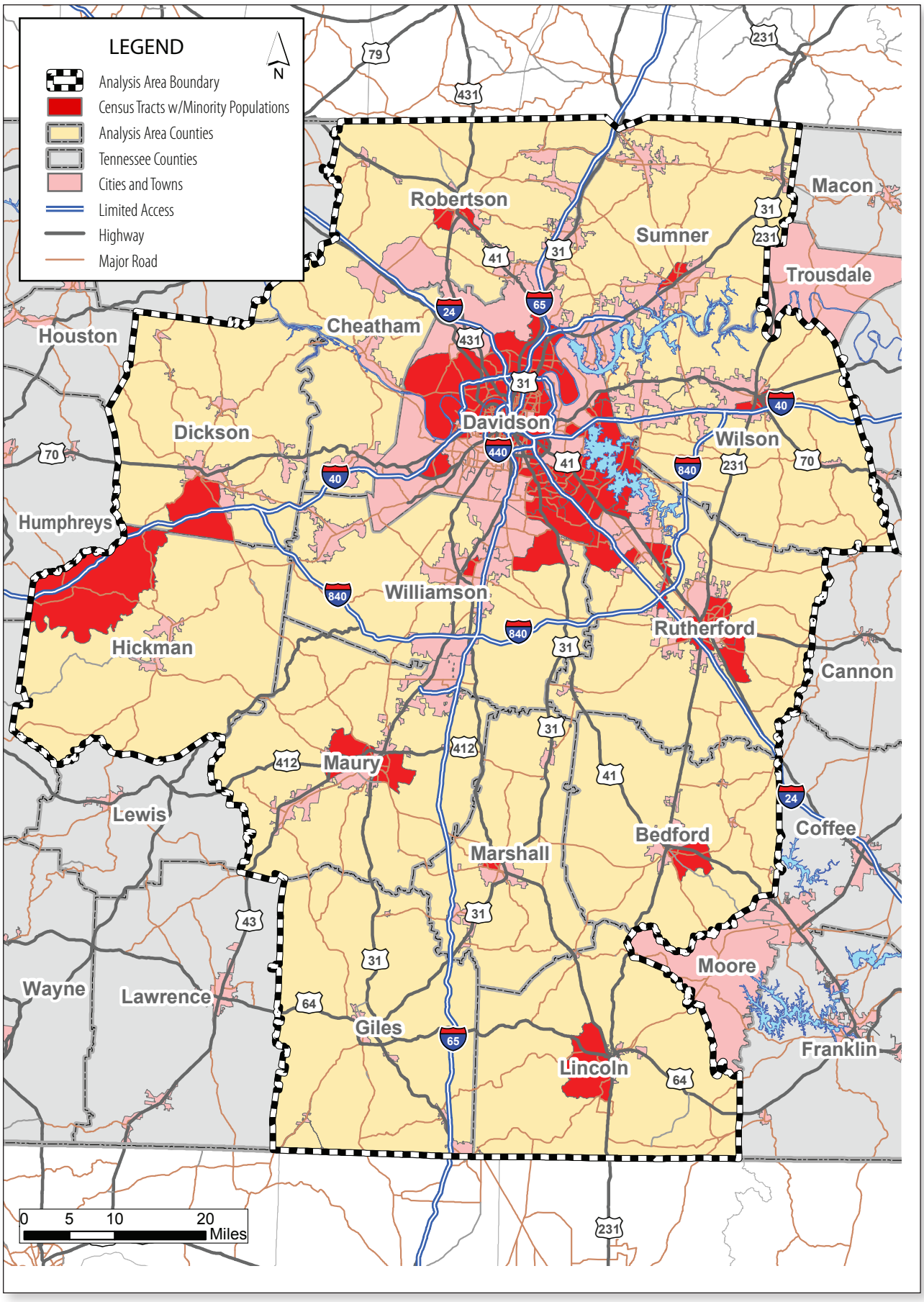
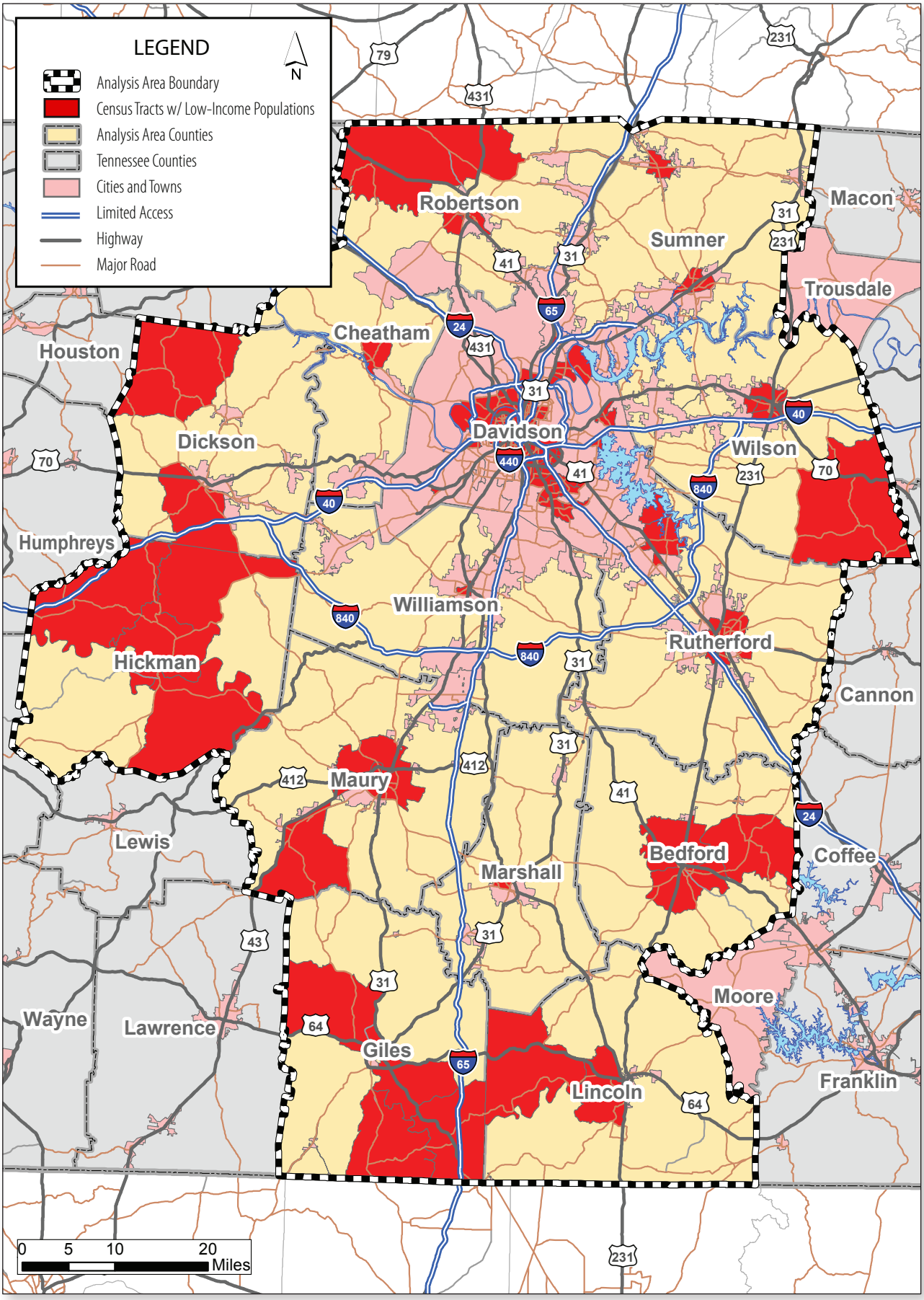


Figure 3-8. Low-Income Populations



commercial development will come online after the completion of the Town Center project, which is focused along US 31 near the I-65/Old Hickory Boulevard interchange.

The Franklin Land Use Plan identifies continued development and intensification of the existing activity center in the Cool Springs area between Moores Lane (SR 441) and south of Murfreesboro Road (SR 96). As discussed earlier, the Goose Creek interchange is in the process of transitioning to a major residential and employment center. The One Franklin Park development will add a considerable amount of Class A office space and related development to land adjacent to the I-65/ McEwan Drive interchange. Additionally, continued development and intensification will occur along Carothers Parkway parallel to I-65 between the Moores Lane and SR 96 interchanges. This whole area will continue to grow and will likely have major implications for I-65. Land to the east of I-65 is likely to experience additional residential and commercial development as well.

The Spring Hill Comprehensive Plan projects continued residential and commercial growth within the city. The focus of commercial and office growth is along US 31. Additional growth will continue to spread eastward on currently undeveloped land, eventually resulting in additional residential and commercial growth between I-65 and US 431.

The General Plan for Thompson's Station suggests that future development in the town will be done in a way that preserves the area's rural character. The General Plan encourages cluster development that contains a mixture of development types. The plan also emphasizes the incorporation of greenbelts and low-density between or among these cluster developments.



The Williamson County Comprehensive Land Use Plan largely preserves the existing rural character of southern unincorporated Williamson County. A major activity center, the "840 Center," is proposed in the Triune area near the intersection of US 41 and I-840. According to the plan, the new center will include new residential growth opportunities, along with a mix of locally oriented businesses.

Maury County

The Spring Hill Comprehensive Plan identifies the interchange of I-65 and Saturn Parkway (SR 396) as a major growth center (the city is located in portions of both Williamson and Maury Counties). East of the interchange is designated as an activity center. This area is largely undeveloped at the present time. Industrial development is proposed along Saturn Parkway between the interchange and the General Motors Spring Hill Plant. Continued suburban residential and commercial growth is planned all the way to Spring Hill's southern border.

The Maury County Comprehensive Plan identifies the interchange areas at Bear Creek Pike (US 412) and New Lewisburg Highway (SR 50) as future employment areas, with complementary interstate gateway districts. The gateway districts will consist of typical highway-oriented commercial development often seen at interchanges. The surrounding employment district will consist of office parks, technology parks and research facilities, and industrial uses. These areas are primarily rural at the present time.

Additionally, Bear Creek Pike between I-65 and Columbia is identified as a suburban growth corridor. Suburban style development, such as residential, office, mixed-use, and civic development types, will be permitted along the corridor, creating a more intensely developed connection to the City of Columbia. This area is also predominantly rural, with some large-lot residential development, at the present time.

Marshall County

Marshall County does not currently have land use plans or policies within the project area.

Figure 3-9. Character Area Map– Nashville Area MPO (North)

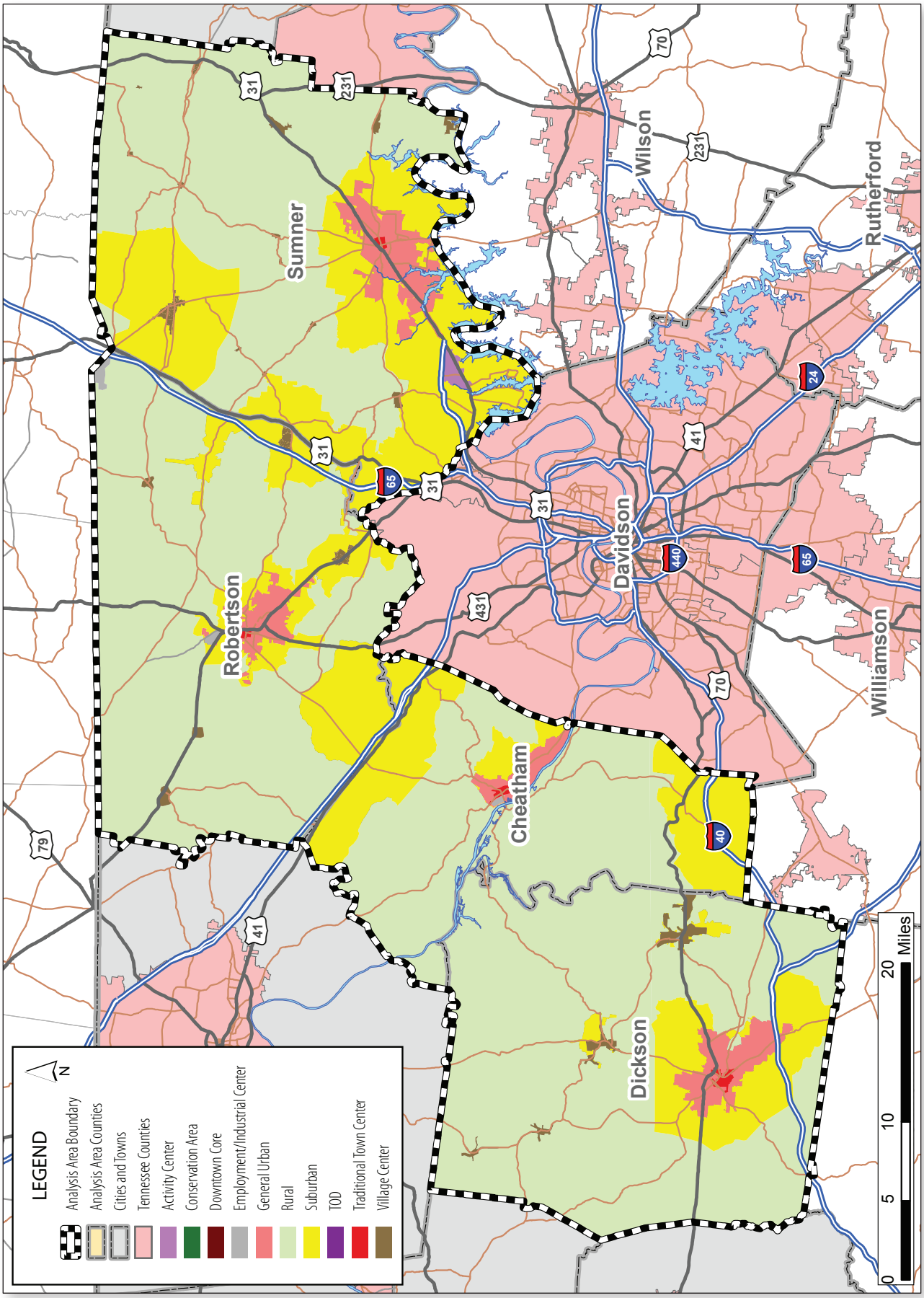


Figure 3-10. Character Area Map– Nashville Area MPO (Central)

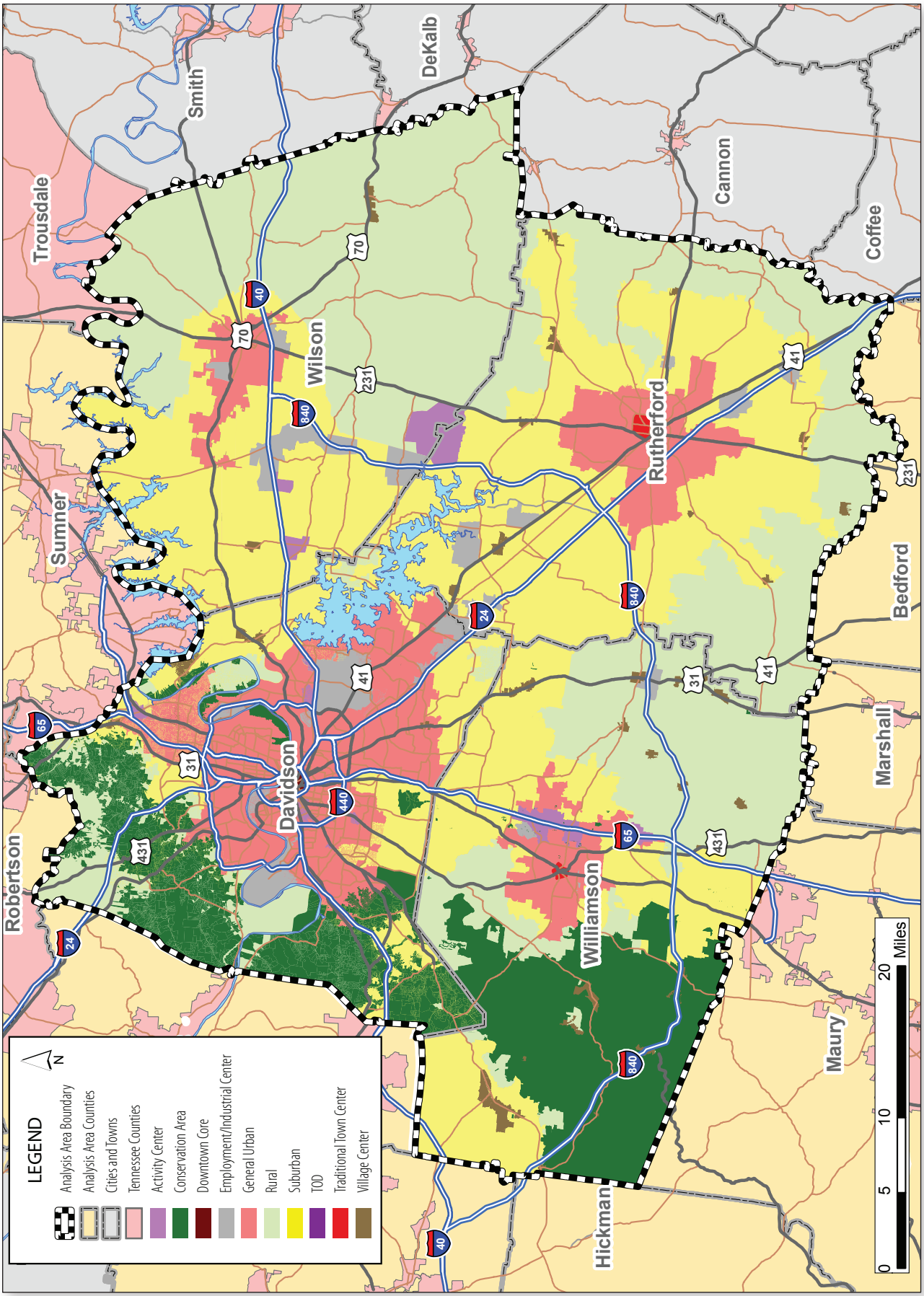
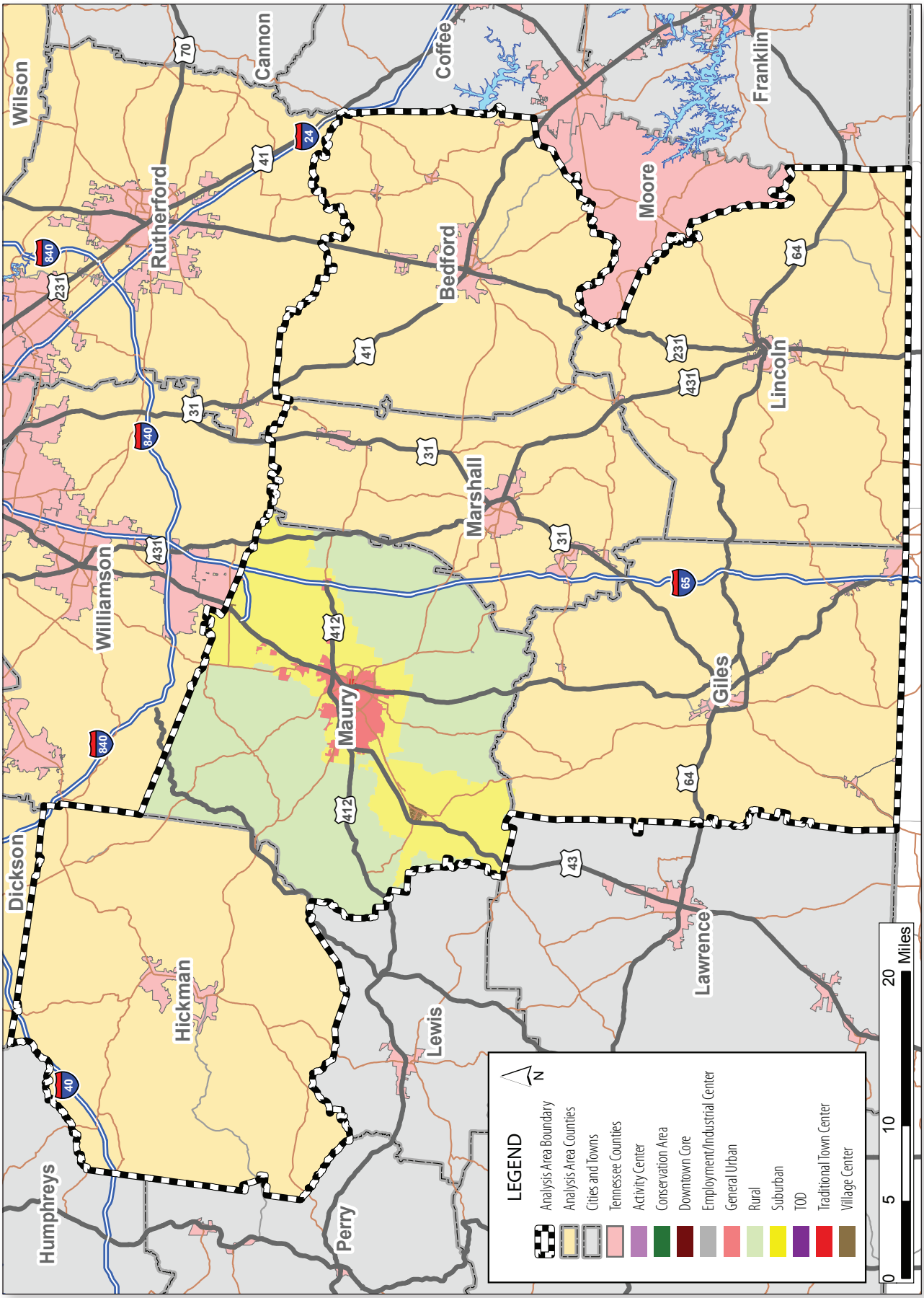


Figure 3-11. Character Area Map– Nashville Area MPO (South)



Giles County

Giles County does not currently have land use plans or policies within the project area.

Environmental Features and Conditions

Wetlands

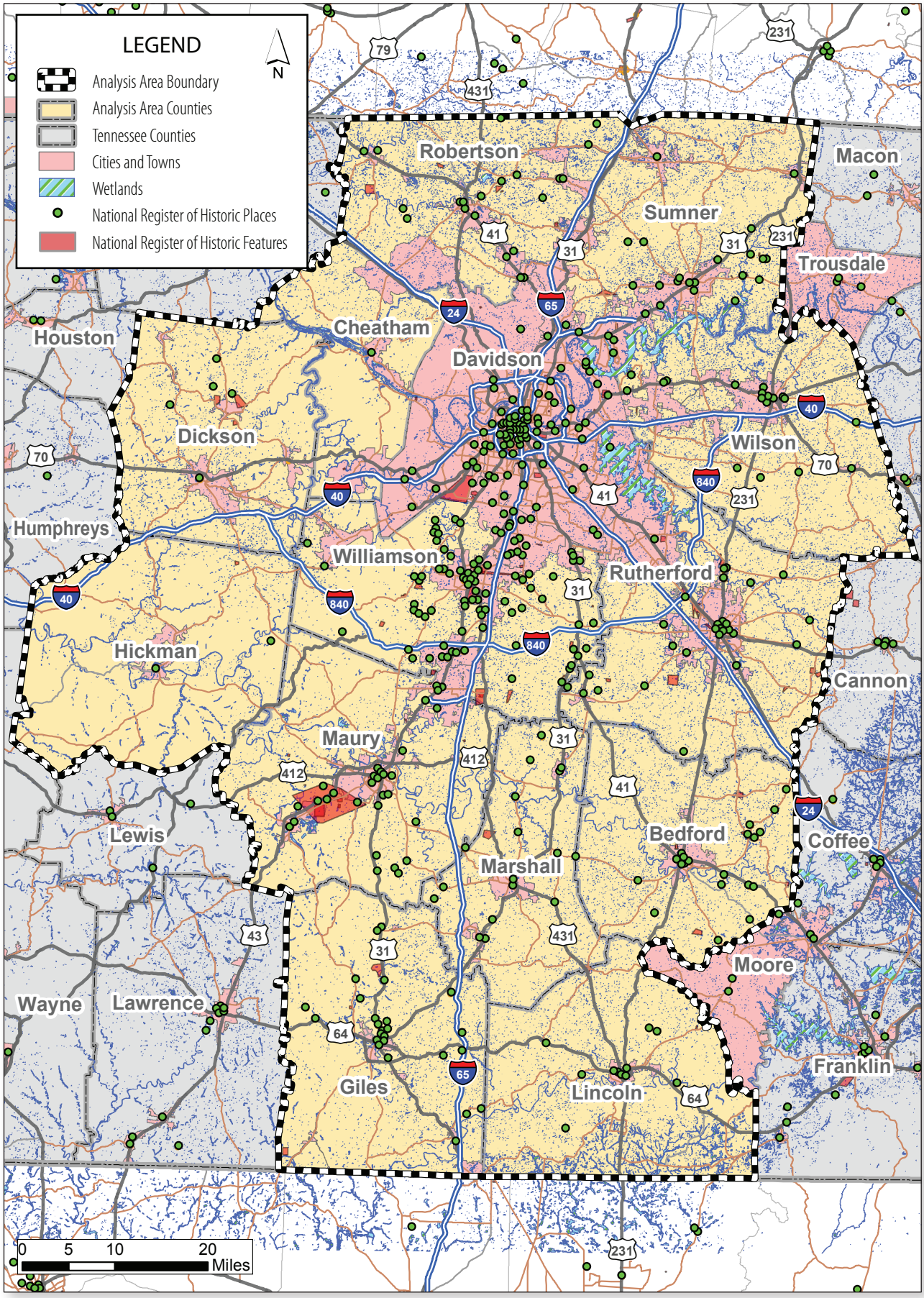
Wetlands are an environmental resource which any proposed improvements will seek to avoid when possible, and to minimize or mitigate impacts when avoidance is not possible. Known wetlands are mapped and made available through the US Fish and Wildlife Service (USFWS). The most recently updated geo-database was obtained directly from USFWS for the entire state of Tennessee. It should be noted that additional field surveying would be necessary during project environmental and design activities, but the database should provide a suitable resource at the planning level for this study.

Historic Resources

Historic resources are another resource to avoid, or minimize and mitigate potential impacts. The current National Register database was obtained through the National Park Service web portal. The Tennessee Historic Commission is the State Historic Preservation Office (SHPO) for Tennessee, and maintains a listing of state owned historic resources. This listing was reviewed, and no state owned resources were observed in the I-65 study corridor. It should be noted that additional field surveying would be necessary during project environmental and design activities to look for both archaeologic and historic resources.

Figure 3-12 displays the wetlands and historic resources data obtained for the study area. Historic resources are the red polygons and orange points, and all blue shapes are wetlands.

Figure 3-12. Wetlands and Historic Data



4. Future Projections

In addition to understanding the existing data and information that influence and are influenced by the corridor, understanding future forecasts is critical to tailoring the project's analysis and recommendations to ensure that the corridor can serve the dynamic and growing region in the decades to come.

4.1 Economic and Population Growth

Recent economic trends in Tennessee indicate that the I-65 corridor is a major driver of economic growth statewide. According to the Tennessee Department of Labor and Workforce Development, the Nashville Metropolitan Statistical Area (MSA) accounted for 61.1 percent of all MSA job growth in the state, adding approximately 30,000 jobs between 2013 and 2014. Recent growth in the Nashville MSA has been driven by increases in professional and business services; trade, transportation and utilities; and leisure and hospitality.

According to the University of Tennessee Center for Business and Economic Research, Tennessee employment is forecasted to grow by a 1.1 percent compound annual growth rate (CAGR) between 2015 and 2021, which slightly outpaces the projected national rate of one percent growth. Though manufacturing is projected to experience short-term employment gains, by 2025 manufacturing employment is projected to be 0.1 percent less than it was in 2015 despite projected gains in manufacturing output. Employment growth is expected to be largest in the professional and business services sector, followed by education and health services, and natural resources, mining, and construction.

Given the projections for statewide economic growth, and assuming that recent trends are indicative of future economic patterns, the I-65 corridor, and the Nashville MSA in particular, is poised to capture much of the state's economic growth in the coming years. In order to get a closer look at projected demographic trends in the study area, socioeconomic data projections prepared for the Nashville Area MPO and TDOT statewide TDMs are examined to determine population, household, and employment growth for the three horizon years in each model: 2020, 2030, and 2040.

Table 4-1 shows the projected population, housing, and employment trends within the study area.

The projected demographic changes in the region in many ways reflect the existing demographic characteristics discussed earlier. Approaching 2040, Metropolitan Nashville-Davidson County will experience continuing declines in the share of population and employment, relative to the study area. Rutherford and Williamson Counties will remain the two non-Nashville counties that capture the majority of the remaining population and employment, comprising 38 percent and 30 percent of the growth, respectively. Williamson County is expected to have the largest share of population and employment growth in the study area.

In terms of growth rates, the study area is expected to far outpace Metropolitan Nashville-Davidson County's population growth. While Metro Nashville is expected to increase in population by 25 percent by 2040, the study area as a whole will experience a 69 percent increase. Metro Nashville will continue to grow as the regional employment center in Middle Tennessee, though it will still experience a lower rate of change than the study area as a whole. Rutherford and Williamson are poised to become major population and employment centers in their own right.

4.2 Planned Transportation Projects

In February 2016, the executive board of the Nashville Area MPO voted to adopt Middle Tennessee Connected – 2016-2040 Regional Transportation Plan (RTP). This document, in addition to the current MPO TIP and TDOT STIP, were reviewed to identify projects that are planned or programmed along the I-65 corridor or its supporting or parallel routes. Projects along the I-65 corridor range from interstate widening projects to the construction of new roadways and the reconstruction of interchanges. The planned and programmed projects will be considered when multimodal recommendations are made at the conclusion of this study.

The full list of identified projects are available in Table 4-2. Figures 4-1, 4-2, and 4-3 show the distribution of the projects throughout the project area. Significant improvements that are planned or programmed include:

Table 4-1. Population, Households, and Employment (2020, 2030, 2040)

2020

County	Population Total	Population Share	Population Increase from 2010	Households Total	Households Percent	Households Increase from 2010	Employment Total	Employment Percent	Employment Increase from 2010
Bedford	51,610	2%	15%	19,006	2%	15%	29,345	2%	14%
Cheatham	45,334	2%	16%	16,887	2%	16%	19,351	1%	22%
Davidson	680,496	31%	9%	294,590	34%	14%	635,738	49%	17%
Dickson	55,396	3%	12%	21,410	2%	12%	25,839	2%	15%
Giles	31,048	1%	5%	12,614	1%	6%	15,658	1%	11%
Hickman	26,773	1%	8%	9,983	1%	11%	7,187	1%	10%
Lincoln	35,226	2%	6%	14,175	2%	6%	16,287	1%	9%
Marshall	34,072	2%	11%	13,244	2%	12%	12,836	1%	7%
Maury	94,861	4%	17%	37,696	4%	19%	47,043	4%	18%
Robertson	83,977	4%	27%	31,026	4%	28%	33,591	3%	20%
Rutherford	384,504	18%	46%	142,448	17%	48%	170,093	13%	27%
Sumner	193,105	9%	20%	73,636	9%	21%	66,686	5%	20%
Williamson	309,328	14%	69%	110,902	13%	71%	162,311	12%	35%
Wilson	157,139	7%	38%	59,535	7%	40%	65,133	5%	26%
TOTAL	2,182,869	100%	25%	857,152	100%	27%	1,307,098	100%	21%

2030

County	Population Total	Population Percent	Population Increase from 2010	Households Total	Households Percent	Households Increase from 2010	Employment Total	Employment Percent	Employment Increase from 2010
Bedford	58,175	2%	29%	21,497	2%	30%	32,892	2%	27%
Cheatham	51,565	2%	32%	19,261	2%	33%	22,813	1%	43%
Davidson	734,958	28%	17%	317,202	31%	22%	745,177	47%	37%
Dickson	61,140	2%	23%	23,726	2%	24%	29,219	2%	30%
Giles	32,620	1%	11%	13,366	1%	13%	17,178	1%	21%
Hickman	28,866	1%	17%	10,999	1%	23%	7,839	0%	20%
Lincoln	37,100	1%	11%	14,979	1%	12%	17,690	1%	19%
Marshall	37,530	1%	23%	14,644	1%	24%	13,672	1%	14%
Maury	106,276	4%	31%	42,241	4%	33%	55,746	4%	39%
Robertson	99,100	4%	50%	36,633	4%	51%	39,857	3%	42%
Rutherford	497,364	19%	89%	183,528	18%	91%	215,490	14%	61%
Sumner	218,698	8%	36%	83,313	8%	37%	80,227	5%	45%
Williamson	426,801	17%	133%	153,181	15%	136%	223,802	14%	86%
Wilson	196,478	8%	72%	74,241	7%	74%	81,960	5%	59%
TOTAL	2,586,671	100%	48%	1,008,811	100%	49%	1,583,562	100%	46%

Table 4-1. Population, Households, and Employment (2020, 2030, 2040) *continued*

2040	Population			Households			Employment		
County	Total	Percent	Increase from 2010	Total	Percent	Increase from 2010	Total	Percent	Increase from 2010
Bedford	64,748	2%	44%	23,996	2%	45%	36,448	2%	41%
Cheatham	57,804	2%	48%	21,637	2%	49%	26,281	1%	65%
Davidson	780,507	26%	25%	335,804	29%	29%	869,137	45%	60%
Dickson	66,896	2%	35%	26,054	2%	36%	32,608	2%	45%
Giles	34,199	1%	16%	14,122	1%	19%	18,704	1%	32%
Hickman	30,967	1%	25%	12,023	1%	34%	8,495	0%	30%
Lincoln	38,984	1%	17%	15,789	1%	18%	19,104	1%	28%
Marshall	40,995	1%	34%	16,054	1%	35%	14,520	1%	21%
Maury	116,514	4%	44%	46,288	4%	46%	65,609	3%	64%
Robertson	112,851	4%	70%	41,723	4%	72%	47,190	2%	68%
Rutherford	602,977	20%	130%	221,926	19%	131%	271,416	14%	103%
Sumner	241,698	8%	50%	91,985	8%	51%	95,970	5%	73%
Williamson	537,377	18%	193%	193,008	17%	197%	307,836	16%	156%
Wilson	233,085	8%	104%	87,889	8%	106%	102,437	5%	98%
TOTAL	2,959,602	100%	69%	1,148,298	100%	70%	1,915,755	100%	77%

2020 Time Horizon

- Major widening and reconstruction of Nolensville Pike (SR 11) in Davidson County
- Construction of the Portland Bypass in Sumner County
- Widening of SR 109 in Sumner County
- Widening of I-65 (four to six lanes) from I-840 to Saturn Parkway
- Widening of SR 96 from Arno Road to I-840

2030 Time Horizon

- Widening of I-65 (four to six lanes) from Long Hollow Pike (SR 257) to the Kentucky State Line
- Rapid transit and managed lanes between Nashville and Franklin
- Managed lanes for rapid transit from I-65 to SR 109 Bypass
- New interchange on I-65 in Williamson County between Old Hickory Boulevard (SR 254) and Concord Road (SR 253)

2040 Time Horizon

- Complete reconstruction of the I-65/I-40 "loop" in downtown Nashville, including reconstruction of existing junctions

Additionally, the Nashville Area MPO has identified "illustrative" projects for future consideration. A need for these projects has been determined, but no funding source has yet been identified. These projects include:

- New interchange at I-65 and Springfield Highway (SR 11/US 41) in Sumner County
- Extension of Buckner Road to Lewisburg Pike (SR 106/US 31) with a new interchange at I-65
- Extension of Saturn Parkway (SR 396) from its current western terminus to I-840
- Widening and realignment of Nolensville Road (SR 11) from Burkitt Road to I-840 in Williamson County

Figure 4-1. Planned Interchange Projects

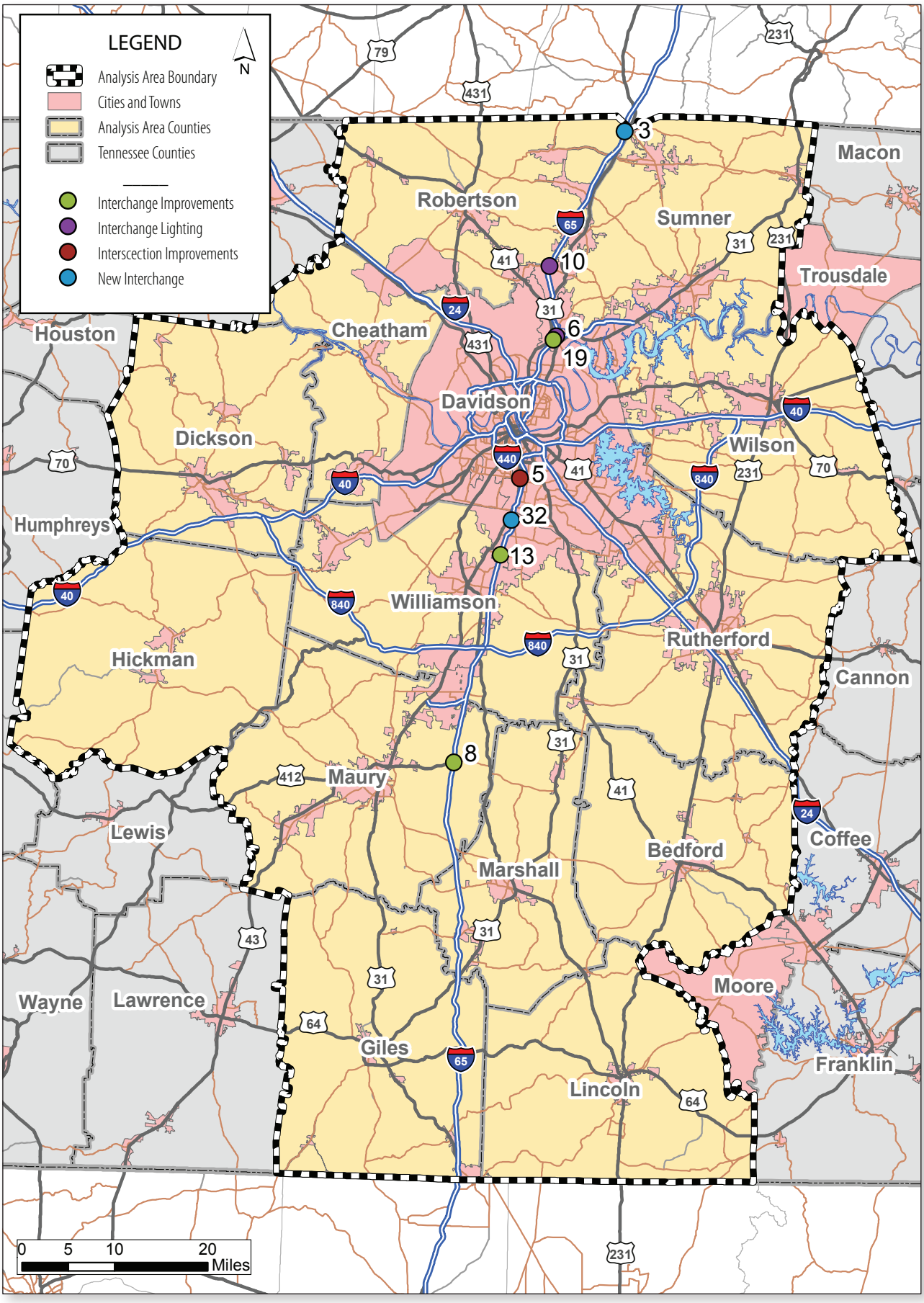


Figure 4-2. Planned Capacity and Reconstruction Projects

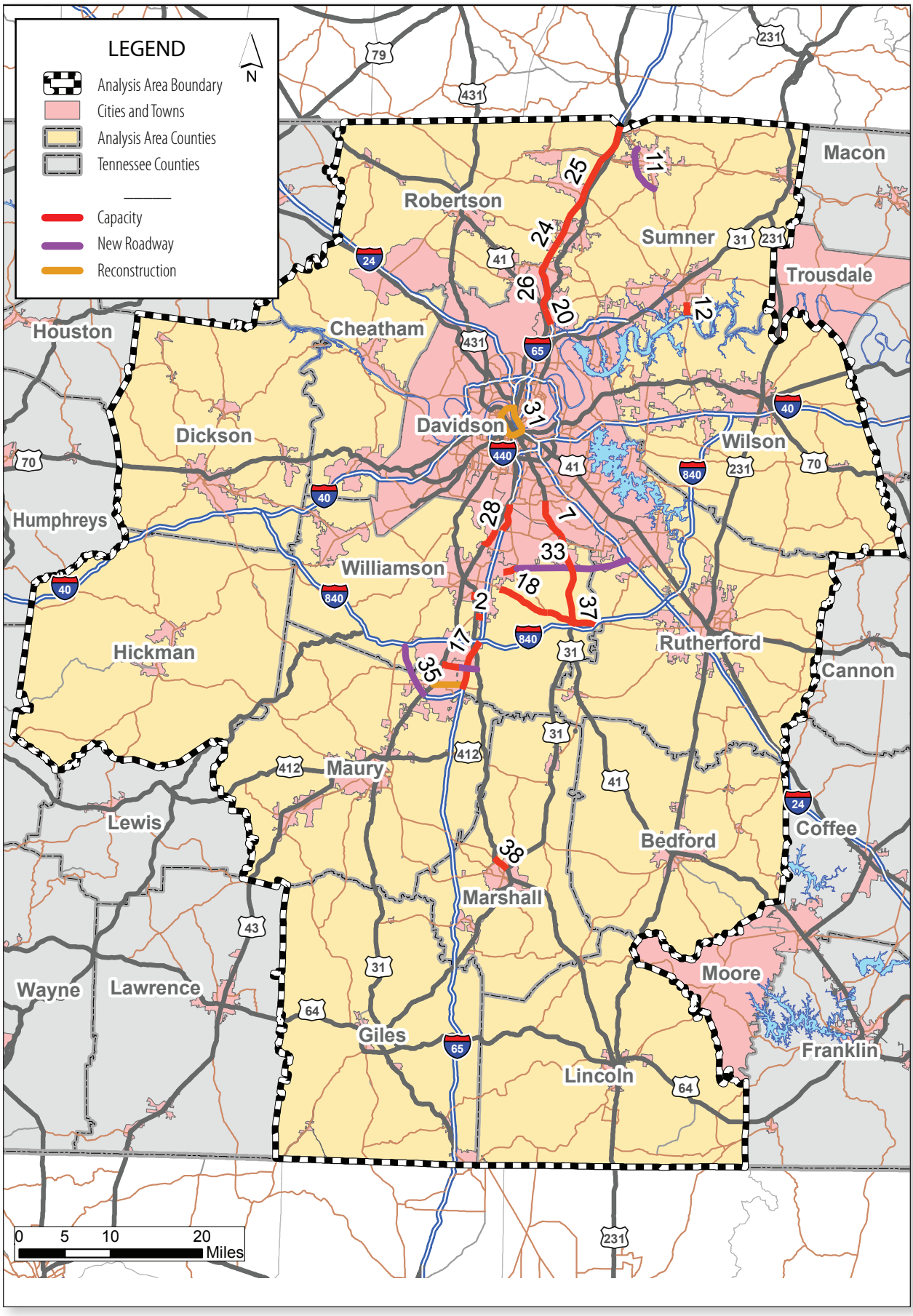


Figure 4-3. Planned Transit and ITS Projects

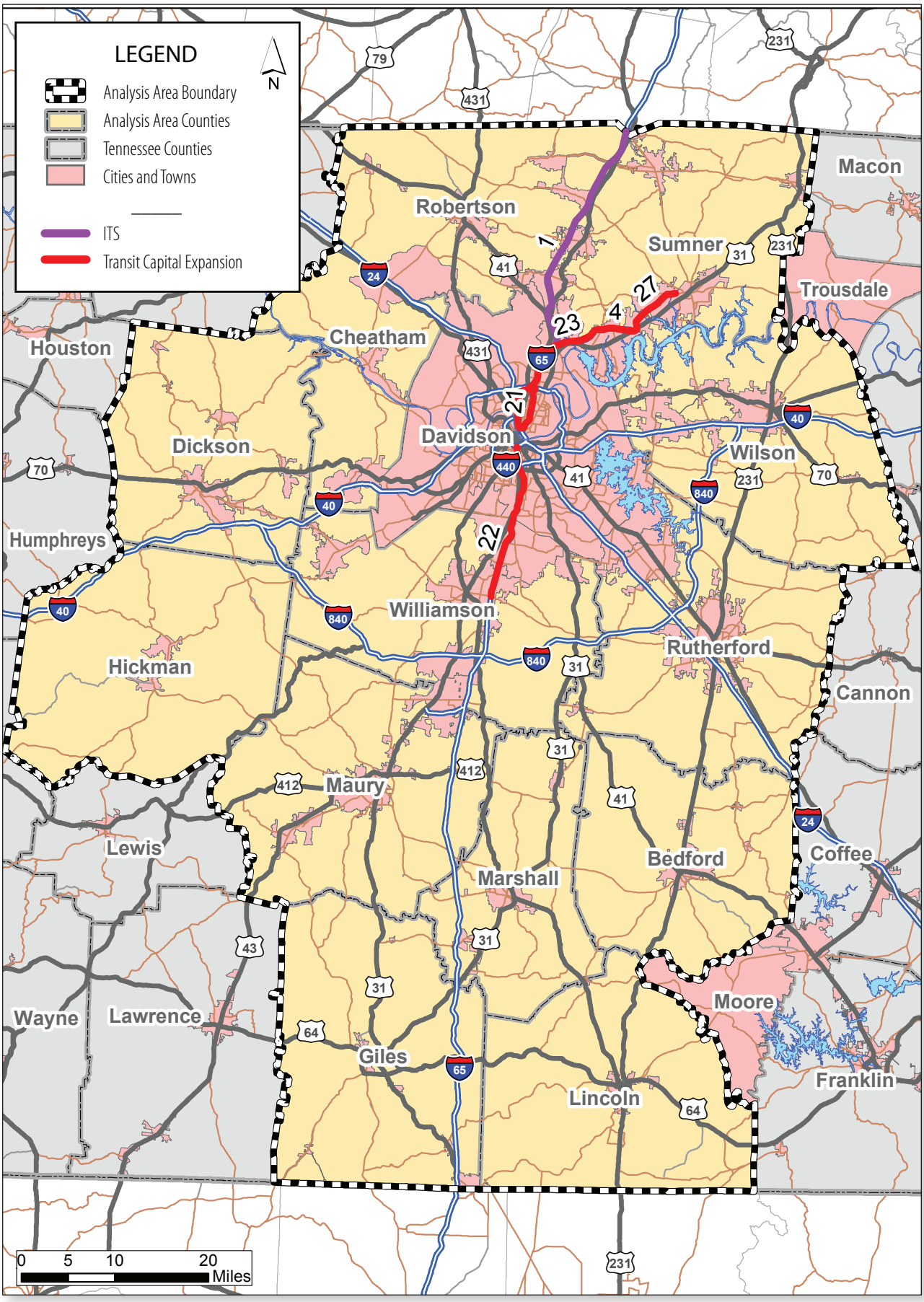
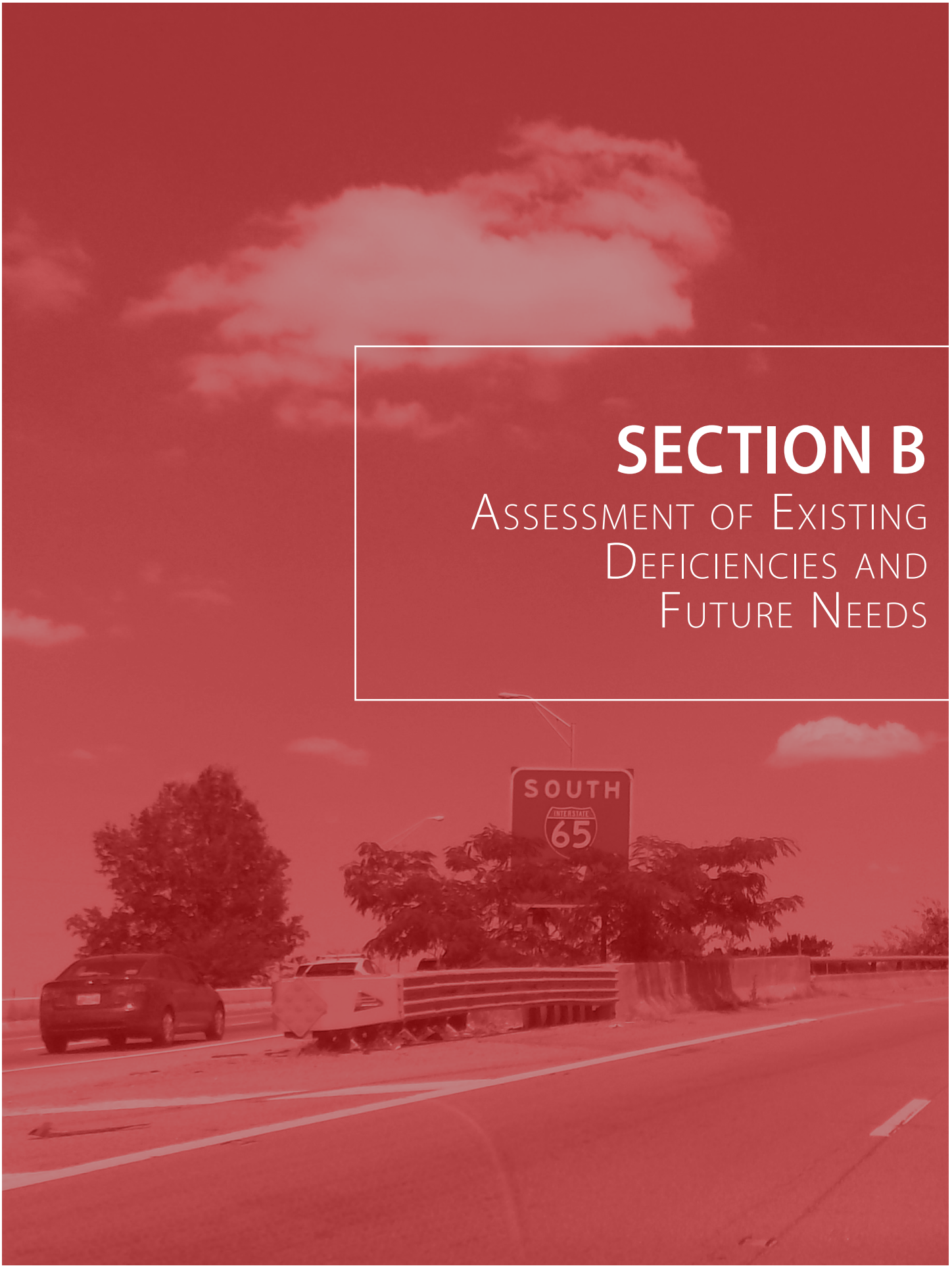


Table 4-2. Planned and Programmed Projects

Source ID		Route and Project Limits	Improvement	Cost	Year	Lead Agency/ Funding Type	LRTP# or TIP#
Nashville Area MPO FY 2014 - 2017 TIP and 2040 RTP	1	I-65 north ITS from Exit 96 to Exit 108 in Davidson, Robinson, and Sumner Counties	Install CCTV and dynamic message boards on I-65	$2,500,000	2014	TDOT/NHPP	TIP # 2012-87-193
	2	SR 248 from SR 106 (Lewisburg Pike) to west of I-65	Widen existing 2 lane road to 4/5 lane	$1,650,000	2014	TDOT/STATE (STA)	TIP # 2012-62-167
	3	I-65/SR 109 Prop/SR 41	New Interchange	$39,300,000	2014	TDOT/NHPP; STP	TIP # 2006-416
	4	NE Corridor Regional Express Bus Service	Transit Capital Expansion	$300,000	2014	TDOT/CMAQ	TIP # 2012-85-180
	5	Battery Lane/Harding Place @ Franklin Road	Intersection Improvements	$1,500,000	2020	TDOT/U-STP	RTP # 2561
	6	I-65 @ Rivergate Parkway, Long Hollow Pike, US 31W	Interchange Lighting	$1,480,000	2020	Goodlettsville/ U-STP	RTP # 1145
	7	Nolensville Pike from south of Old Hickory Blvd (SR 245) to south of Burkitt Road	Reconstruction and Widening, 2 to 5 lanes	$17,750,000	2020	TDOT/NHPP	RTP # 1287/2550
	8	I-65 @ Bear Creek Pike (SR 99/US 431)	Interchange Modification	$5,500,000	2020	TDOT/NHPP	RTP # 1369-1291
	9	I-65 Weigh Station near the TN/KY State Line	Roadway Reconstruct	$14,500,000	2020	TDOT/NHPP	RTP # 1396
	10	I-65 @ Bethel Road (SR 257)	Interchange Lighting Improvement	$50,000	2020	TDOT/U-STP	RTP # 2563
	11	SR 109 Portland Bypass	New Roadway, 4 lanes	$68,880,000	2020	TDOT/NHPP	RTP # 1345
	12	SR 109 from north of the Cumberland River Bridge to SR 109 Bypass south of Gallatin	Widening, 2 to 4 lanes	$16,200,000	2020	TDOT/NHPP	RTP # 1340
	13	I-65 @ Moore's Lane	Interchange Improvements	$4,000,000	2020	Brentwood/ NHPP	RTP # 1176
	14	Duplex Road (SR 247) from Main Street (SR 6/ US 31) to I-65	Roadway Reconstruct	$13,500,000	2020	TDOT/S-STP	RTP # 1199-1322
	15	Murfreesboro Road (SR 96) from east of Wilson Pike (SR 252) to I-840	Widening, 2 to 5 lanes	$27,630,000	2020	TDOT/S-STP	RTP # 1316
	16	Franklin Road (SR 6) from Concord Road (SR 253) to Moore's Lane (SR 441)	Widening, 2 to 5 lanes	$22,500,000	2020	TDOT/NHPP	RTP # 1172-1325
	17	I-65 from I-840 to Saturn Parkway	Widening, 4 to 6 lanes	$52,250,000	2020	TDOT/NHPP	RTP # 1415
	18	Murfreesboro Road (SR 96) from east of Arno Road to Wilson Pike (SR 252)	Widening, 2 to 5 lanes	$37,500,000	2020	TDOT/STATE	RTP # 1315
	19	NET Corridor Interchange 1 – Vietnam Veterans Parkway (SR 386) @ I-65 Interchange Modification WB to NB and SB to EB Traffic	Interchange Modification	$26,840,000	2030	TDOT/RTA - NHPP	RTP # 1143
	20	I-65 from Long Hollow Pike (SR 174) to Blue Star Road (US 31)	Widening, 4 to 6 lanes	$36,230,000	2030	TDOT/NHPP	RTP # 1408

Source ID		Route and Project Limits	Improvement	Cost	Year	Lead Agency/ Funding Type	LRTP# or TIP#
Nashville Area MPO FY 2014 - 2017 TIP and 2040 RTP	21	NE Corridor Transit/Managed Lanes along Ellington Pkwy (SR 6)/I-65 to SR 386	Transit Capital Expansion - Widening, 2 to 4 lanes	$107,360,000	2030	TDOT/RTA - NHPP	RTP # 2543
	22	Rapid Transit/Managed Lanes between Nashville and Franklin along I-65/US 31/CSX Corridor	Transit Capital Expansion	$335,500,000	2030	RTA/TDOT - NHPP	RTP # 9999
	23	NET Corridor Section 1 – Vietnam Veterans Parkway (SR 386) Transit/Managed Lanes from I-65 to US 31E/Saundersville Road	Transit Capital Expansion - Widening, 4 to 6 lanes	$187,880,000	2030	TDOT/RTA - S-STP	RTP # 1364
	24	I-65 from Bethel Road (SR 257) to SR 25	Widening, 4 to 6 lanes	$149,300,000	2030	TDOT/NHPP	RTP # 1411
	25	I-65 from SR 25 to TN/KY State Line	Widening, 4 to 6 lanes	$153,320,000	2030	TDOT/NHPP	RTP # 1410
	26	I-65 (SB only) from Blue Star Road (US 31) to Bethel Road (SR 257)	Widening, 4 to 6 lanes	$67,100,000	2030	TDOT/NHPP	RTP # 1431
	27	NET Corridor Section 2 – Vietnam Veterans Parkway (SR 386) from US 31E/Saundersville Road to SR 109 Bypass	Multi-Modal Widening, 4 to 6 lanes	$131,520,000	2030	TDOT/NHPP	RTP # 1277
	28	I-65 between Old Hickory Blvd (SR 254) and Concord Road (SR 253)	New Interchange	$46,970,000	2030	TDOT/NHPP	RTP # 1175
	29	East McEwen Drive from near Cool Springs Blvd to Wilson Pike (SR 252)	Widening, 2 to 4 lanes	$36,640,000	2030	Franklin/O-STP	RTP # 1359
	30	Lewisburg Pike (SR 106/US 431) from Mack Hatcher Parkway (SR 397) to Donelson Creek Parkway	Widening, 2 to 4 lanes	$17,450,000	2030	Franklin/S-STP	RTP # 1341
	31	Downtown Nashville Interstate Loop Interchanges/Junctions Reconstruction	Roadway Reconstruct	$612,280,000	2040	TDOT/NHPP	RTP # 9999
	32	I-65 @ Springfield Highway (SR 11/US 41)	New Interchange	$22,000,000	Illustrative	Goodlettsville	RTP # 1149
	33	Smyrna/Williamson County Connector from I-24 @ Rocky Fork Road to McEwen Drive Extension	New Roadway	$80,000,000	Illustrative	Smyrna	RTP # 1177
	34	Buckner Road Extension to Lewisburg Pike (SR 106/US 431) with New Interchange @ I-65	New Roadway	$32,000,000	Illustrative	Spring Hill	RTP # 1197
	35	Saturn Pkwy (SR 396) Extension to Carters Creek Pike (SR 246) @ I-840 Interchange	New Roadway	$125,000,000	Illustrative	Spring Hill	RTP # 1201
	36	Buckner Road Widening from Columbia Pike (SR 6/US 31) to Buckner Lane	Widening	$23,000,000	Illustrative	Spring Hill	RTP # 1198
	37	Nolensville Road (SR 11) from Burkitt Road to I-840 with Reaignment from south of Clovercroft Road to north of Sunset Road in Nolensville	Widening	$60,000,000	Illustrative	TDOT	RTP # 1255
TDOT 2014 - 2017 STIP	38	SR 50 US 431	Widening	$13,500,000	2016	TDOT	STIP # 1459020



SECTION B

Assessment of Existing Deficiencies and Future Needs

SECTION B: ASSESSMENT OF EXISTING DEFICIENCIES AND FUTURE NEEDS

1. Introduction

The Interstate 65 (I-65) corridor supports a wide range of land uses, activity centers, and travel in Tennessee, serving as the backbone for economic development and growth in the region. As population and employment continue to expand in the corridor, new travel demands are placing additional pressures on the interstate as well as parallel and intersecting highways. Consequently, familiar challenges such as increased travel times, traffic congestion, and traffic incidents are becoming the norm, especially during peak periods, and undermining the transportation system's ability to sustain future growth.

In the context of substantial change in the region, an assessment of existing deficiencies and future needs allows all stakeholders to better understand the transportation opportunities and challenges in the I-65 corridor and begin to identify potential solutions and strategies. The following analysis evaluates deficiencies and needs in the I-65 corridor across a broad spectrum of transportation issues, modes, and services, including:

- Land use and economic development;
- Highway capacity and travel demand;
- Safety;
- Intelligent transportation systems (ITS);
- Freight;
- Transit; and
- Walking and bicycling.

The analysis specifically focuses on the Trend scenario for the I-65 corridor – i.e., existing and future conditions if current practices, plans, and policies remain unchanged. To supplement the technical analysis, public workshops and internet survey tools have generated a large number of comments from stakeholders throughout the corridor. Together, the technical analysis and public input form the basis for the subsequent tasks in the Interstate 65 Multimodal Corridor Study, namely the development of potential strategies and solutions to address identified deficiencies and needs.

1.1 Defining the Trend Scenario

The Trend scenario establishes the existing and projected transportation conditions in the I-65 corridor, and serves as the baseline for identifying needs and ultimately proposed improvements. Because of the complex array of transportation issues, modes, and services found in an interstate corridor, the Trend scenario can be described qualitatively, in terms of plans and policies, as well as quantitatively. To develop the Trend scenario, the analysis relies on population and employment projections from the Tennessee Department of Transportation's (TDOT) and the Nashville Area Metropolitan Planning Organization's (MPO) travel demand models.

In addition to the growth forecasts, the Trend scenario includes assumptions about major capacity and interchange projects currently programmed for construction in TDOT's State Transportation Improvement Program (STIP) and the Nashville Area MPO's Transportation Improvement Program (TIP). The "Existing plus Committed" (E+C) highway network consists of the existing highway system in the corridor plus two programmed capacity projects and one programmed interchange project. The STIP and TIP also include ITS improvements and expanded transit (Table 1-1).

Table 1-1. I-65 Corridor Programmed Projects

Route and Project Limits	Improvement	Cost	Year	Lead Agency/ Funding Type	TIP# or STIP#
SR-109 Portland Bypass	Construct new 4 lane divided roadway	$72,000,000	2019	TDOT/NHPP	TIP # 2011-51-108
I-65 @ Bethel Road Interchange Lighting Improvements	Install interchange lighting at interchange of I-65 and Bethel Road (SR-257)	$1,021,800	2017	TDOT/U-STBG	TIP # 2016-34-235
NE Corridor Regional Express Bus Service	Transit Capital Expansion	$1,254,000	2018	RTA/CMAQ	TIP # 2012-85-180
Rivergate Parkway Reconstruction	Reconstruction and widening from Dickerson Pike (US-41/SR-11) to Gallatin Road (US-31E/SR-6)	$16,250,000	2019	Goodlettsville/U-STBG	TIP # 2017-110-013
Express Bus Service from Williamson County	Express bus service from Spring Hill, Franklin, and Brentwood to Nashville and return	$1,100,000	2018	RTA/CMAQ	TIP # 2009-85-012
SR-6/US-31/Franklin Road	Widening, from 2 to 5 lanes, from Concord Road to south of Moore's Lane	$38,000,000	2017	TDOT/NHPP	TIP # 2006-408
McEwan Drive Widening - Phase 4	Widening to 4 lanes from East Cool Springs Drive to Wilson Pike (SR-252)	$36,640,000	2017	Franklin/Local	TIP # 2011-62-011
Columbia Avenue (US-31/SR-6) South Widening	Widening, from 3 to 5 lanes, between Mack Hatcher Blvd (SR-397) and Downs Blvd	$21,000,000	2017	Franklin/U-STBG	TIP # 2014-62-001
SR-247 (Duplex Road) Widening	Widening, from 2 to 3 lanes, from US-31/ SR-6 to 0.1 mile west of I-65	$18,040,000	2017	TDOT/STBG	TIP # 2004-051
SR-99 (US 412) Interchange Modification	Modification of the I-65 interchange at SR-99 (US-412)	$8,000,000	2017	TDOT/NHPP	TIP # 2016-84-231
SR-50 (US-431)	Widening, from 2/3 to 5 lanes, from Franklin Pike (US-431/SR-106) to Verona Avenue (US-31A/SR-11)	$34,485,000	2017	TDOT/ACNHPP	STIP # 1759020

Source: 2017-2020 State Transportation Improvement Program, TDOT; 2017-2020 Transportation Improvement Program, Nashville Area MPO.

2. Land Use and Economic Development

Population and employment growth drive public infrastructure and service needs, and the I-65 corridor has been and is facing unprecedented change. Although the focus of the I-65 study is on the corridor's transportation system, the underlying growth and development patterns will largely determine how transportation improvements can and should adapt over time to meet new needs and address deficiencies. Understanding where growth is expected to occur and what form it will take will help inform potential transportation strategies and solutions.

2.1 Population and Employment Projections

The counties in the I-65 corridor study area (Figure 2-1) are expected to experience a significant increase in population and employment over the next 25 years, adding approximately 1,215,000 more people and approximately 830,000 more jobs between 2010 and 2040, increases of 69 percent and 77 percent, respectively. The counties within the Central Sub-Area, which largely anchor the Nashville-Davidson-Murfreesboro-Franklin Metropolitan Statistical Area (MSA), are projected to experience both the highest relative and absolute population and employment increases between 2010 and 2040. The Central Sub-Area is projected to experience an 82 percent increase in population and an 83 percent increase in employment. The North and South Sub-Areas will experience smaller rates of growth, with employment outpacing population growth rates in both areas.

More specifically, two thirds of projected population growth in the corridor is forecasted to occur in three counties, Rutherford, Williamson, and Wilson Counties, which will each more than double their 2010 populations by 2040 to approximately 603,000, 537,000, and 233,000 people, respectively. On the employment side, Davidson, Rutherford, and Williamson Counties will realize much of the growth between 2010 and 2040, adding approximately 326,000, 138,000, and 188,000 jobs, respectively. These counties also comprise most of the population and employment growth over the interim horizon years. Table 2-1 shows projected population and employment by county and sub-area.

Finally, areas in the immediate vicinity, or one mile, of I-65 interchanges (Table 2-2) are anticipated to grow by more than 55,000 people (50 percent increase) and 154,000 jobs (71 percent increase) for an approximate total of 164,500 people and 372,300 jobs by 2040. Interchange areas projected to add more than 10,000 people and/or 10,000 jobs include:

- Downtown Nashville;
- Cool Springs;
- North of Downtown Nashville;
- South of Downtown Nashville;
- Rivergate; and
- SR 254 – Old Hickory Boulevard.

2.2 Planned and Proposed Development

Existing plans and currently proposed development will guide much of the forecasted population and employment growth over the next 25 years. While each of the sub-areas faces unique circumstances and challenges, large scale development is planned throughout the I-65 corridor, especially from Portland on the north to Columbia on the south, representing approximately 75 miles of the 122-mile corridor.

North Sub-Area

Additional growth is planned along both sides of I-65 in Robertson and Sumner Counties. Major employment and activity centers are planned for the new SR 109 interchange with I-65 in Portland immediately south of the Tennessee-Kentucky state line and at the SR 76 interchange at Exit 108 in White House. The scale of development planned at the new SR 109 interchange, the North Gateway Corridor, is significant with a developable land area of approximately 4,000 acres. For comparison, the Cool Springs area in Franklin is approximately 1,200 acres. While the exact nature of development has yet to be determined, the proposed land use plan calls for a regional center with commercial, industrial, residential, and recreational uses. The interchange area around the SR 76 interchange (Exit 108) is expected to be developed as a highway commercial activity center, with new regional offices or office headquarters and park-and-ride lots.

Figure 2-1. Study Area Map with Sub-Areas

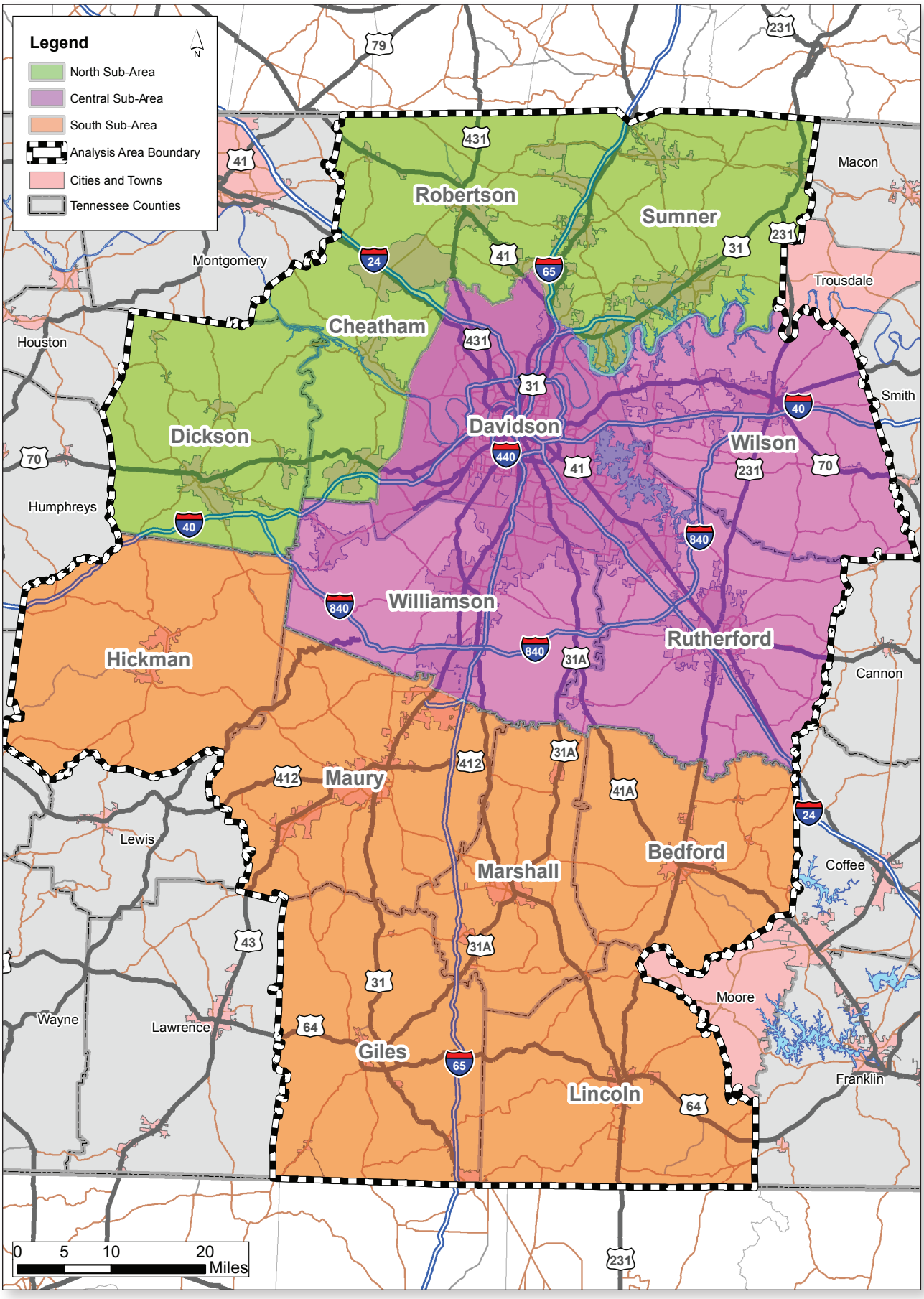


Table 2-1. County Growth Trends

		2010		2020				2030				2040			
		Population	Employment	Population		Employment		Population		Employment		Population		Employment	
Sub-Area	County	Total	Total	Total	Increase from 2010	Total	Increase from 2010	Total	Increase from 2010	Total	Increase from 2010	Total	Increase from 2010	Total	Increase from 2010
North	Cheatham	39,107	15,899	45,334	16%	19,351	22%	51,565	32%	22,813	43%	57,804	48%	26,281	65%
	Dickson	49,664	22,469	55,396	12%	25,839	15%	61,140	23%	29,129	30%	66,896	35%	32,608	45%
	Robertson	66,283	28,067	83,977	27%	33,591	20%	99,100	50%	39,857	42%	112,851	70%	47,190	68%
	Sumner	160,645	55,354	193,105	20%	66,686	20%	218,698	36%	80,227	45%	241,698	50%	95,970	73%
	Sub-Area Total	315,699	121,789	377,812	20%	145,467	19%	430,503	36%	172,026	41%	479,249	52%	202,049	66%
Central	Davidson	626,682	542,773	680,496	9%	635,738	17%	734,958	17%	745,177	37%	780,507	25%	869,137	60%
	Rutherford	262,604	133,803	384,504	46%	170,093	27%	497,364	89%	215,490	61%	602,977	130%	271,416	103%
	Williamson	183,182	120,266	309,328	69%	162,311	35%	426,801	133%	223,802	86%	537,377	193%	307,836	156%
	Wilson	113,993	51,640	157,139	38%	65,133	26%	196,478	72%	81,960	59%	233,085	104%	102,437	98%
	Sub-Area Total	1,186,461	848,481	1,531,467	29%	1,033,275	22%	1,855,601	56%	1,266,429	49%	2,153,946	82%	1,550,826	83%
South	Bedford	45,058	25,809	51,610	15%	29,345	14%	58,175	29%	32,892	27%	64,748	44%	36,448	41%
	Giles	29,485	14,153	31,048	5%	15,658	11%	32,620	11%	17,178	21%	34,199	16%	18,704	32%
	Hickman	24,690	6,543	26,773	8%	7,187	10%	28,866	17%	7,839	20%	30,967	25%	8,495	30%
	Lincoln	33,361	14,892	35,226	6%	16,287	9%	37,100	11%	17,690	19%	38,984	17%	19,104	28%
	Marshall	30,617	12,004	34,072	11%	12,836	7%	37,530	23%	13,672	14%	40,995	34%	14,520	21%
	Maury	80,956	39,996	94,861	17%	47,043	18%	106,276	31%	55,746	39%	116,514	44%	65,609	64%
	Sub-Area Total	244,167	113,397	273,590	12%	128,356	13%	300,567	23%	145,017	28%	326,407	34%	162,880	44%
STUDY AREA TOTAL		1,746,327	1,083,668	2,182,869	25%	1,307,098	21%	2,586,671	48%	1,583,472	46%	2,959,602	69%	1,915,755	77%

Source: Statewide Travel Demand Model, Version 2

Table 2-2. Interchange Areas: Population and Employment, 2010-2040

Interchange Areas (multiple interchanges)	2010 Population	2040 Population	2010-2040 Population Change	Percentage Population Change	2010 Employment	2040 Employment	2010-2040 Employment Change	Percentage Employment Change
Downtown Nashville	27,999	41,194	13,195	47%	109,480	182,945	73,465	67%
Cool Springs	15,312	31,111	15,800	103%	39,828	69,279	29,451	74%
North of Downtown Nashville	16,926	23,406	6,480	38%	7,388	27,621	20,233	274%
South of Downtown Nashville	19,210	23,707	4,496	23%	36,133	48,153	12,020	33%
Rivergate	9,415	11,750	2,335	25%	9,850	14,863	5,014	51%
SR 254 - Old Hickory Blvd	4,050	5,115	1,065	26%	6,505	11,186	4,681	72%
Concord Road	2,244	3,521	1,278	57%	3,854	7,535	3,681	96%
Madison Sub-Market	4,461	5,366	905	20%	2,589	3,989	1,400	54%
Springfield Road	1,771	2,492	721	41%	980	2,323	1,343	137%
SR 396 - Saturn Pkwy	3,246	4,818	1,573	48%	254	1,390	1,137	448%
I-840	436	3,312	2,876	659%	69	688	618	891%
Bethel Road	1,235	1,739	504	41%	410	967	557	136%
SR 248 - Goose Creek Bypass	836	3,849	3,013	360%	105	634	529	503%
US 31 - Giles County	382	438	56	15%	204	270	66	32%
SR 52	402	637	235	59%	99	159	59	60%
SR 99	377	555	178	47%	31	61	30	98%
SR 25	441	627	185	42%	32	55	23	70%
SR 50	126	163	37	30%	11	31	20	183%
SR 273	92	108	16	17%	19	31	11	59%
SR 129	136	184	48	35%	49	57	7	15%
SR 373	113	151	39	34%	10	15	5	47%
SR 11	111	141	30	27%	53	56	2	4%
US 64	87	101	14	16%	17	13	-4	-22%
TOTAL	109,409	164,487	55,077	50%	217,971	372,321	154,350	71%

Central Sub-Area

NashvilleNext, the comprehensive plan for Metro Nashville and Davidson County, includes a land use vision that will largely preserve the general urban character along the I-65 corridor. Development centers are identified at the I-65 interchanges with Vietnam Veterans Boulevard/SR 386 (Exit 95), Briley Parkway/ SR 155 (Exit 90), the downtown loop and Midtown areas of Nashville (multiple exits), Harding Place/SR 255 (Exit 78), and Old Hickory Boulevard/SR 254 (Exit 74). Additionally, I-65 from the downtown loop to Harding Place is identified as an "immediate need" priority corridor, calling for more intense housing and commercial development along the corridor in concert with improvements to high capacity transit service.

In Williamson County, development is planned or proposed adjacent to many of the interchanges on I-65. New or additional development is imminent near the Old Hickory Boulevard interchange, the Franklin/Cool Springs area (Exits 65 through 69), and the Goose Creek Bypass interchange (Exit 61), with the latter two being designated as "Regional Commerce" concept areas in Envision Franklin, the city's most recent land use plan update. A major mixed-use development, including over 300,000 square feet of office space, single- and multi-family housing, and a hotel, is already proposed for the northeast corner of McEwen Drive and Carothers Parkway.

East of I-65 in Williamson County, the "840 Center" is planned for the interchange of US 31A/US 41A and I-840, and consists of residential and mixed-use development. Additionally, the 780-acre Alexander Farm site off Buckner Lane in Spring Hill was recently re-zoned from agricultural to a "Gateway District," which calls for a mixture of office, residential, and commercial uses. The development potential at the site is high, given that a new interchange at Buckner Lane and I-65 is included in the Nashville Area MPO's 2040 Regional Transportation Plan.

South Sub-Area

Future development in the South Sub-Area is planned for the Bear Creek Pike (Exit 46) and New Lewisburg Highway (Exit 37) interchanges. Planned development is currently identified as highway-oriented commercial development. Development is proposed to be complemented by adjacent employment districts consisting of office parks, technology parks and research facilities, and industrial uses. The interchanges are in predominately rural areas, and new development will increase travel demand at I-65 and on adjacent connecting routes. Additionally, an area of land to the northwest of Columbia is served by a rail spur and is currently zoned for industrial use. This area has been identified as a freight growth area by the Nashville Area MPO.

2.3 Existing and Future Opportunities and Challenges

The existing and projected growth in the corridor will continue to place pressure on I-65 and the transportation system. The following summarizes the key findings related to growth and development.

A. **Corridor Population and Employment Growth:** Communities throughout the I-65 corridor are expected to experience increases in population and employment over the next 25 years, adding approximately 1,215,000 more people and approximately 830,000 more jobs between 2010 and 2040. Both population and employment growth will be heavily concentrated in Davidson, Rutherford, and Williamson Counties, accounting for 70 to 80 percent of new people and jobs. As Williamson and Rutherford Counties, and to a lesser extent Robertson and Sumner Counties, continue to grow as employment centers, new commuting routes, such as I-840 or SR 96, will assume greater importance.

B. **Interchange Area Employment Growth:** Growth within one mile of existing I-65 interchanges will strongly tilt toward employment, with three jobs added for every new resident, for a total of approximately 154,000 new jobs within the interchange areas. Managing travel to, from, and within existing and emerging employment centers near interchanges will continue to present opportunities and challenges. These growth patterns will also exacerbate already high peak hour demand on I-65 and related interchange facilities.

C. **Planned and Proposed Development:** In addition to the growth projected throughout the corridor and near interchanges, there are many significant developments near I-65 already in some stage of the planning and development process. Projects such as the North Gateway Corridor in Portland are in the earlier stages of land use policy planning while others such as Berry Farms in Franklin are currently phasing construction. In more developed areas like Nashville, long-range plans call for significant increases in development intensities to absorb projected growth and new high capacity transit services to support the higher densities.

3. Highway Capacity and Travel Demand

The population and employment growth projections serve as the foundation for evaluating existing and future highway capacity and travel demand in the trend scenario. The analysis utilizes TDOT's traffic history website, the statewide travel demand model, and origin-destination data from AirSage, Inc. to evaluate the following capacity and demand conditions in the corridor:

- Traffic volumes and projections;
- Travel patterns;
- Volume-to-Capacity ratios;
- Bottlenecks; and
- Travel time and delay for key markets.

3.1 Traffic Volumes and Projections

Traffic volumes along I-65 were collected using TDOT's traffic history website. Traffic history reflects the annual average daily traffic (AADT) at specific count locations along Tennessee roads. Counts were collected at 17 stations along the I-65 corridor, 10 of which surround the Nashville area. Figure 3-1 displays the traffic volumes collected at each of the 17 stations. The maximum AADT along I-65 is 172,104, found in south Nashville, between the I-440 and Harding Place/SR 255 interchanges. Also, of note, traffic volumes nearly double south of SR 386 and north of I-840 over volumes immediately north and south of those locations. As shown, traffic volumes toward the Kentucky state line are considerably higher than volumes near the Alabama state line.

Table 3-1 shows the daily personal vehicle and truck trips in the I-65 corridor. In 2010, there were 2,532,128 daily trips within one mile of the I-65 corridor. Of these daily trips, 130,543, or 5.4 percent, were truck trips. The remaining 2,401,585 trips were personal vehicle trips. The number of daily trips is expected to rise 82 percent by 2040 to 4,602,348 trips. Of the 2040 trips, 231,220, or 5.3 percent, are expected to be truck trips. The remaining 4,371,128 trips are expected to be personal vehicle trips. The total number of truck trips is expected to increase by 77 percent from 2010 to 2040.

Total vehicle miles traveled (VMT) were calculated, by roadway functional class and urban or rural context, for the analysis area for 2010 and 2040. Total VMT for the analysis area is forecasted to increase by 61 percent between 2010 and 2040. The largest percentage increases will be experienced on urban collectors and urban local roads, at 100 and 107 percent, respectively. However, the largest absolute increase is expected on arterials, which will see an increase of approximately 29,000,000 VMT in urban areas and approximately 25,000,000 VMT in rural areas.

VMT per capita shows different trends for different functional classes. Total VMT per capita decreases by five percent for the entire analysis area. Urban interstates and arterials decrease by 20 and nine percent, respectively, while rural interstates and local roads decrease by 11 and 16 percent, respectively. Urban collectors and local roads and rural arterials and collectors experience increases of between 11 and 22 percent. The overall decrease and forecasted decreases on interstate facilities suggests that while VMT is increasing in tandem with population, driving distances in some areas are decreasing. This is consistent with general trends in urbanization as regional centers expand and new centers develop in high-growth areas. Table 3-2 presents the 2010-2040 VMT trends for the analysis area.

3.2 Travel Patterns

Major Trip Destinations (O-D Pairs)

Origin-Destination (O-D) data allows a more detailed analysis of trip patterns than other traditional methods of analysis. O-D data was obtained for 2016 from AirSage, Inc. AirSage processes real-time, cellular signal data points to identify travel patterns and transportation trends. O-D data were obtained for the entire state of Tennessee and were processed, analyzed, and summarized for travel markets in Figure 3-2, which displays the most common trip destination for each travel market with the arrow color correlating with destination. For example, there is a pale purple arrow pointing from Marshall County to Maury County. This indicates that the majority of trips originating in Marshall County end in Maury County. This analysis excludes trips that originate and end in the same travel market. While the Nashville Core is a significant travel destination, as expected, it is not the only significant destination in the study corridor. The most common destinations are the Nashville Core and

Figure 3-1. 2015 Daily Traffic Volumes Along I-65

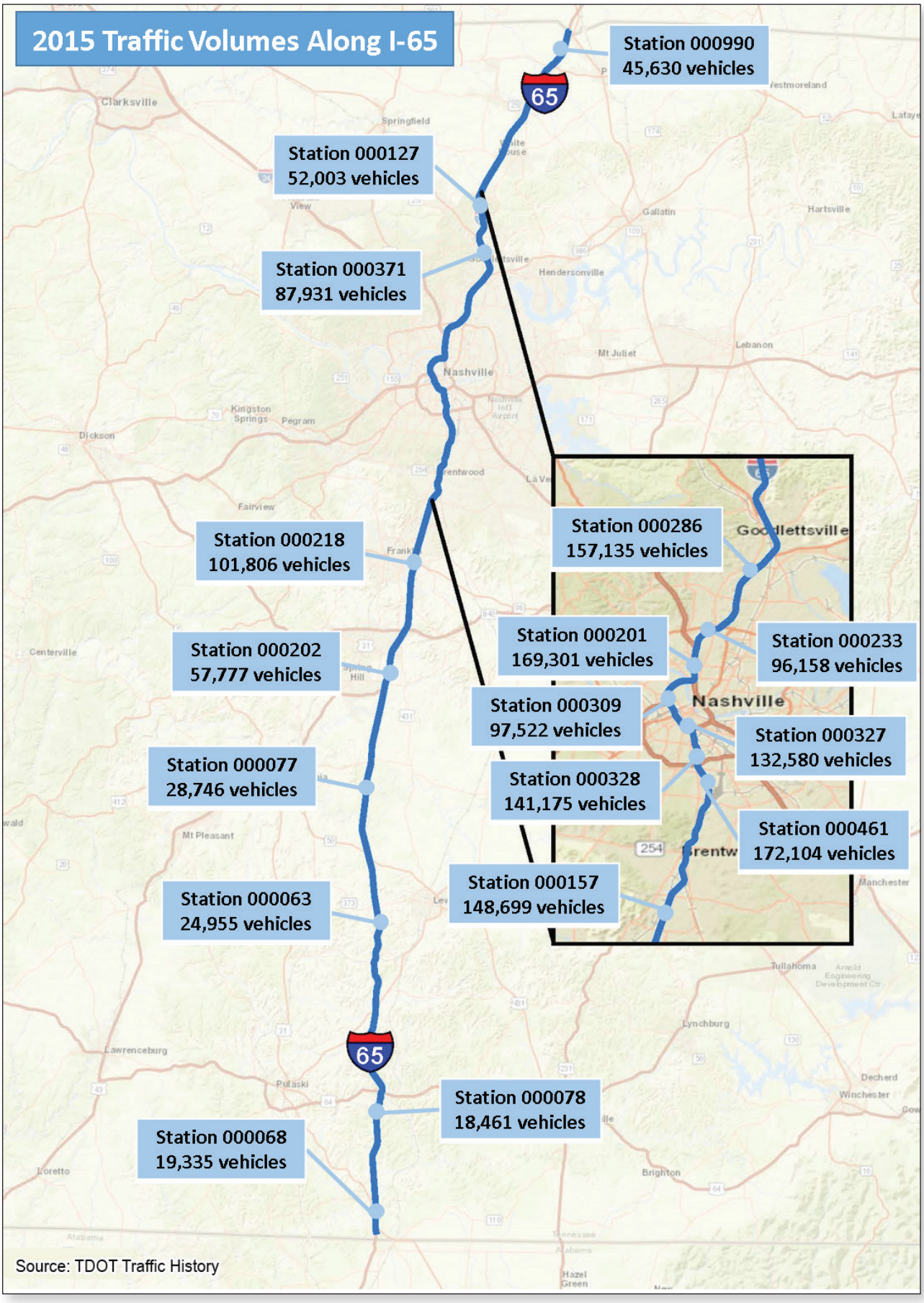


Table 3-1. I-65 Area Daily Trip Breakdown 2010 and 2040

Trip Types	Daily Trips 2010	2040	% Change
Personal Trips	2,401,585	4,371,128	82%
Truck Trips	130,543	231,220	77%
Total (Personal + Trucks) Trips	2,532,128	4,602,348	82%
Percent Truck Trips	5.4%	5.3%	---

Source: Statewide Travel Demand Model

Table 3-2. VMT by Functional Class

	Functional Class Group	Total VMT (1,000s) 2010	2040	Percent Change	VMT per Person 2010	2040	Percent Change
Urban	Interstates	40,196	54,646	35.9%	23	18	-19.8%
	Arterials	52,695	81,525	54.7%	30	28	-8.7%
	Collectors	8,397	16,805	100.1%	5	6	18.1%
	Local Roads	347	720	107.3%	<1	<1	22.3%
Rural	Interstates	26,259	39,563	50.7%	15	13	-11.1%
	Arterials	28,530	53,796	88.6%	16	18	11.3%
	Collectors	16,991	32,365	90.5%	10	11	12.4%
	Local Roads	237	338	42.6%	<1	<1	-15.8%
Analysis Area Total		173,652	279,757	61.1%	99	95	-4.9%

Source: Statewide Travel Demand Model

East Nashville/Madison, followed by Franklin, Spring Hill, and Maury County.

Census County-to-County Work Flow

The US Census compiles county-to-county work flows, which tracks the patterns of work-related trips. This data source does not include other trip purposes such as shopping or recreation trips. Figure 3-3 shows the most common trip generation for each county with arrow color correlating with destination, and the percentage of work trips originating from each county to the primary destination county. This indicates that the majority of trips originating in Cheatham County end in Davidson County. This analysis excludes trips that originate and end in the same key travel market. The most common destination is Davidson County, serving as the most common destination for trips originating in eight of the 13 surrounding counties.

3.3 Volume-to-Capacity Ratios

A volume-to-capacity (V/C) ratio quantitatively assesses the effectiveness of a corridor. The ratio compares the demand for a corridor with the capacity the corridor is designed to accommodate. Level of service (LOS) is a qualitative measure of the operating conditions of a roadway derived, in this case, from V/C ratios. The LOS of a facility is measured by a letter from "A" to "F", with an "A" referring to a facility in excellent operational condition and "F" referring to a facility in unsatisfactory operational condition. Figures 3-4 and 3-5 depict the V/C ratios and LOS for I-65 in 2010 and 2040.

In 2010, most of I-65 functions in good operational conditions, or LOS A to C. LOS decreases to LOS D and E at select locations around the Nashville area – specifically, near the I-65/SR 386 (Vietnam Veterans Boulevard) interchange, the I-65/I-40 interchange in North Nashville, the I-65/I-40 interchange in downtown Nashville, the I-65/I-440 interchange, and from Harding Place to Cool Springs. By 2040, LOS degrades to LOS D, E, and F for most of I-65 between the Kentucky state line and Spring Hill in Maury County. I-65 is expected to continue to operate well in the rural southern sections of the roadway. It is important to note that the V/C ratios and corresponding LOS reflect daily traffic volumes and do not represent peak travel periods and traffic incidents. Degrading daily LOS in the future likely means that peak period and incident related delays will become more prevalent. Figure 3-6 captures directional travel percentages and V/C ratios at the Sumner-Davidson county line and the Davidson-Williamson county line. Daily V/C ratios at the two locations are significantly lower than AM and PM V/C ratios.

Lower future LOS on I-65 may also result in traffic shifting to arterial roadways parallel to the interstate. Several parallel arterials are projected to be approaching capacity in 2040, and additional spillover traffic will push them above capacity. The spillover effect was analyzed at arterials near two key locations along I-65. Figures 3-8 and 3-9 display the resulting traffic volume increases projected for these arterials in 2040. The volume increases range from a 50 percent increase on Nolensville Pike/US 41A (Figure 3-7) to a 520 percent increase on Horton Highway/US 31A (Figure 3-8). This spillover effect on a typical weekday will likely be even more pronounced when there is an incident on I-65.

Figure 3-2. Existing Year (2016) Major Trip O-D Pairs

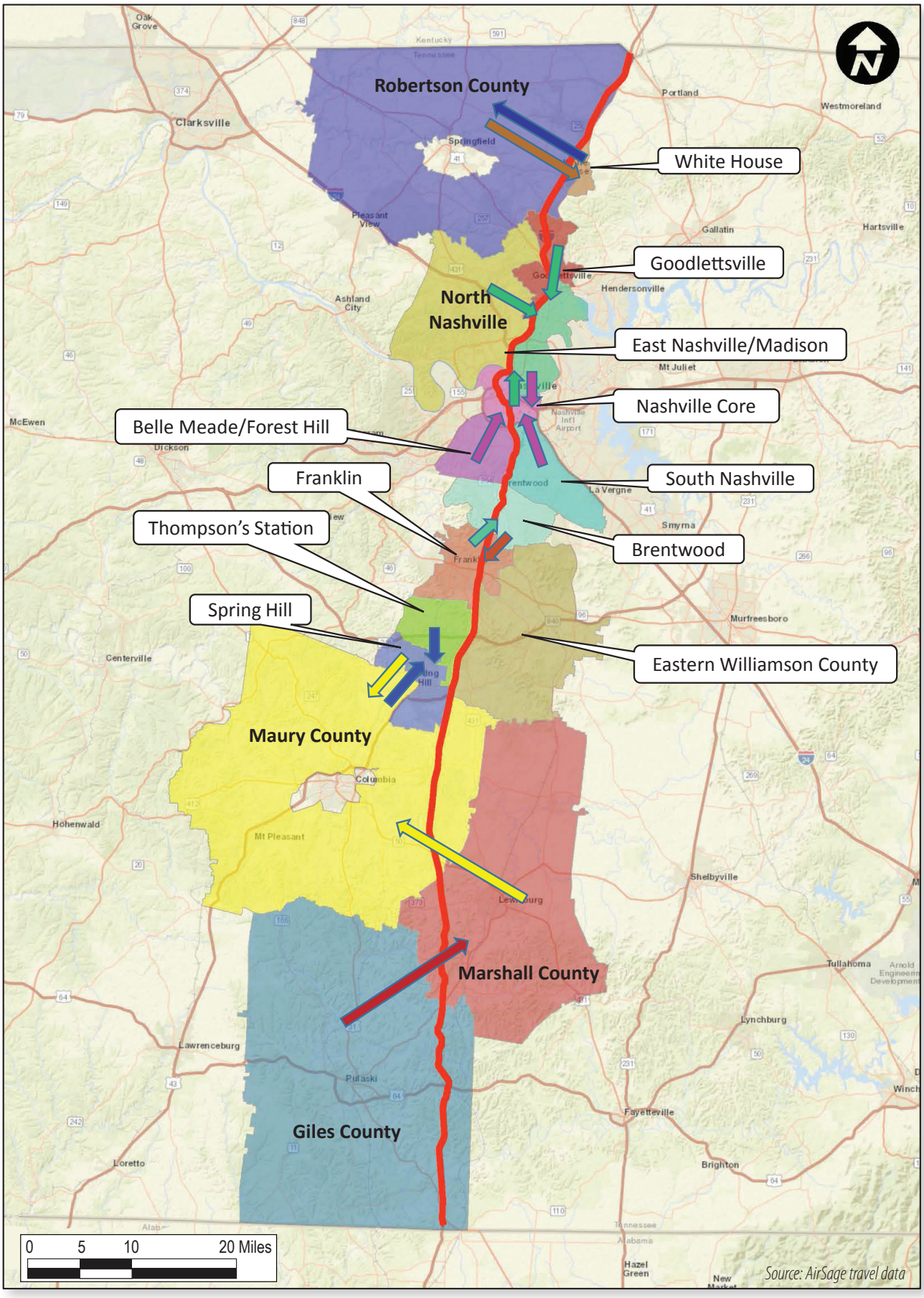


Figure 3-3. Existing Year (2016) County-to-County Work Flow

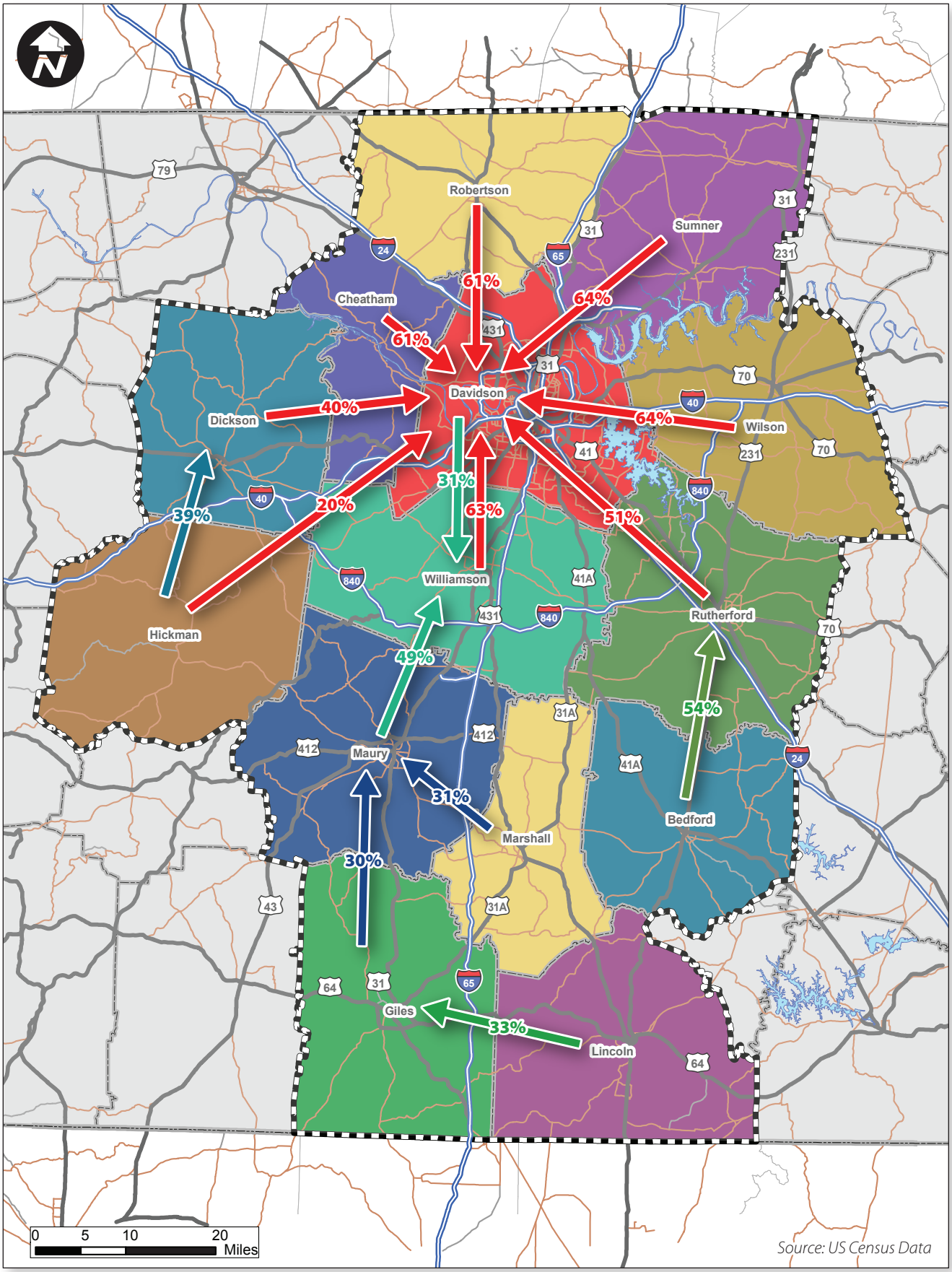


Figure 3-4. 2010 Daily V/C & LOS: Interstates

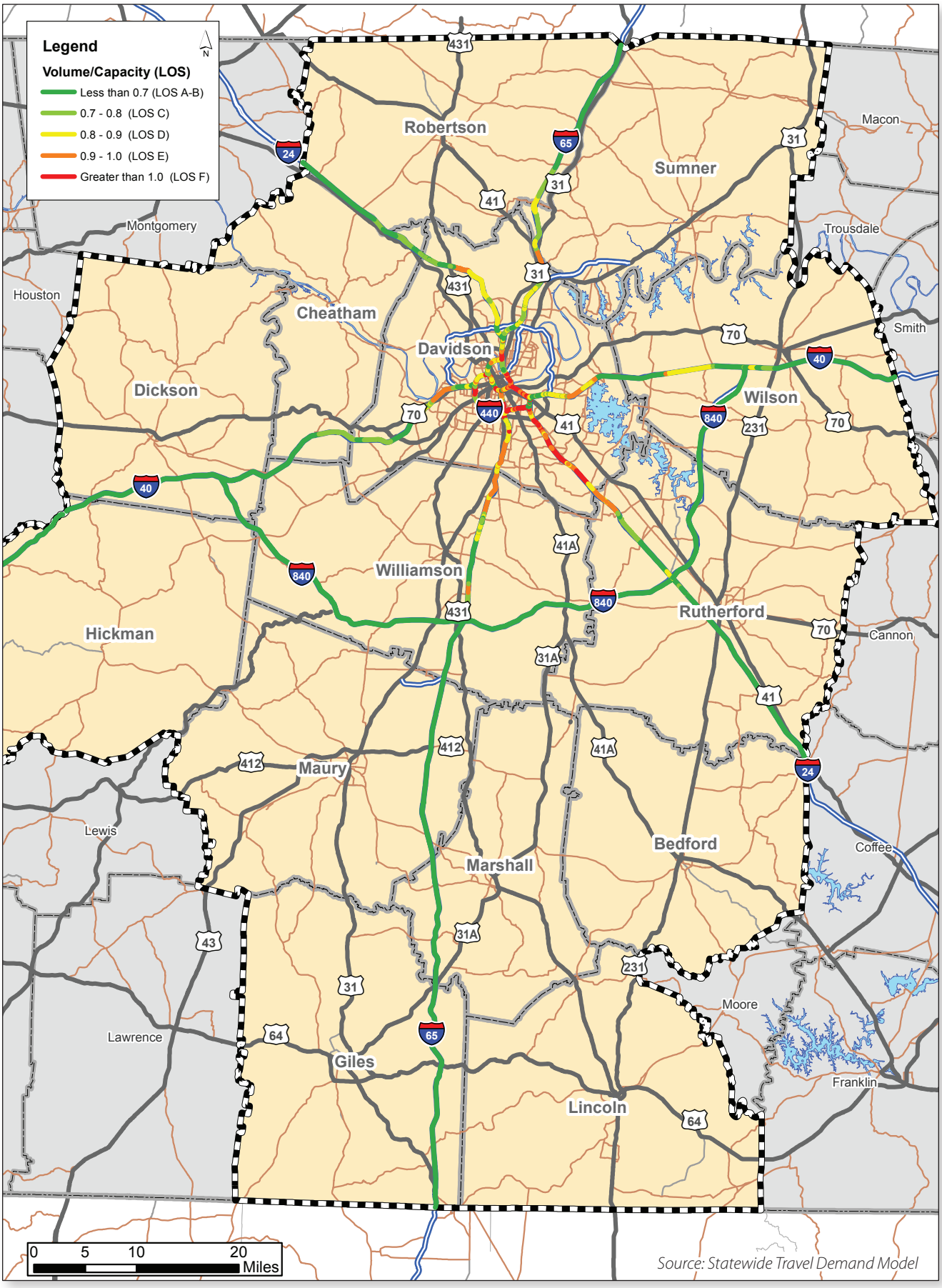


Figure 3-5. 2040 Daily V/C & LOS: Interstates

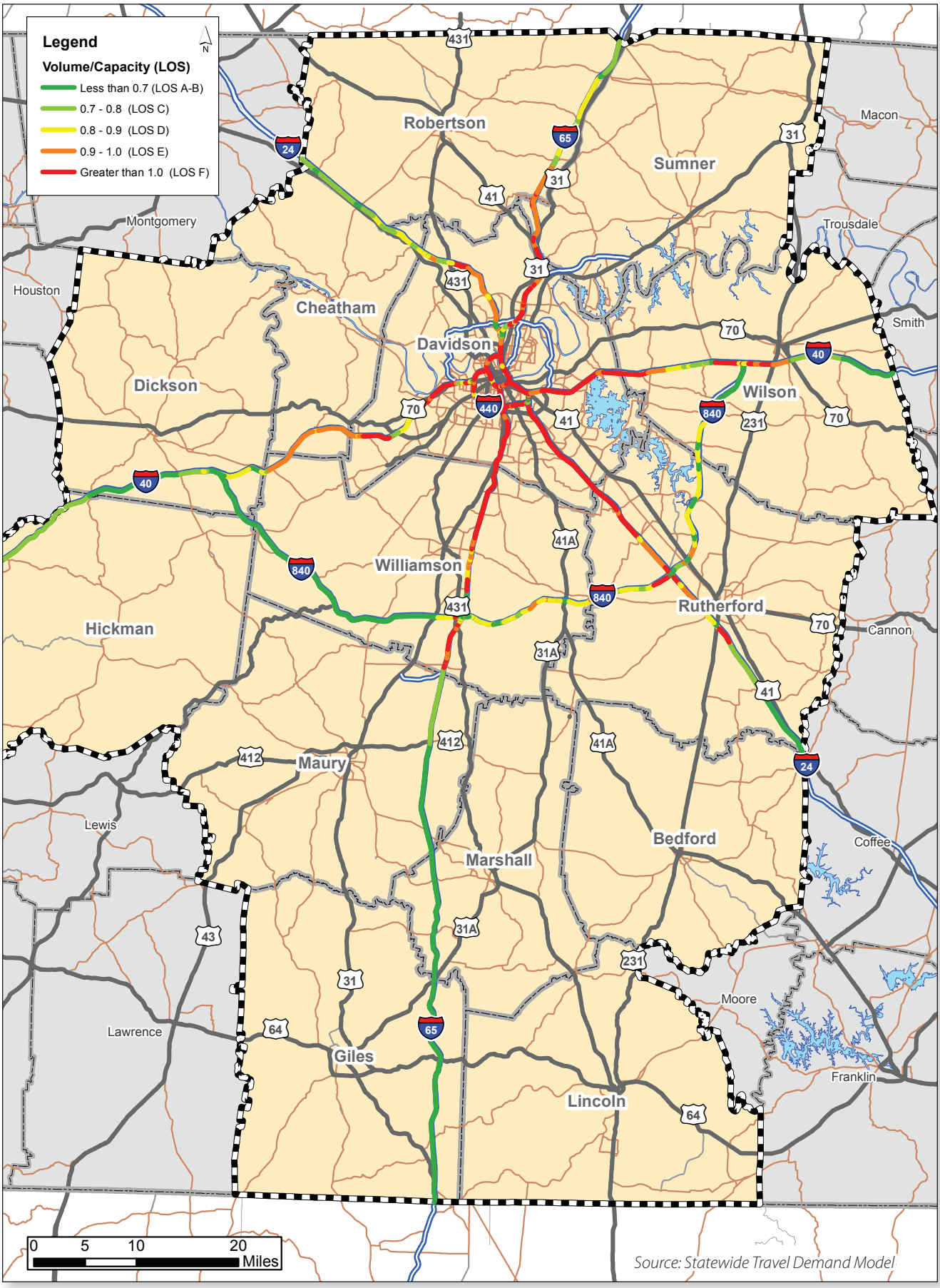
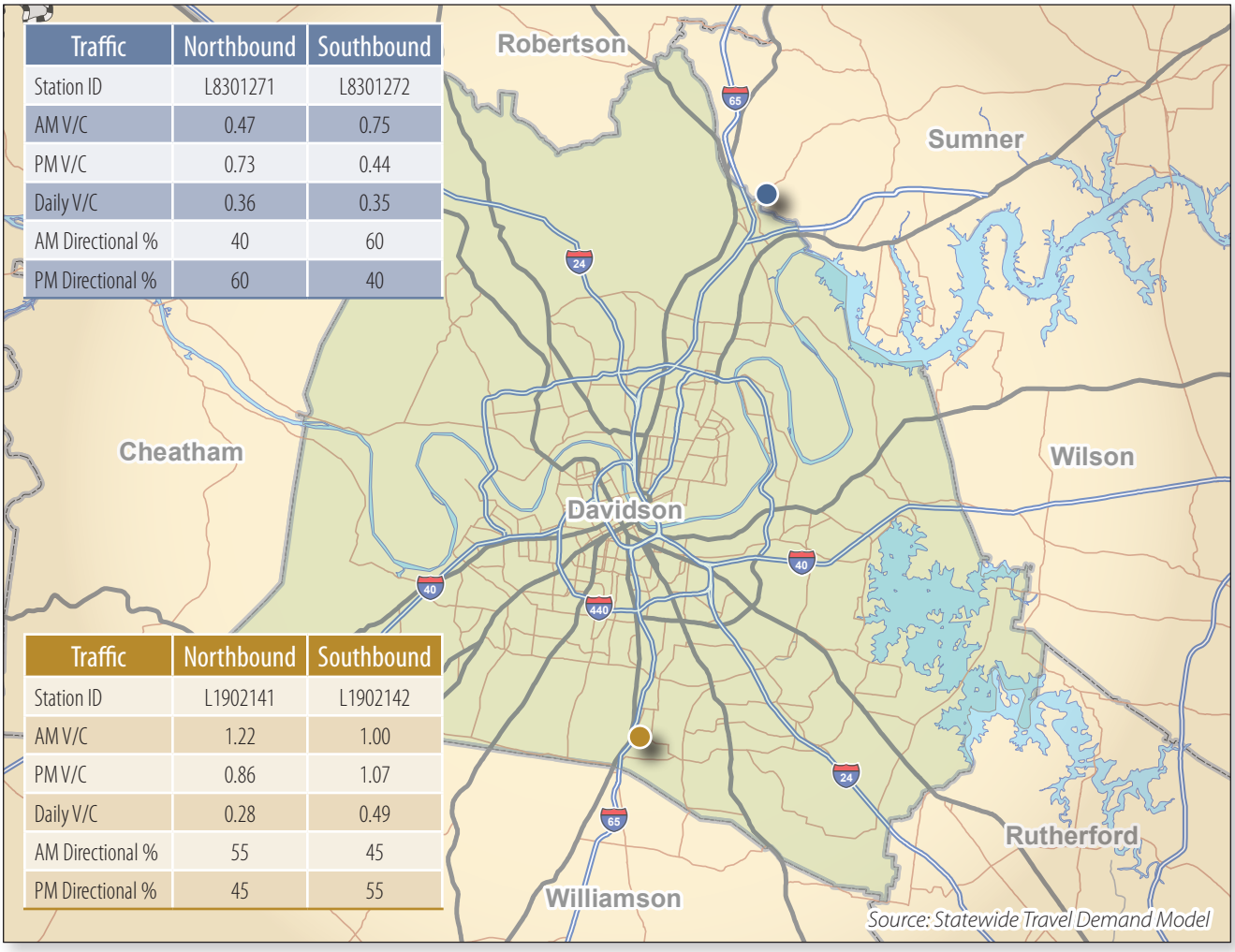


Figure 3-6. I-65 Directional Daily and Peak Traffic Analysis



Traffic	Northbound	Southbound
Station ID	L8301271	L8301272
AM V/C	0.47	0.75
PM V/C	0.73	0.44
Daily V/C	0.36	0.35
AM Directional %	40	60
PM Directional %	60	40

Traffic	Northbound	Southbound
Station ID	L1902141	L1902142
AM V/C	1.22	1.00
PM V/C	0.86	1.07
Daily V/C	0.28	0.49
AM Directional %	55	45
PM Directional %	45	55

Figure 3-7. Spillover Effect – Davidson/Williamson County Line

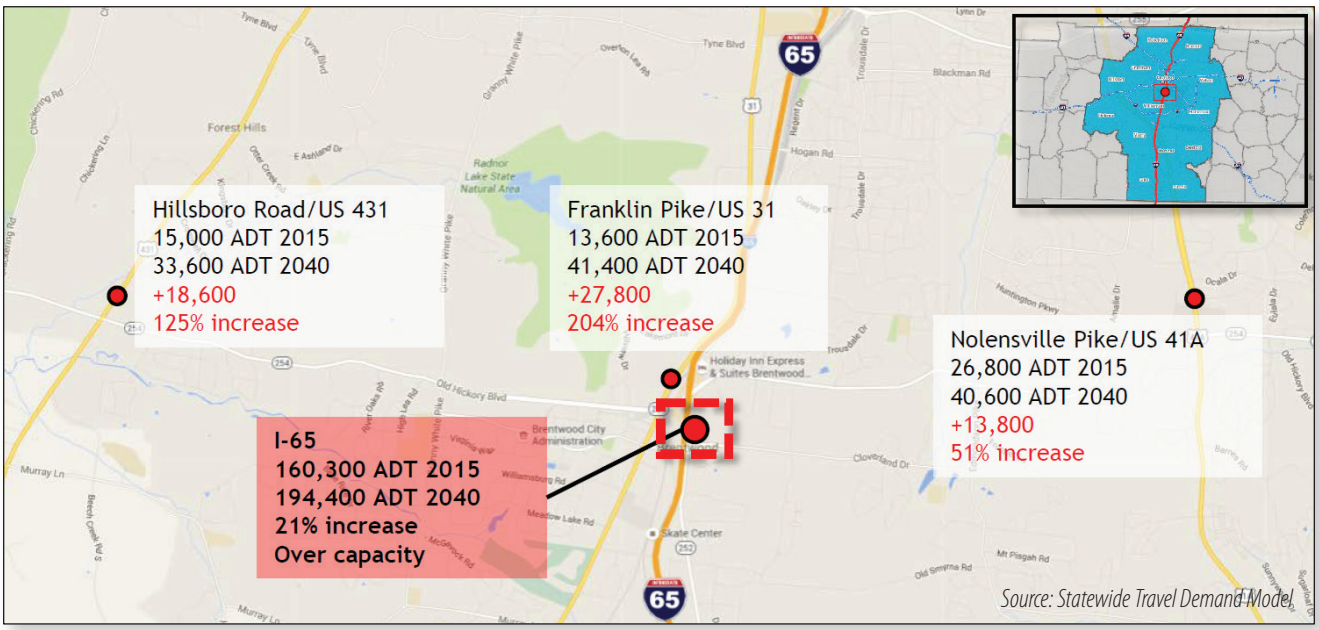
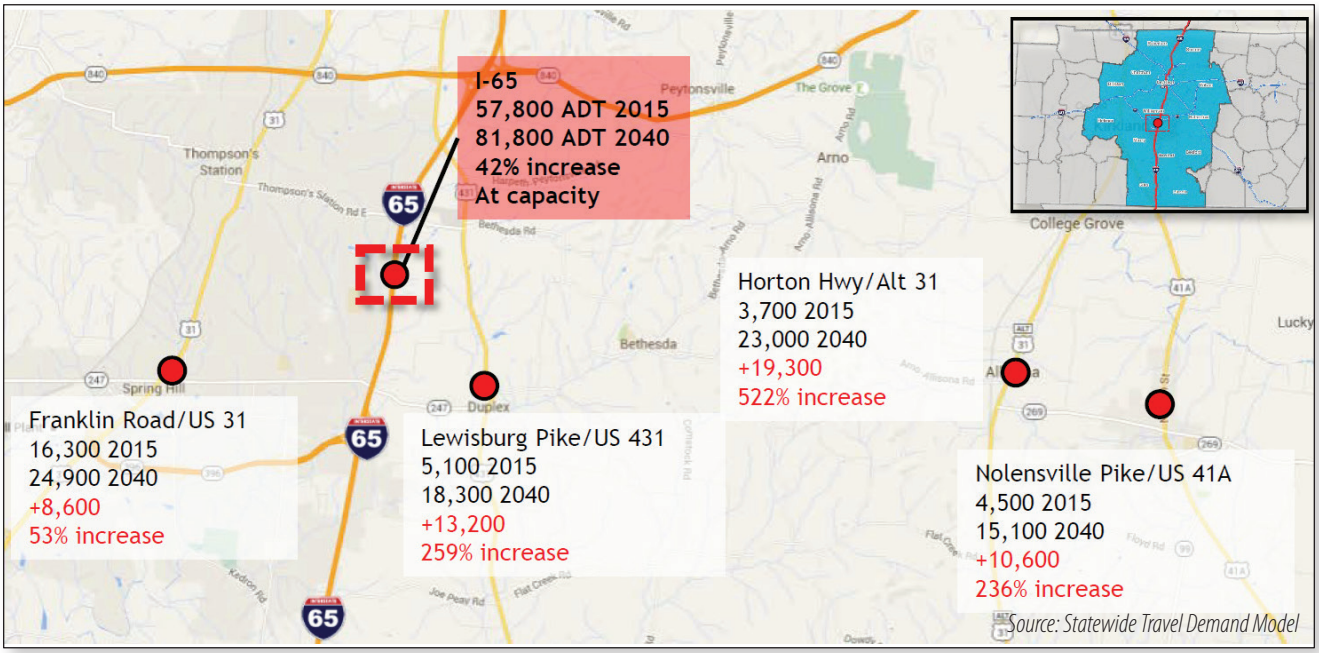


Figure 3-8. Spillover Effect – Spring Hill Area



3.4 Bottlenecks

Bottlenecks are frequently caused by lane drops, interchanges, heavy volumes exceeding capacity, merge segments, and diverge segments. Figures 3-9, 3-10, and 3-11 display bottleneck locations along I-65 and provide explanations for their occurrence. The corridor features frequent bottlenecks in the AM and PM peak periods in both the northbound and southbound directions.

Figure 3-9. Bottlenecks North of Nashville

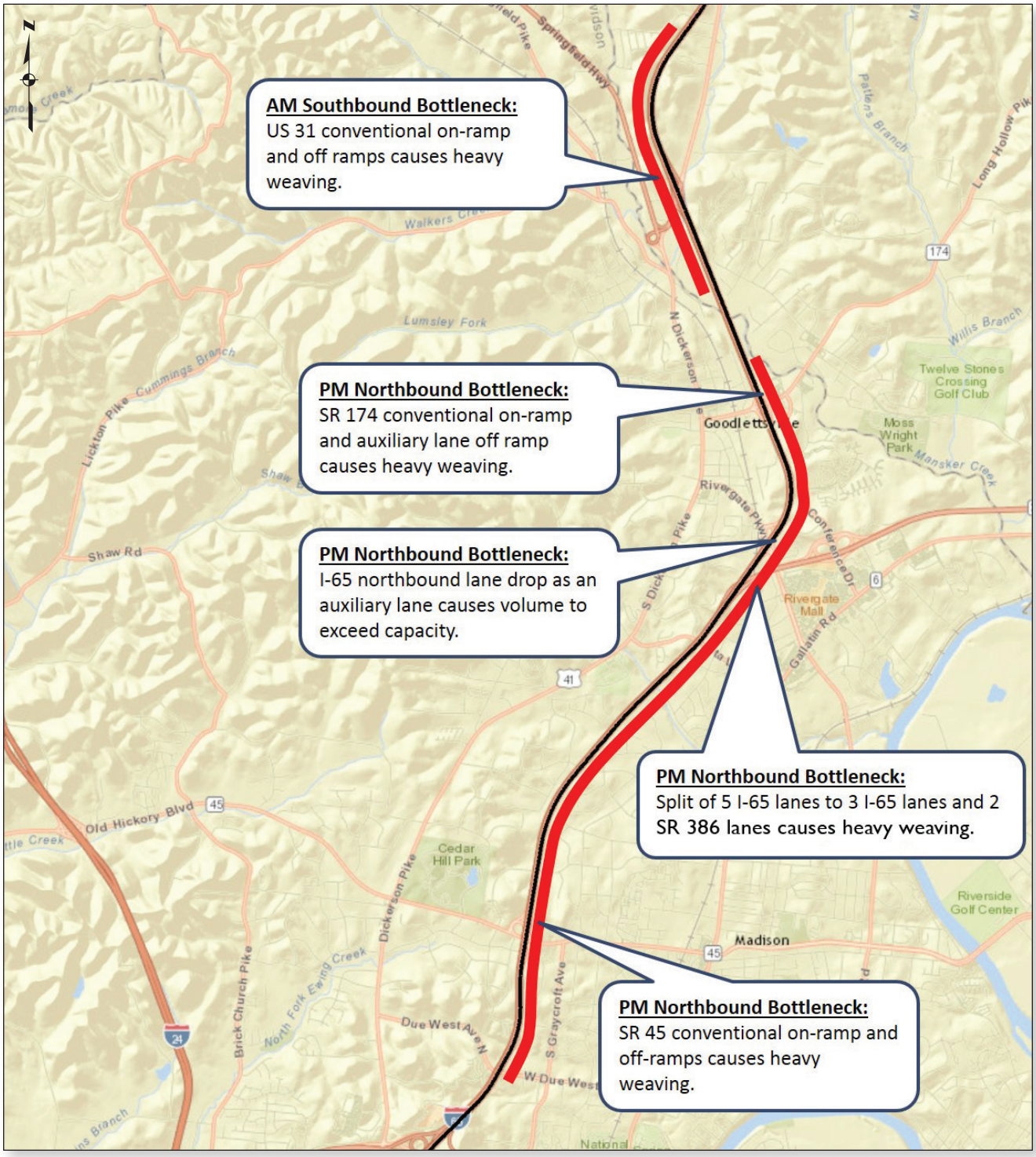


Figure 3-10. Bottlenecks around Nashville

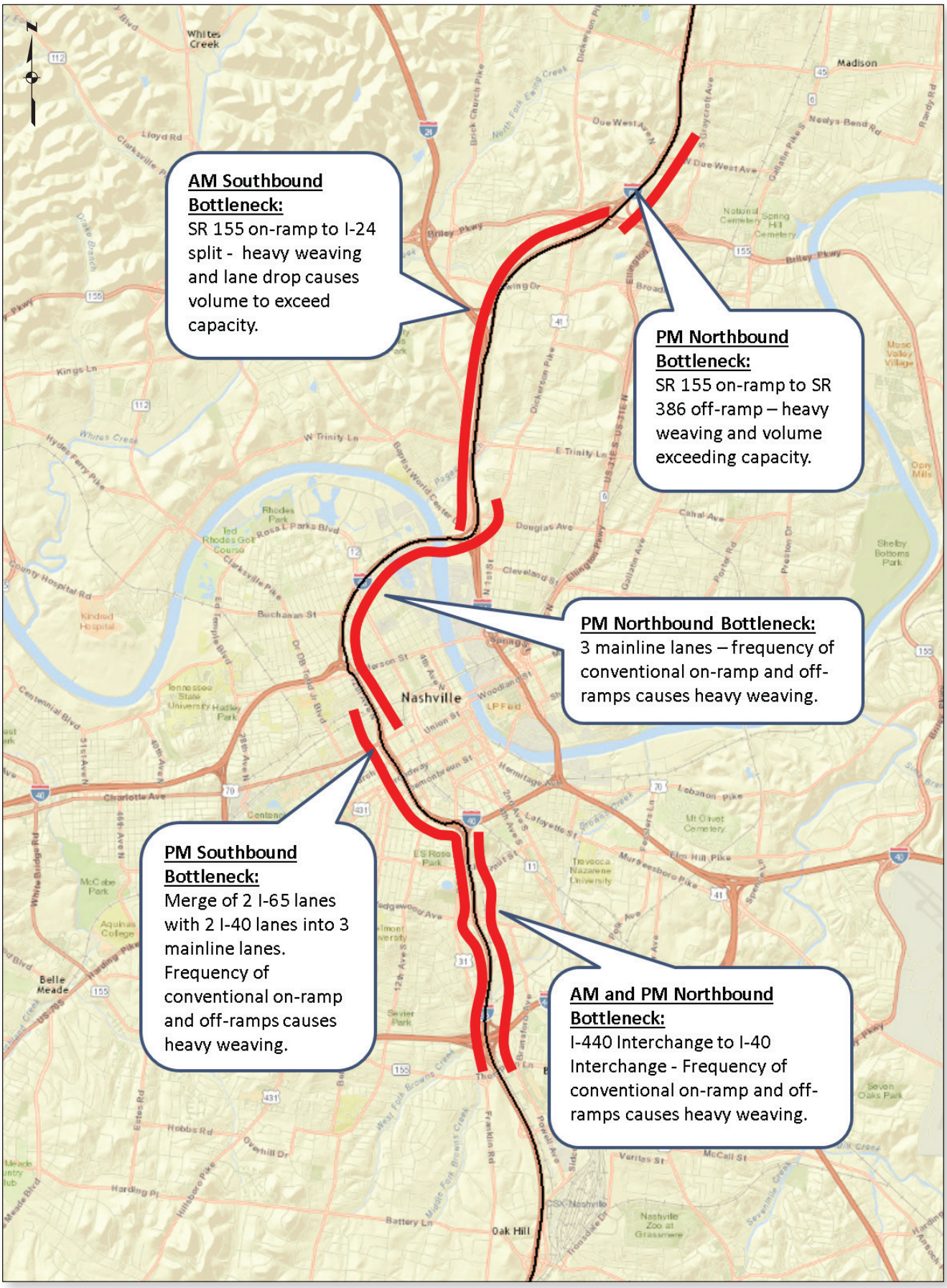
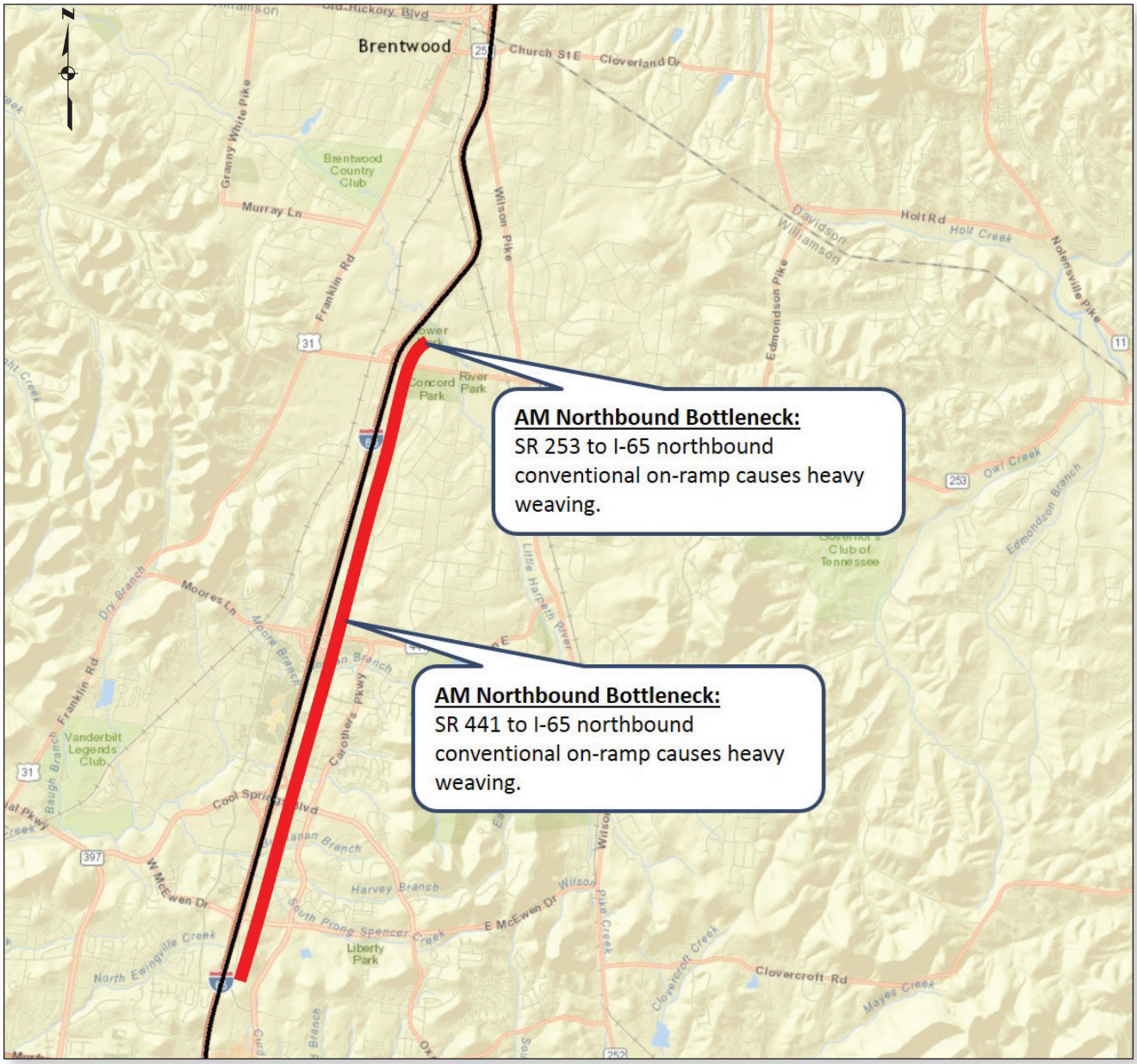


Figure 3-11. Bottlenecks South of Nashville



3.5 Travel Time and Delay

Modeled vehicle hours of travel (VHT) for the 2010 and 2040 baseline conditions are reported in Table 3-3. VHT measures the total amount that automobiles and trucks are traveling on the road system on a typical weekday. VHT trends in the corridor mirror those of VMT. At the analysis area level, total VHT increases by approximately 68 percent. The largest percentage increases are experienced on urban collectors and urban local roads, at 105 and 124 percent, respectively. However, as with VMT, arterials again experience the largest numerical increase at approximately one million hours in urban areas and 460,000 hours in rural areas. Like VMT, VHT on rural interstates and arterials will increase at a faster rate than in urban areas.

VHT per capita, like VMT per capita, also shows different trends for different functional classes. Total VHT per capita decreases by approximately one percent for the entire analysis area. As with VMT per capita, urban interstates and arterials and rural interstates and local roads will see per capita decreases up to 16 percent. Urban collectors and local roads and rural arterials and collectors will see increases of up to 30 percent. As with VMT, the reduction in per capita VHT, accompanied by faster increases of total VHT in rural areas, suggests that

Table 3-3. VHT by Functional Class



	Functional Class Group	Total VHT (1,000s) 2010	2040	Percent Change	VHT per Person 2010	2040	Percent Change
Urban	Interstates	679	1,013	49.2%	0.39	0.34	-12.0%
	Arterials	1,626	2,637	62.2%	0.93	0.89	-4.3%
	Collectors	264	541	105.2%	0.15	0.18	21.1%
	Local Roads	11	25	124.2%	0.01	0.01	32.3%
Rural	Interstates	348	527	51.1%	0.20	0.18	-10.8%
	Arterials	531	994	87.2%	0.30	0.34	10.5%
	Collectors	372	710	91.0%	0.21	0.24	12.7%
	Local Roads	5	8	42.4%	0.00	0.00	-16.0%
	Analysis Area Total	3,836	6,456	68.3%	2.20	2.18	-0.7%

Source: Statewide Travel Demand Model

Table 3-4. VHD by Functional Class



	Functional Class Group	Total VHD 2010	2040	Percent Change	VHD per Person 2010	2040	Percent Change
Urban	Interstates	75,979	200,819	164.3%	0.044	0.068	56.0%
	Arterials	24,018	190,186	691.8%	0.014	0.064	367.2%
	Collectors	874	25,951	2870.0%	0.001	0.009	1652.5%
	Local Roads	52	2,406	4512.8%	0.000	0.001	2621.8%
Rural	Interstates	467	3,357	618.4%	0.000	0.001	323.9%
	Arterials	251	6,401	2446.6%	0.000	0.002	1402.6%
	Collectors	105	2,242	2044.0%	0.000	0.001	1165.1%
	Local Roads	0	22	4887.9%	0.000	0.000	2843.1%
	Analysis Area Total	101,746	431,384	324.0%	0.058	0.146	150.2%

Source: Statewide Travel Demand Model

travel patterns will become increasingly decentralized from downtown Nashville by 2040.

Modeled vehicle hours of delay (VHD) for base year 2010 and future year 2040 are presented in Table 3-4 by functional class. The projected analysis area-wide VHD is projected to increase by 324 percent by 2040, indicating that congestion in the corridor will become more severe going forward. Rural VHD will increase at a significantly higher rate than urban VHD, particularly on interstate and arterial facilities, which will increase by 618 and 2,447 percent, respectively. However, urban interstates and arterials will experience the largest numerical increases, at approximately 125,000 and 166,000 hours, respectively.

A decrease in VHT per capita accompanied by an increase in VHD per capita suggests that commuters will spend less time traveling overall, likely due to a greater jobs-housing balance supported by new employment centers. However, the amount of time spent in congested conditions, particularly during peak hour, will increase on a per capita basis by 2040.

Average speeds were examined by functional class in both urban and rural areas of the corridor, as seen in

Table 3-5. Average speeds corridor-wide are projected to decrease by approximately four percent. Urban roadways will experience decreases between three and ten percent. Rural roadways will largely maintain the existing speeds.

Table 3-6 displays estimated travel times in 2010 and 2040 between select travel markets. Travel time was calculated based on the link level travel time from the statewide loaded model. Travel times are for interchange-to-interchange travel and do not include travel on surface streets. Further, the times represent travel under ideal conditions, for example, with no incidents. Ten O-D pairs were analyzed based on the volume of trips between the pairs. Travel times are forecasted to increase between 70 and 100 percent in six of the ten O-D pairs, with the greatest increases occurring in pairs extending from Spring Hill to Nashville. Trips from Franklin to the Nashville Core, for example, are projected to double from 29 minutes to 59 minutes, and although a shorter distance, the duration of trips from Franklin to Brentwood will increase from 10 minutes to 21 minutes. Table 3-7 displays delay in 2010 for the key O-D pairs. Typical travel time was computed using Google Maps directions for a typical weekday at 12:00 PM. Delay was computed by subtracting the 2010 model travel time from Google's maximum typical travel time.

3.6 Existing Deficiencies and Future Needs

Highway capacity and travel demand vary widely throughout the I-65 corridor. While current deficiencies tend to be focused between Moores Lane/SR 441 and downtown Nashville, daily trips are projected to nearly double over the next 25 years leaving much of I-65 in fair to poor operating conditions. Following are key findings from the highway capacity and travel demand analysis:

A. **Traffic Volumes:** The maximum AADT along I-65 is 172,104, found in south Nashville between the I-440 and the Harding Place/SR 255 interchanges. Of note, traffic volumes nearly double south of SR 386 and north of I-840 over volumes immediately adjacent to those locations. Traffic volumes toward the Kentucky state line are considerably higher than volumes near the Alabama state line.

B. **Daily Personal Vehicle and Truck Trips:** In 2010, there were 2,532,128 daily trips within 1 mile of the I-65 corridor. Of these daily trips, 130,543, or 5.4 percent, were truck trips. The number of daily

Table 3-5. Average Speeds by Functional Class

	Functional Class Group	Average Speed 2010	Average Speed 2040	Percent Change
Urban	Interstates	60	56	-6.7%
Urban	Arterials	32	31	-3.1%
Urban	Collectors	32	31	-3.1%
Urban	Local Roads	31	28	-9.7%
Rural	Interstates	75	75	0.0%
Rural	Arterials	54	54	0.0%
Rural	Collectors	46	46	0.0%
Rural	Local Roads	44	44	0.0%
	Analysis Area Average	45	43	-4.4%

Source: Tennessee Statewide Travel Demand Model

Table 3-6. 2010 and 2040 Travel Time for Key O-D Pairs

Market From-To	Travel Time (min) Model 2010	Travel Time (min) Model 2040	% Change
Franklin to Brentwood	10	21	110%
Brentwood to Franklin	11	22	100%
South Nashville to Franklin	22	37	68%
South Nashville to Nashville Core	16	30	88%
Franklin to Nashville Core	29	59	103%
Portland to Nashville Core	41	47	15%
Hendersonville to Nashville Core	25	32	28%
Spring Hill to Nashville Core	36	64	78%
Spring Hill to Franklin	20	36	80%
Giles County to Franklin	56	69	23%

Source: Statewide Travel Demand Model

Table 3-7. 2010 Typical Travel Time and Delay for Key O-D Pairs

Market From-To	Travel Time - 2010 Model (min)	Typical Travel Time (min)	Delay (min)
Franklin to Brentwood	10	10-16	6
Brentwood to Franklin	11	9-14	3
South Nashville to Franklin	22	18-26	4
South Nashville to Nashville Core	16	14-20	4
Franklin to Nashville Core	29	22-35	6
Portland to Nashville Core	41	40-55	14
Hendersonville to Nashville Core	25	22-35	10
Spring Hill to Nashville Core	36	30-40	4
Spring Hill to Franklin	20	18-24	4
Giles County to Franklin	56	55-70	14

Source: Statewide Travel Demand Model and Google

trips is expected to increase 82 percent by 2040 to 4,602,348 trips. Of the 2040 trips, 231,220, or 5.3 percent, are expected to be truck trips.

C. **Vehicle Miles Traveled:** Daily VMT is projected to increase at near the same rate as population growth between 2010 and 2040. The largest increases will be experienced on both urban and rural arterials within the corridor. However, VMT per capita shows decreases on all interstate facilities, urban arterials, and rural local roads. This reflects increasing urbanization in the corridor as existing regional centers expand and new centers develop in high-growth areas.

D. **Major Trip Destinations:** The most common destinations in the I-65 corridor are the Nashville Core and East Nashville/Madison, followed by Franklin, Spring Hill, and Maury County. In effect, the trip destinations highlight the importance of daily trips in a corridor running from Goodlettsville to South Nashville and a second corridor from Brentwood to Columbia.

E. **County-to-County Work Flows:** The most common commuting destination is Davidson County, serving as the primary work destination for trips originating in eight of the 13 surrounding counties. Williamson County is the most common destination for work trips from Davidson and Maury Counties, and Maury County serves the same function for Giles and Marshall Counties.

F. **Volume-to-Capacity Ratios:** In 2010, most of I-65 functions in good operational conditions, with LOS A to C. LOS decreases to LOS D and E at select locations around the Nashville area – specifically, near the I-65/SR 386 (Vietnam Veterans Boulevard) interchange, the I-65/I-40 interchange in North Nashville, the I-65/I-40 interchange in downtown Nashville, the I-65/I-440 interchange, and from Harding Place to Cool Springs. By 2040, LOS degrades to LOS D, E, and F for most of I-65 between the Kentucky state line and Spring Hill in Maury County. I-65 is expected to continue to operate well in the rural southern sections of the roadway. It is important to note that the V/C ratios and corresponding LOS reflect daily traffic volumes and do not represent peak travel periods and traffic incidents. Daily V/C ratios are typically substantially lower than AM and PM V/C ratios in urban areas.

G. **Spillover Traffic on Arterials:** Several parallel arterials are projected to be approaching capacity in 2040, and additional spillover traffic will push them above capacity. Volume increases range from 50 percent on Nolensville Pike/US 41A to 520 percent on Horton Highway/US 31A. The spillover effect on a typical weekday will likely be even more pronounced when there is an incident on I-65.

H. **Bottlenecks:** Bottlenecks are frequently caused by lane drops, interchanges, heavy volumes exceeding capacity, merge segments, and diverge segments. The corridor features frequent bottlenecks in the AM and PM peak periods in both the northbound and southbound directions, extending as far north as Millersville in Sumner County to Cool Springs in Williamson County.

I. **Travel Times:** Travel times are forecasted to increase between 70 and 100 percent in seven of the ten O-D pairs analyzed, with the greatest increases occurring in pairs extending from Spring Hill to Nashville. Trips from Franklin to the Nashville Core, for example, are projected to double from 29 minutes to 59 minutes, and although a shorter distance, the duration of trips from Franklin to Brentwood will increase from 10 minutes to 21 minutes.

4. Safety

Increasing traffic volumes, vehicle miles traveled, and travel times create the conditions for more traffic incidents. Crashes can, of course, have devastating impacts on individuals and families, and more routinely, generate long travel delays especially where travel options are limited. Crash data was collected throughout the I-65 corridor and analyzed to identify locations with existing safety issues and potential future safety issues.

4.1 Crash Analysis

Crash Rates and Crash Hotspots

Crash rates were collected for the entire I-65 corridor from TDOT for the 2013-2015 three-year period, and are reported in terms of crashes per million vehicle miles traveled. The statewide average crash rate is set at 0.512 crashes per million vehicle miles for rural freeways and 1.036 crashes per million vehicle miles for urban freeways. I-65 crash rates were compared to the Tennessee statewide averages based on the following metrics:

- **Below Average:** Locations with crash rates below the statewide average were classified as below average.
- **Average:** Locations with crash rates at or within 15 percent above the statewide average were classified as average.
- **Above Average:** Locations with crash rates between 15 and 100 percent above the statewide average were classified as above average.
- **Significantly Above Average:** Locations with crash rates greater than or equal to 100 percent higher than the statewide average were classified as significantly above average.

Crash hotspots were identified as the locations with crash rates significantly above average, shown in red in Figure 4-1. Table 4-1 lists all crash hotspot locations along I-65 and compares the segment's crash rate with the statewide average crash rate. Table 4-2 reports injuries and fatalities resulting from reported crashes from 2013 to 2015 compared by sub-area. While the number of fatalities remained consistent from 2013 to 2015, the number of injuries increased by 18 percent. However, the three-year total of 34 percent of injuries per crash is consistent through each individual year. On average, over the three-year period, 0.4 percent of crashes led to fatalities.

Crash by Type

Reported crashes are categorized into ten collision types:
0 – No Collision with Vehicle
1 – Rear-end
2 – Head-on
3 – Angle
4 – Sideswipe, Same Direction
5 – Sideswipe, Opposite Direction
6 – Rear to Side
7 – Rear to Rear
8 – Other
9 – Unknown

In total, 9,049 crashes were analyzed over the three-year period of 2013 to 2015. Figure 4-2 details the crash types on I-65 between 2013 and 2015. Over 90 percent of crashes were caused by one of three reasons: no collision with vehicle, rear ending, or side swiping in the same direction.

Potential Crash Factors

Crashes occurring in crash hotspot locations were broken down into two categories to generate insights into potential factors:

- Crashes in congested crash hotspots; and
- Crashes in non-congested crash hotspots.

Figures 4-3 and 4-4 display the crash breakdown by type for each of the two categories listed. Both categories have three main crash causes: rear ending, no collision with a vehicle, and sideswiping in the same direction. These causes are consistent with the overall findings in Figure 4-2, although the percentage breakdown differs between them. Rear-end crashes remain the most common cause of crashes in both congested and non-congested crash hotspots – 42 percent of crashes in congested crash hotspots and 44 percent of crashes in non-congested crash hotspots. However, sideswipes in the same direction make up a larger portion of crashes in congested areas as compared to non-congested areas. These crashes comprise 28 percent of crashes in congested crash hotspots, but only 15 percent of crashes in non-congested crash hotspots. Additionally, crashes

Figure 4-1. I-65 Three-Year (2013-2015) Crash Rates

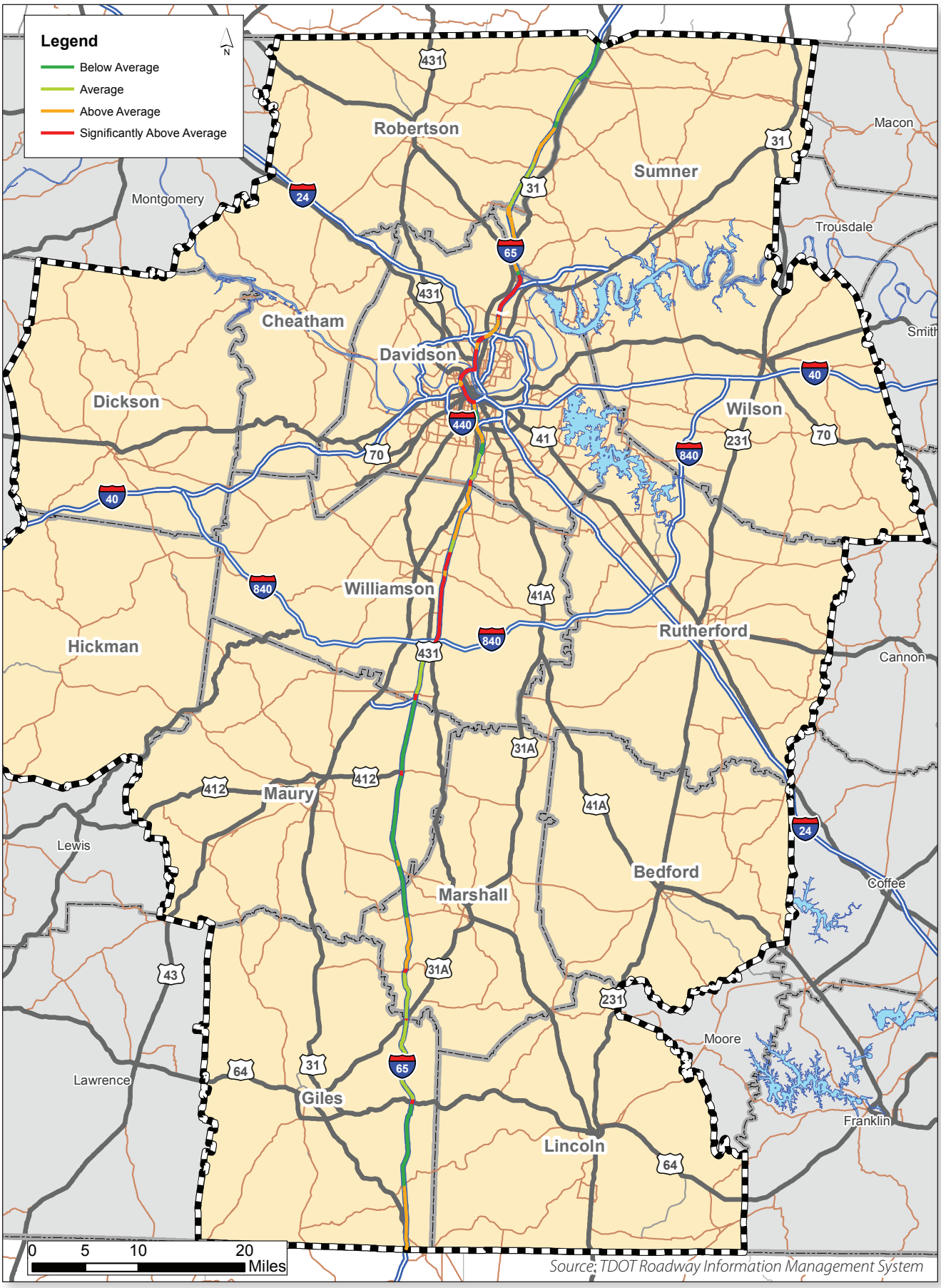


Table 4-1. I-65 Crash Hotspots Table

Hotspot Location Description	Statewide Crash Rate (per million vehicle miles)	Segment Crash Rate (per million vehicle miles)
Exit 97: SR 174/Long Hollow Pike to Exit 92: SR 45/Old Hickory Blvd	0.512	1.16 - 2.248
Exit 90: SR 155/US 41 to Exit 88: I-24 West	1.036	2.395
Nashville Downtown: Exit 88: I-24 West to Exit 210: the I-65/I-40 Interchange	1.036	2.145 - 5.668
Exit 74: SR 254 West/Old Hickory Blvd Interchange	0.512	2.622
Exit 68: Cool Springs Blvd to Exit 59: I-840	0.512	1.312 - 1.778
Exit 53: SR 396/Saturn Pkwy Interchange	0.512	1.559
Exit 46: US 412/SR 99 Interchange	0.512	1.098
Exit 27: SR 129/Lynnville Highway Interchange	0.512	1.035
Exit 22: SR 11/US 31A Interchange	0.512	2.459
Exit 14: US 64/SR 15 Interchange	0.512	1.213

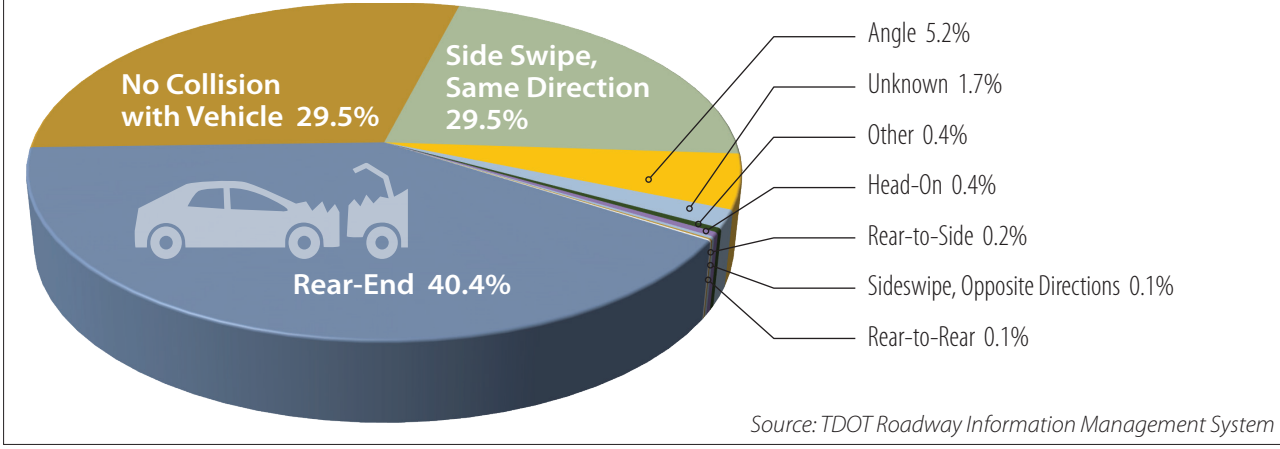
Source: TDOT Roadway Information Management System

Table 4-2. Sub-Area Crash Summary for Reported Crashes along I-65 (2013-2015)

		2013			2014			2015			3 Year Total				
Subarea	County	Total Crashes	Number of Fatalities	Number of Injuries	Total Crashes	Number of Fatalities	Number of Injuries	Total Crashes	Number of Fatalities	Number of Injuries	Total Crashes	Number of Fatalities	Percent of Fatalities per Crash	Number of Injuries	Percent of Injuries per Crash
North	Robertson	157	0	63	163	4	66	182	1	68	502	5	1.0%	197	39%
	Sumner	92	0	34	101	1	39	101	0	34	294	1	0.3%	107	36%
Central	Davidson	1,757	8	621	1,600	5	549	2,234	5	738	5,591	18	0.3%	1908	34%
	Williamson	586	2	164	691	1	217	714	4	230	1,991	7	0.4%	611	31%
South	Giles	85	1	36	86	0	42	91	2	25	262	3	1.1%	103	39%
	Marshall	61	2	28	52	0	22	64	1	40	177	3	1.7%	90	51%
	Maury	83	0	38	69	1	22	80	0	33	232	1	0.4%	93	40%
	Total	2,821	13	984	2,762	12	957	3,466	13	1,168	9,049	38	0.4%	3,109	34%

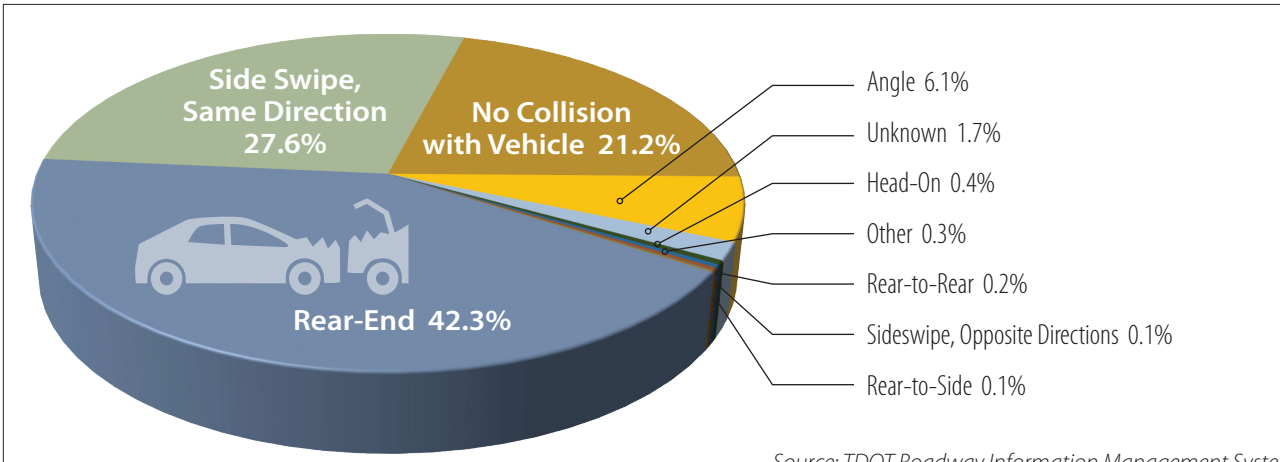
Source: TDOT Roadway Information Management System

Figure 4-2. I-65 Three-Year (2013-2015) Crash Breakdown by Type



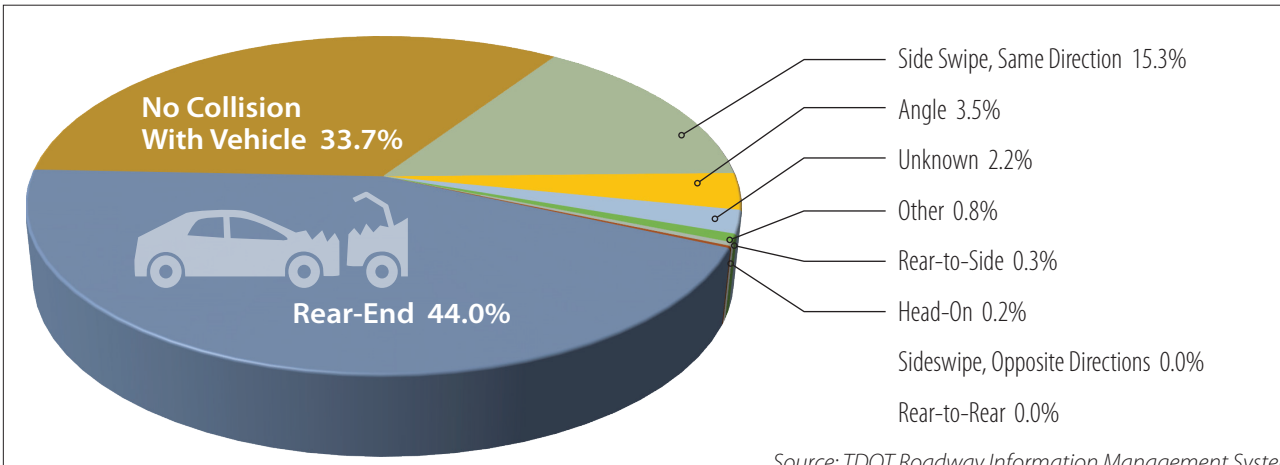
Source: TDOT Roadway Information Management System

Figure 4-3. 2013-2015 Crash Breakdown in Segments with High Crash Rates and Congestion



Source: TDOT Roadway Information Management System

Figure 4-4. 2013-2015 Crash Breakdown in Segments with High Crash Rates and No Congestion



Source: TDOT Roadway Information Management System

occurring with no collision with a vehicle (i.e., hitting a fixed object or obstruction) make up a larger portion of crashes in non-congested areas as compared to congested areas – 33 percent of crashes in non-congested crash hotspots and only 21 percent of crashes in congested hotspots.

The roadway geometry for I-65 was also analyzed for deficiencies that could be causes in crash hotspots. The roadway geometric conditions analyzed are horizontal alignment, vertical alignment, outside shoulder width, inside shoulder width, and median width. The locations of areas with deficiencies were overlaid with high crash rate areas to analyze if geometric deficiencies could be the cause of high crash rates. Figure 4-5 compares the locations with crash rates significantly above the statewide average with locations of geometric design deficiencies.

The northernmost crash hotspot on I-65 occurs around the SR 386 interchange. The majority of this hotspot location does not meet inside shoulder width and median width standards. For the crash hotspot just north of the I-24 and I-65 merge to the southern merge point of I-40 and I-65, sections do not meet standards for inside shoulder width, outside shoulder width, and median width. Additionally, the southern I-24 and I-65 merge does not meet horizontal alignment standards. I-65 leaving Davidson County is a crash hotspot that does not meet standards for horizontal alignment, vertical alignment, outside shoulder width, and median width.

I-65 from north of SR 96 through south of I-840 is another crash hotspot location. The majority of this hotspot location does not meet the median width standard, with portions not meeting the inside shoulder width standard. Another crash hotspot occurs as I-65 crosses Williamson County's southern border. This location does not meet the outside shoulder width and median width standards. The interchange at I-65 and US 412/Bear Creek Pike interchange is also a crash hotspot. This location does not meet the inside shoulder width and outside shoulder width standards. The I-65 at SR 129/Lynnville Highway and I-65 at US 31A interchanges are crash hotspots. These locations meet all analyzed geometric design standards. I-65 at the US 64 Bypass route is a crash hotspot. This location does not meet the horizontal alignment standard.

It is important to emphasize that geometric designs which are less than optimal are sometimes permitted and constructed due to other factors preventing desired design standards. Further analysis would be required to determine the full impact of the geometric design deficiencies on crash history. Lastly, in considering future changes to the corridor,



The Following Standards Have Been Utilized in Color Coding the Geometric Design Deficiencies

Horizontal Alignment Standard

Distances between successive curves to ensure that proper superelevation transitions:

- Meets standard
- Deficient

Vertical Alignment Standard

Allowable grade for the terrain type of the study area (level, rolling, or mountainous):

- Meets standard
- Within AASHTO allowable one percent grade for urban/mountainous area
- Deficient

Inside Shoulder Width Standard

TDOT & AASHTO recommend 4-foot inside shoulder widths for four lane roadways and 10-foot inside shoulder widths for six lane roadways; portions where truck traffic exceeds 250 DDHV should consider 12-feet:

- Meets stricter standard for truck traffic greater than 250 DDHV
- Meets TDOT & AASHTO standard of 10-foot for 6-lane section
- Meets TDOT & AAHSTO standard of 4-foot for 4 lane section
- Deficient; less than 10 feet on a 6-lane section
- Deficient; less than 4 feet on a 4-lane section

Outside Shoulder Width Standard

TDOT and AASHTO recommend 10-foot shoulders; portions where truck traffic exceeds 250 DDHV should consider 12-feet:

- Meets stricter 12-foot standards for truck traffic greater than 250 DDHV
- Meets TDOT and AASHTO 10-foot standard
- Deficient

Median Width Standard

AASHTO recommends 10 feet in urban areas and 36 feet in rural areas:

- Meets the rural standard of 36 feet
- Meets the urban standard of 10 feet
- Deficient; less than 36 feet in rural section
- Deficient; less than 10 feet in urban section

Figure 4-5. Geometric Deficiencies and Crash Hotspots



Source: TDOT Roadway Information Management System

consideration should be given to whether any of these deficiencies can be corrected as part of other projects in the corridor. It should also be noted that most of these same segments also have high traffic volumes, which is also likely a contributing factor to the number of crashes.

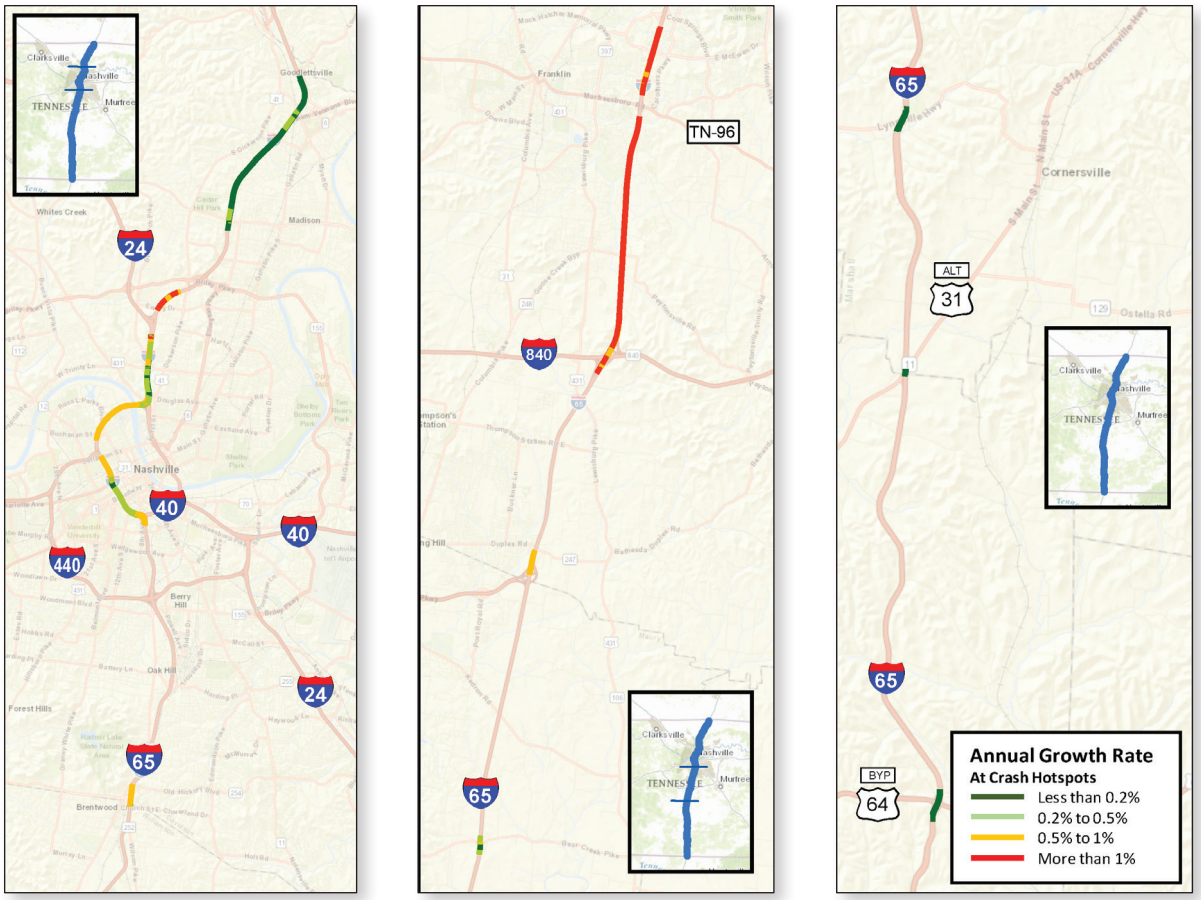
Traffic Increases at Hotspots

Annual growth rates (AGR) for traffic volumes were calculated for each crash hotspot along I-65 using projected 2040 volumes. Figure 4-6 displays the AGRs grouped into four categories: less than 0.2 percent, 0.2 to 0.5 percent, 0.5 to 1.0 percent, and greater than 1.0 percent. Interstate 65 just north of I-840 and through Franklin and Thompson's Station has AGRs of over 1.0 percent. The crash hotspots in these areas are a key safety concern as traffic increases over time. The Nashville downtown loop is another area of concern, with growth rates between 0.5 and 1.0 percent.

Impacts to Regular Operations

Crashes impact regular operations by reducing the number of lanes accessible to traveling vehicles and therefore reducing roadway capacity. The number of lanes on I-65 varies from two to five lanes. If a crash occurs during AM or PM peak hours, the crash can impact the roadway for several hours and reduce roadway capacity between 20 and 50 percent. Figure 4-7 displays the number of lanes on I-65 at crash hotspots. Three areas of concern exist for the impact of a crash to regular operations. First, I-65 along the Nashville downtown loop has many crash hotspots. The loop's northern diverge with I-24 and southern diverge with I-40 are sharp curves with only two lanes. The roadway curvature coupled with the fact that this is a high-volume urban area make crashes in this area a primary concern. Next, I-65 through Franklin, between SR 96 and I-840 has a two lane stretch and crash hotspot. While curvature is not a concern at this location, the length of the crash hotspot still leaves this as an area of concern. Lastly, I-65 in Goodlettsville north of the merge with SR 386/ Vietnam Veterans Boulevard has a three-lane crash hotspot stretch. The curvature of this area makes this an area of concern, as a crash could greatly hinder traffic flow.

Figure 4-6. Traffic Increase at Hotspots



Source: Statewide Travel Demand Model

Pedestrian and Bicycle Crashes

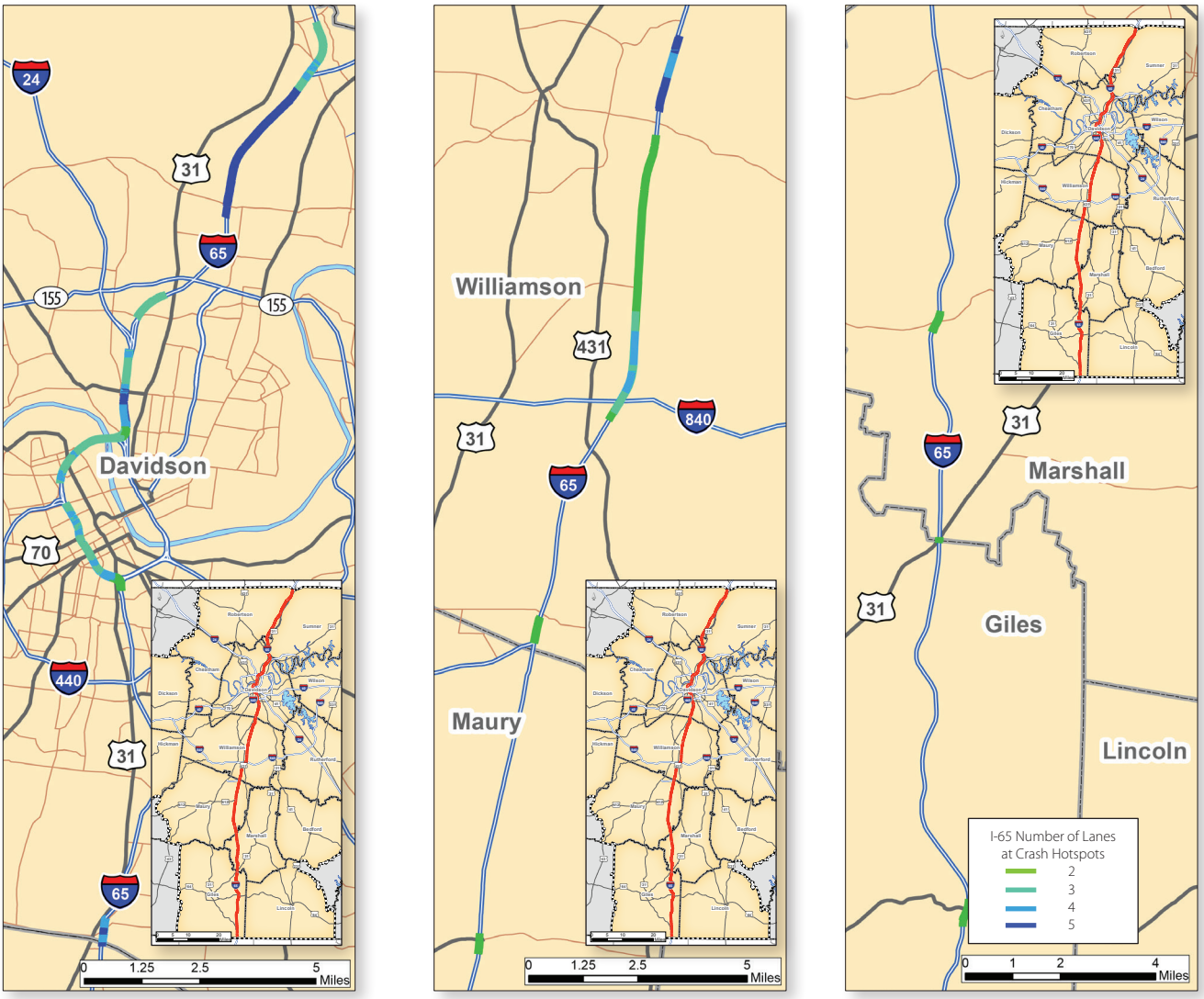
Pedestrian and bicycle crashes within one-mile of I-65 were also analyzed for the three-year period 2013-2015. In total, there were 429 crashes involving a pedestrian or bicyclist (Figure 4-8). Fifteen of the crashes occurred on I-65, and 414 took place within one mile of the interstate. Figures 4-9 and 4-10 illustrate the location of crashes in the higher incident areas of I-65 and Trinity Lane (Exit 87), I-65 and downtown Nashville, and I-65 between Old Hickory Boulevard and Moores Lane. While most of the crashes did not occur on the interstate, pedestrian and bicycle safety on streets that parallel and intersect I-65 impacts the effectiveness of the transportation system to provide travel options throughout the corridor, including the important first and last mile to transit. Of the non-interstate crashes, 77 percent involved pedestrians (Table 4-3).

Table 4-3. Non-Interstate Pedestrian and Bicycle Crash Locations

Vicinity of Crash	Pedestrian	Bicycle
Driveway, Alley Access, etc.	11	7
Entrance/Exit Ramp	3	1
Intersection	159	56
On Roadway	146	31
TOTAL	319	95

Source: TDOT Roadway Information Management System

Figure 4-7. I-65 Number of Lanes at Crash Hotspots



Source: TDOT Roadway Information Management System

Figure 4-8. 2013-2015 Pedestrian and Bicycle Crashes

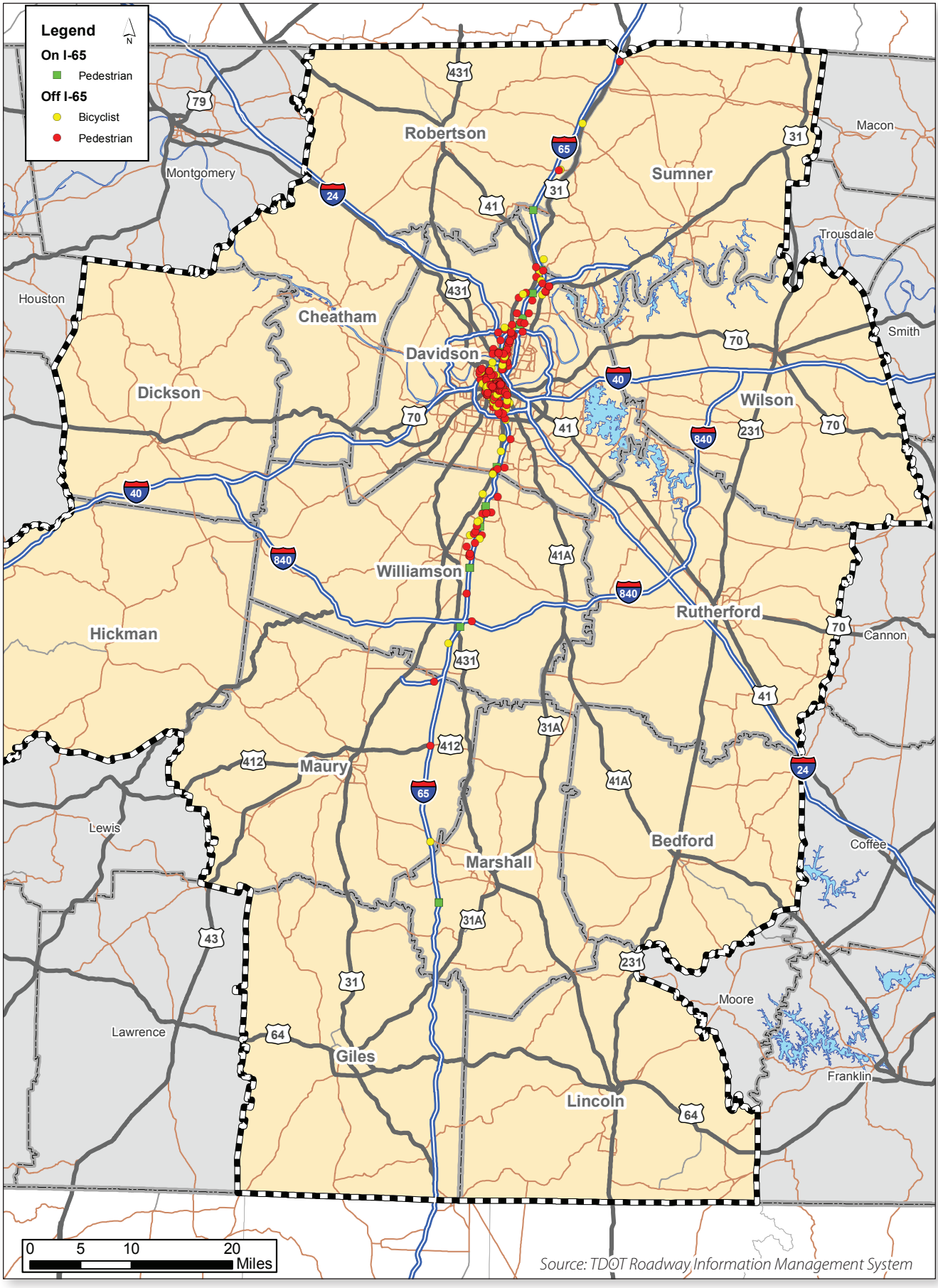


Figure 4-9. 2013-2015 Pedestrian and Bicycle Crashes: Nashville Core

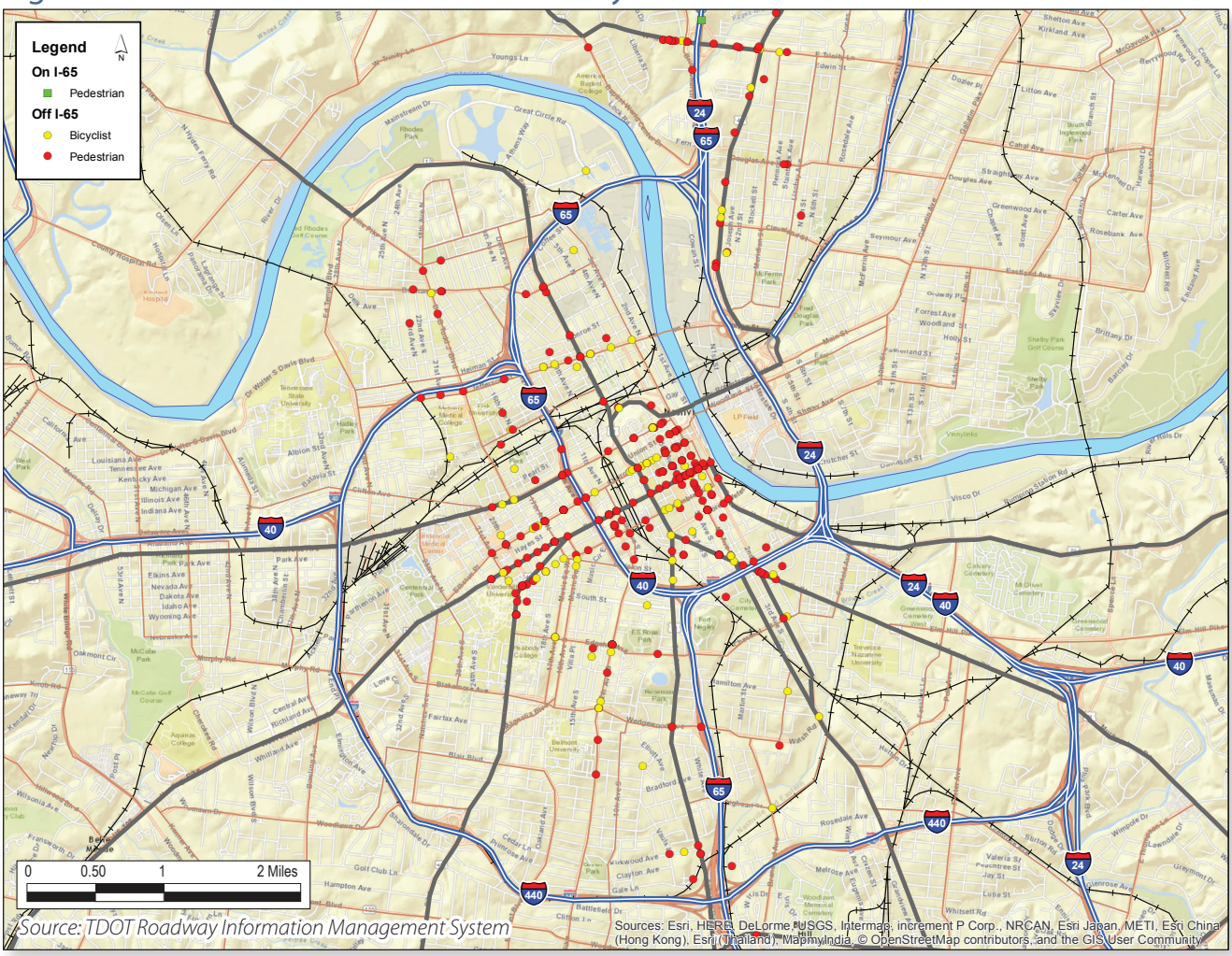
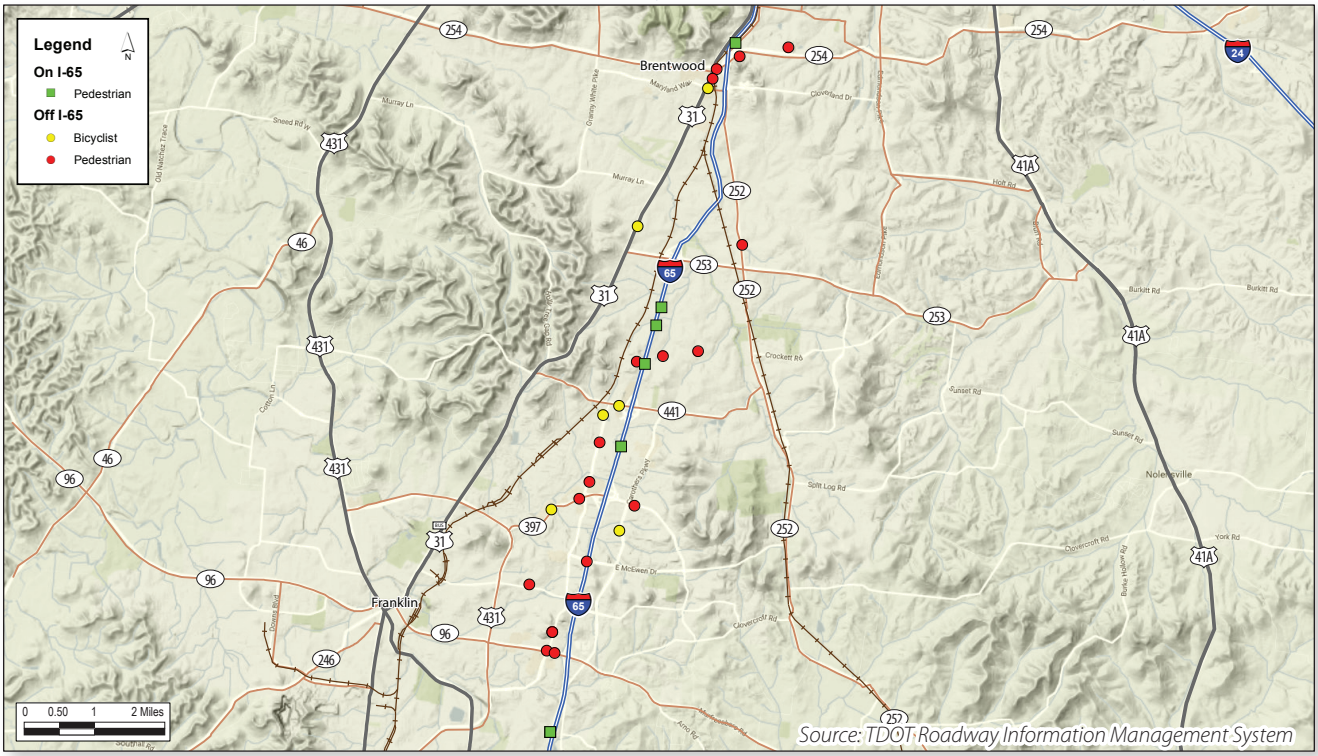


Figure 4-10. 2013-2015 Pedestrian and Bicycle Crashes: Williamson County



4.2 Existing Deficiencies and Future Needs

Crashes were analyzed over the three-year period of 2013 to 2015, with crash hotspots identified as locations with crash rates significantly above the statewide average. The safety analysis also examined potential factors at crash hotspots, including crash types, congestion, and roadway geometry. It is important to underscore that geometric designs which are less than optimal are sometimes permitted and constructed due to other factors preventing desired design standards. Further analysis would be required to determine the full impact of the geometric design deficiencies on crash history. Key findings of the analysis include:

A. **Crash Rates and Hotspots:** Crash hotspots were identified as the locations with crash rates significantly above the statewide average for similar facilities. Ten hotspots, ranging from individual interchange locations to segments between three and nine miles in length, were documented. Additionally, injuries and fatalities resulting from reported crashes from 2013 to 2015 were compared by travel market, with large increases in the East Nashville/Madison, Nashville Core, and South Nashville travel markets. While the number of fatalities remained consistent from 2013 to 2015, the number of injuries increased by 18 percent.

B. **Crash Types:** Rear-end crashes remain the most common cause of crashes in both congested and non-congested crash hotspots – 42 percent of crashes in congested crash hotspots and 44 percent of crashes in non-congested crash hotspots. However, sideswipes in the same direction make up a larger portion of crashes in congested areas as compared to non-congested areas. These crashes comprise 28 percent of crashes in congested crash hotspots, but only 15 percent of crashes in non-congested crash hotspots. Additionally, crashes occurring with no collision with a vehicle (i.e., hitting a fixed object or obstruction) make up a larger portion of crashes in non-congested areas as compared to congested areas – 33 percent of crashes in non-congested crash hotspots and only 21 percent of crashes in congested hotspots.

C. **Roadway Geometry:** The roadway geometry for I-65 was also analyzed for deficiencies that could be potential factors in crash hotspots. The roadway geometric conditions analyzed were horizontal alignment, vertical alignment, outside shoulder width, inside shoulder width, and median width. Although most of the crash hotspots included geometric deficiencies, additional analysis would be required to determine the full impact of the geometric design on crash history.

D. **Traffic Increases:** Interstate 65 just north of I-24 and through Franklin and Thompson's Station has annual traffic growth rates over 1.0 percent. The crash hotspots in these areas are a key safety concern as traffic increases over time. The Nashville downtown loop is another area of concern, with annual growth rates between 0.5 and 1.0 percent.

E. **Impacts to Regular Operations:** Three areas of primary concern exist for the impact of a crash to regular operations. First, I-65 along the Nashville downtown loop has many crash hotspots. Next, I-65 through Franklin, between SR 96 and I-840 has a two lane stretch and crash hotspot. Last, I-65 in Goodlettsville north of the merge with SR 386/ Vietnam Veterans Boulevard has a three-lane crash hotspot stretch. The curvature of this area makes this an area of concern, as a crash could greatly hinder traffic flow.

F. **Pedestrian and Bicycle Crashes:** Pedestrian and bicycle crashes within one-mile of I-65 were also analyzed for the three-year period 2013-2015. In total, there were 429 crashes involving a pedestrian or bicyclist. Fifteen of the crashes occurred on I-65, and 414 took place with one mile of the interstate. Of the non-interstate crashes, 77 percent involved pedestrians.

5. Operations and Maintenance

5.1 State of Good Repair

Pavement Sufficiency Rating

Data was collected from the Tennessee Roadway Information Management System (TRIMS) and the Highway Performance Monitoring System (HPMS) to assess current I-65 assets. TRIMS is a TDOT database containing information regarding roadway traffic, geometry, history, maintenance features, and more. The HPMS is a national highway information system containing data on all public roads, including performance, condition, use, and operating

characteristics. Table 5-1 details the operations and maintenance data collected by TRIMS and HPMS for I-65 by county.

Pavement smoothness is a key factor in determining roadway ratings, measured in this analysis using the International Roughness Index (IRI). The IRI is the most widely accepted indicator of pavement performance. The IRI measures suspension movement over a longitudinal distance in units of inches per mile, with a score of "0" referring to a perfectly smooth roadway. In 2006, FHWA set standards determining that a good quality roadway must have an IRI of 95 inches per mile or lower. The average IRI for I-65 is 63, with Davidson and Robertson Counties exhibiting the highest scores.

Bridge Conditions

Data was collected from TDOT's TRIMS database to analyze the conditions of all bridges in the I-65 corridor. Bridges were classified as having structural deficiencies, no structural deficiencies, or data unavailable. Figure 5-1 displays the classifications for all bridges along I-65, and shows two bridges with structural deficiencies.

5.2 Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) improve transportation safety and mobility and enhance productivity through advanced management and communication technologies. ITS capabilities can both address spot problem areas in corridors as well as support integrated management.

ITS Device Inventory

TDOT has deployed numerous ITS devices along I-65 as part of their Smartway system including Dynamic Message Signs (DMS), CCTV cameras, Radar Detection System (RDS), and fiber optic and wireless communications. These devices are instrumental in facilitating the needs of the system and the motoring public, as well as for future opportunities for increasing the efficient use of the existing capacity. Currently, there are no devices that have been deployed in the North and South Sub- Areas of the corridor. However, within the Central Sub-Area, there are 40 CCTVs, 123 RDSs, and 15 DMSs. These devices are connected via the previously mentioned fiber optic communications to the Region 3 Traffic Management Center (TMC) located in Nashville, which operates 24 hours a day, seven days a week.

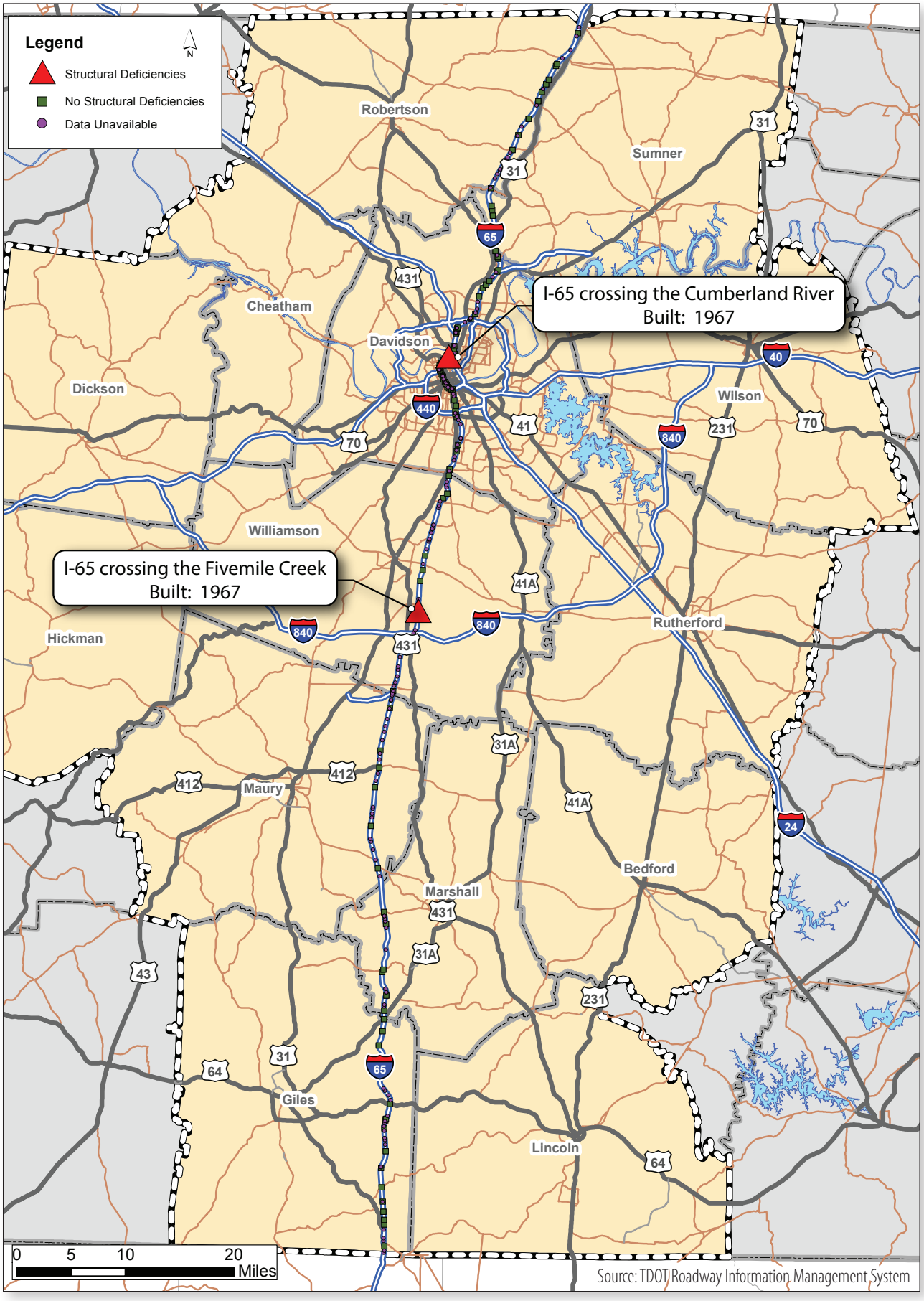
Through the deployed devices, the Smartway system can collect information on how traffic along I-65 is moving through the RDS, which detect the presence of vehicles in each lane providing information on the capacity of I-65 as well as the speed along the facility. The CCTVs are used to verify the data received from the RDSs and to monitor I-65 for incidents and other potential roadway hazards. The information is then used by TMC operators to display information on the DMS about incidents, construction, travel speeds, and other relevant driving messages, and to deploy incident management services along I-65 where needed. There are 33 HELP vehicles that patrol middle Tennessee, including the area of I-65 from SR 96 (Exit 65) to SR 155 (Exit 90). In addition to the DMS along I-65, the SmartWay website provides users pre-trip information.

Table 5-1. I-65 Operations and Maintenance by County

County	Average International Roughness Index	Most Recent Resurfacing	Sign Inventory (as % of total # signs)				Max AADT	Max Directional Distribution
			Good	Fair	Poor	N/A		
Davidson	76	2000	47%	1%	-	52%	172,100	65%
Giles	64	1998	36%	0%	0%	64%	20,260	59%
Marshall	54	1993	36%	0%	1%	63%	26,160	55%
Maury	55	1994	26%	-	1%	73%	35,250	54%
Robertson	74	2000	47%	2%	0%	51%	52,320	58%
Sumner	65	1994	35%	1%	-	64%	82,710	62%
Williamson	55	1994	47%	1%	0%	52%	148,820	67%
OVERALL AVERAGE	**63**	-	**39%**	**1%**	**0%**	**60%**	**76,803**	**60%**

Source: TDOT Roadway Information Management System; Highway Performance Monitoring System

Figure 5-1. I-65 Bridge Conditions



TDOT has proposed an expansion of the Smartway system along I-65 that would add CCTVs, RDSs, and DMSs to the North and South Sub-Areas. For the North Sub-Area, nine CCTVs and four DMSs are proposed, which will extend coverage from US 31W (Exit 98) to approximately two miles north of the interchange at SR 76 (Exit 108). The South Sub-Area has 13 CCTVs, four DMS, and 29 RDSs that are proposed for the I-65 corridor, extending the system coverage to approximately one mile south of the I-65 and I-840 interchange (Exit 59).

5.3 ITS State of the Practice

The I-65 corridor in Tennessee currently employs many ITS applications and strategies to improve safety and operations. As with all technology, trends in ITS strategies are rapidly changing. Reviewing the state of the practice nationally can highlight opportunities to advance ITS in the I-65 corridor.

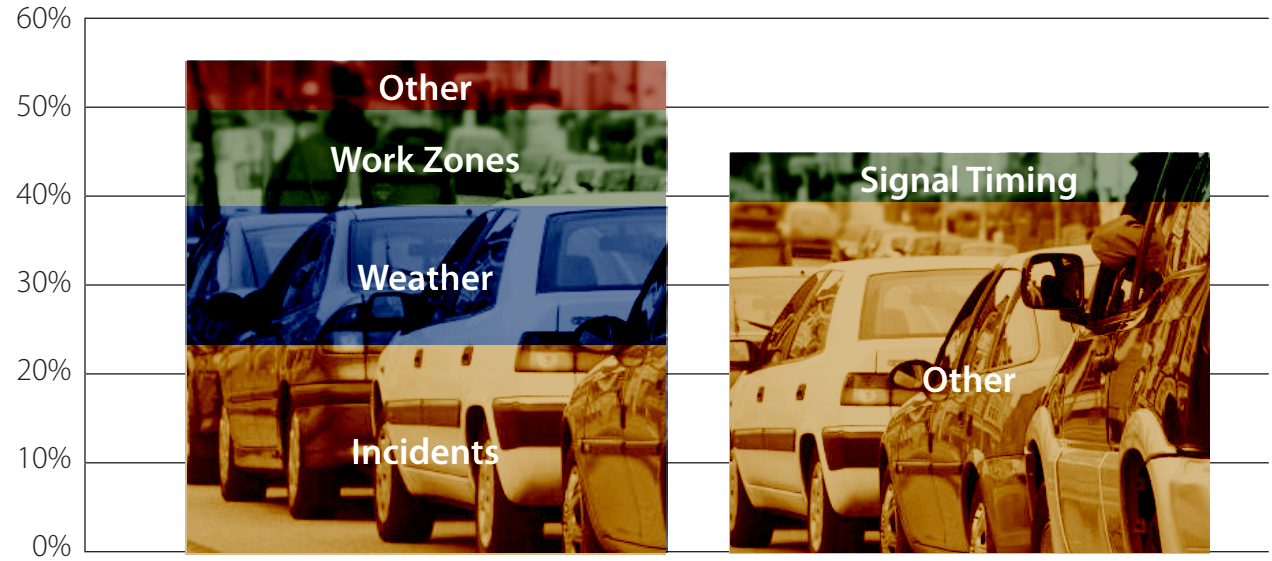
Transportation System Management and Operations (TSM&O)

Given constraints on adding new capacity, it is increasingly important to maximize existing transportation networks, especially "taking back" capacity lost to congestion, incidents, construction, weather, and poor ramp signalization. Figure 5-2 illustrates the common sources of congestion. TSM&O can provide an integrated program to optimize the performance of existing infrastructure through the implementation of systems and services that preserve capacity and improve reliability and safety. The associated activities focus on well-known strategies including incident management, traffic signal timing, ramp metering, road weather management, and others.

Best practices in TSM&O across the U.S. and internationally highlight many possible ITS and ITS related operations and safety programs, strategies, and applications that may be appropriate for use now, or in the future, on all or portions of the I-65 corridor. These opportunities include:

- Managed Lanes;
- Active Traffic and Demand Management (ATDM);
  - Active Traffic Management (ATM)
  - Active Demand Management (ADM)
  - Active Parking Management (APM)
- Freight Applications;
  - Freight Advanced Traveler Information System (FRATIS)
  - Freight Signal Priority
  - Truck Parking, Truck Parking Guidance, and Rest Areas
- Work Zone Mobility and Safety;
- Traffic Incident Management (TIM);
- Integrated Corridor Management; and
- Connected and Autonomous Vehicles Technology.

Figure 5-2. Congestion Contributors



Source: FHWA

Managed Lanes

Managed lanes are defined as highway facilities or a set of lanes where operational strategies are proactively implemented and managed in response to changing conditions. The managed lane concept is typically a "freeway-within-a-freeway" where a set of lanes within the freeway cross section is separated from the general-purpose lanes. The facility incorporates a high degree of operational flexibility so that over time operations can be actively managed to respond to growth and changing needs. The operation of and demand on the facility is managed using a combination of tools and techniques to continuously achieve an optimal condition, such as free-flow speeds. The principal management strategies can be categorized into three groups: pricing, vehicle eligibility, and access control. Examples of operating managed lane projects include high-occupancy vehicle (HOV) lanes, value priced lanes, high-occupancy toll (HOT) lanes, or exclusive or special use lanes. Figure 5-3 shows the potential lane management applications. On the left are the applications that are made up of a single strategy. As you move from left to right on the graphic, the strategies increase complexity. The Nashville Area MPO examined the feasibility of these strategies for the Middle Tennessee region in its *Managed Lanes Preliminary Feasibility Assessment*.

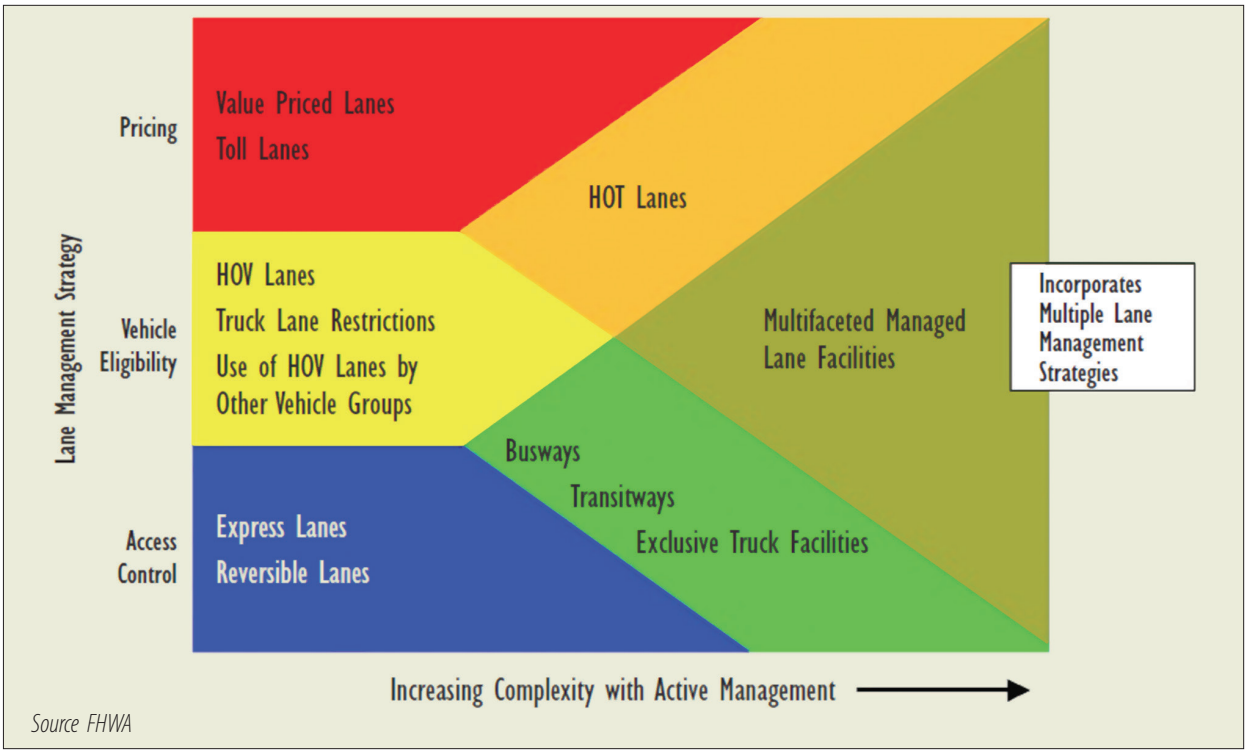
Active Traffic and Demand Management (ATDM)

ATDM is a strategy area that encompasses the dynamic management, control, and influence of travel demand, traffic demand, and traffic flow of transportation facilities. Using available tools and assets, traffic flow is managed and traveler behavior is influenced in real-time to achieve operational objectives, such as preventing or delaying breakdown conditions, improving safety, promoting sustainable travel modes, reducing emissions, or maximizing system efficiency. The notion of dynamically managing the trip chain is the ultimate vision of ATDM.

Active management of transportation and demand can include multiple approaches spanning demand management, traffic management, parking management, and the efficient utilization of other transportation modes and assets. There are three major categories of strategies in the ATDM framework:

- Active Traffic Management (ATM) - manages recurrent and non-recurrent congestion based on prevailing and predicted traffic conditions;

Figure 5-3. Managed Lane Applications



  - Adaptive Traffic Signal Control (ATSC)
  - Dynamic Lane Assignment (DLA)/Dynamic Lane Use Control
  - Dynamic Speed Limit (DSpL)/Variable Speed Limit
  - Queue Warning (QW)
- Active Demand Management (ADM) - manages demand and has the potential to redistribute travel to less-congested times of the day or routes and/or to reduce the overall vehicle trips by influencing a change in mode choice; and
  - Dynamic High-Occupancy Vehicle (HOV)/ Managed Lanes
  - Dynamic Routing
  - On-Demand Transit
  - Predictive Traveler Information
- Active Parking Management (APM) - manages parking facilities in a region to optimize performance and utilization of those facilities while influencing travel behavior at various stages along the trip making process.

Freight Applications

Improved systems are being developed for the freight community throughout the US. These new systems identify the specific needs of the community and attempt to address them through various ITS applications, including:

- Freight Advanced Traveler Information System (FRATIS) - provides real-time information to freight companies to support dynamic planning and efficient decision making;
  - Freight-Specific Dynamic Travel Planning and Performance
  - Drayage Optimization
- Freight signal priority - provides signal priority to freight vehicles near freight facilities with a goal of reducing delays, increasing travel time reliability, and enhancing safety at critical intersections;
- Truck parking and truck parking guidance – provides truck parking availability information to trucking companies and drivers with the potential to facilitate spot reservations; and
- Enhanced rest areas – provide better service to the trucking community and general population by including alternative refueling stations, Wi-Fi, and information kiosks.

Work Zone Mobility and Safety

Work zone safety is of paramount importance to TDOT. During construction, it is necessary to effectively manage traffic to minimize travel delays, ensure safety for motorists and workers, as well as complete road work on time, particularly in high-impact areas like metropolitan regions and corridors. FHWA's Every Day Counts (EDC) initiative, which is in its third iteration, specifically targets work zone safety via its Smarter Work Zones strategies that focus on project coordination and technological applications. The technological applications focus on queue management and speed management, and both involve the deployment of ITS for the dynamic management of work zone traffic impacts and aim to improve motorist and work safety and mitigate against congestion.

Traffic Incident Management (TIM)

TIM consists of a planned and coordinated multi-disciplinary process to detect, respond to, and clear traffic incidents so that traffic flow may be restored as safely and quickly as possible. Effective TIM reduces the duration and impacts of traffic incidents and improves the safety of motorists, crash victims and emergency responders. Planning and coordination includes numerous public and private partners including law enforcement, fire and rescue, emergency medical services, transportation departments, public safety communications, emergency management, towing and recovery, hazardous materials contractors, and traffic information media.

Integrated Corridor Management (ICM)

ICM is comprised of the coordinated operation of multiple transportation networks and cross-network connections encompassing a corridor and the synchronization of the institutions responsible for corridor accessibility and mobility. With an objective of improving accessibility, mobility, safety, and other transportation related goals for travelers and goods, ICM is comprised of several activities including cooperative and integrated policy among corridor operational stakeholders, improving the efficiency of cross-network junctions and interfaces, providing accessibility and mobility opportunities from a route and mode perspective, real-time monitoring and information distribution, congestion and incident management, travel demand management, and transportation pricing and payment opportunities.

Active management and integration are fundamental concepts used within ICM. Active management requires the monitoring and assessing of the performance of the system against defined performance metrics, while dynamically implementing actions and services in response to changes in demand. Information must be provided to system operators and users, allowing them to make the most informed decisions and choices for a successful system. Integration requires system assets be managed in a unified manor to ensure that actions can be taken that benefit the entire corridor.

Connected and Autonomous Vehicles Technologies

Harnessing technological advances to provide a safer roadway system has been a goal for both public and private enterprises. Within the USDOT, the ITS Joint Program Office (JPO), National Highway Traffic Safety Administration (NHTSA), and numerous other agencies have been coordinating and fostering the advancement of connected vehicle technologies with a goal of addressing transportation safety, mobility, and the environment. On the private side, auto manufactures, original equipment manufacturers (OEMs), and tech companies, including Google and Tesla, have been providing game changing opportunities for the transportation community including the autonomous vehicle. Initially, it was believed that the connected vehicle technology would be introduced to the market first with the autonomous feature following closely behind. However, technological advances and public acceptance has sped up the deployment of autonomous vehicles within the US and these two tracks of vehicle advancements have now converged into concurrent efforts.

Connected Vehicle Technology

Through the utilization of connected vehicle technology, vehicles, roads and other infrastructure, and smartphones will be able to communicate and share vital transportation information with each other. The communication will be based on dedicated short-range communications (DSRC), primarily, which is like Wi-Fi. While many vehicles today are currently "connected" through cellular technology, DSRC provides unique opportunities for fast, secure, and reliable communications, which is not vulnerable to interference. When there is near 100 percent penetration of DSRC, vehicles will be able to attain a 360-degree awareness of their surroundings and can communicate with equipment installed in and along roadways providing drivers with information on work zones, congestion warning messages, incidents, traffic signal timing changes, railroad crossings, and school zones.

In the fall of 2015, three pilot connected vehicle deployment sites were announced by the USDOT as part of their Connected Vehicle Pilot Development Program. These locations are examining the effects of connected vehicle technologies on the safety and efficiency of truck movements along interstates, the abilities of vehicle-to-vehicle (V2V) and intersection communication to improve vehicle flow and pedestrian safety, and the impacts of safety and mobility applications on and in proximity to reversible freeway lanes.

Autonomous Vehicle Technology

Using radar, LIDAR, GPS, Odometry, and computer vision, autonomous vehicles sense the surrounding environment and navigate without the need for human input. NHTSA and DOT support states, other governmental agencies, and industry to ensure that testing takes place and provides for safety on today's roadways. Currently, autonomous cars are being tested on public streets in various locations. Tesla Motor vehicles provide drivers an autopilot feature that allow vehicles to navigate the roadway system and even change lanes without the driver's control. Uber, a ridesharing company, has begun testing its autonomous fleet in Pittsburg. The University of Michigan's Mcity test facility is being utilized for autonomous testing by major auto manufacturers as well as startup companies. The trucking industry is also testing autonomous features that are similar to the auto industry. This technology can be utilized for truck platooning, allowing multiple trucks to be accelerated and decelerated as one unit, which has economic, environmental, and safety benefits associated.

5.4 Existing Deficiencies and Future Needs

Operations and maintenance investments, services, and strategies are pivotal to the long-term safety and efficiency of travel in the I-65 corridor. Whether it is ongoing pavement management or the deployment of state-of-the-art information and communications technologies, operations and maintenance bookend

both the quality and flexibility of the transportation system. While operations and maintenance levels are currently meeting basic needs on I-65, as the corridor grows and new technologies are introduced, the interstate itself will change and increasingly function as part of a dynamic connected system, rather than as a largely distinct highway facility.

A. **Pavement Sufficiency Rating:** Pavement smoothness is a key factor in determining roadway ratings, measured in this analysis using the International Roughness Index (IRI). In 2006, FHWA set standards determining that a good quality roadway must have an IRI of 95 inches per mile or lower. The average IRI for I-65 is 63, with Davidson and Robertson Counties exhibiting the highest scores.

B. **Bridge Conditions:** Bridges were classified as having structural deficiencies, no structural deficiencies, or data unavailable. On I-65, two bridges are classified as structurally deficient, one crossing the Cumberland River in Nashville and the other crossing Fivemile Creek in Williamson County.

C. **ITS Devices:** There are numerous ITS devices on I-65 as part of the TDOT Smartway system including Dynamic Message Signs (DMS), CCTV cameras, Radar Detection System (RDS), and fiber optic and wireless communications. TDOT has proposed an expansion of the Smartway system along I-65 that would add CCTVs, RDSs, and DMSs to the North and South Sub-Areas. For the North Sub-Area, nine CCTVs and four DMSs are proposed, which will extend coverage from US 31W (Exit 98) to approximately two miles north of the interchange at SR 76 (Exit 108). The South Sub-Area has 13 CCTVs, four DMS, and 29 RDSs that are proposed for the I-65 corridor, extending the system coverage to approximately one mile south of the I-65 and I-840 interchange (Exit 59).

D. **ITS Strategies:** ITS state of the practice highlights opportunities to advance ITS in the I-65 corridor, including:

- Within the TSM&O strategies, operations such as managed lanes and ATDM would be applicable in the Central Sub-Area with limited additional ITS devices needed. Another ATDM tool is ramp metering, which would require metering technologies on all ramps and special consideration paid to acceleration lengths as well as upstream volume detection if none exists. DLR/Contraflow Lane Reversal and QW deployments could also be appropriate for the I-65 corridor, particularly where there is high directional flow in the AM and PM peaks or where congestion on arterials creates backups onto the interstate.
- For transit operations, DShL/Hard Shoulder Running/Temporary Shoulder Use could be deployed along I-65 to encourage transit usage and would require minimal additional ITS and signing deployments.
- Freight TSM&O strategies could also be deployed in the I-65 corridor. The FRATIS application could help address congestion by providing the trucking community with live traffic conditions, incidents, road closures and work zones, and truck parking opportunities via a shared data platform with the Regional TMC.
- There are currently no dedicated TDOT truck parking lots along I-65, and creating these with proper monitoring and communication infrastructure would likely require a significant ITS deployment.
- To harness the benefits of connected vehicles, roadside infrastructure supporting communication among vehicles on the DSRC bandwidth will be needed throughout the transportation network. Areas along I-65 that already have devices deployed could be retrofitted with DSRC enabled devices that also support current detection technologies. As the sections of I-65 to the North and South become equipped with ITS technologies, consideration should be given to including DSRC technology and/or other connected vehicle platforms (e.g., 5G).

6. Transit

The I-65 study area is served by a variety of local transit and express commuter routes, and includes ridesharing options. Currently, however, many of these systems do not complement one another. Providing alternatives to single occupancy vehicle travel by allowing individuals to travel continuously and seamlessly across modes is essential to support growth and development in the I-65 corridor.

6.1 Existing Transit Service

The Regional Transportation Authority (RTA) of Middle Tennessee partners with the Nashville Metropolitan Transit Authority (MTA) to provide transit services in the I-65 corridor, with most routes concentrated in the Nashville core. RTA services in the I-65 corridor are limited to express route service targeting commuters traveling between Maury, Sumner, Robertson, and Williamson Counties and downtown Nashville. Table 6-1 reports the number of trips and average daily ridership on the existing commuter express routes that use the I-65 corridor to travel on a portion, or all, of their routes.

All I-65 based express routes are limited to two or three inbound and outbound trips in the morning and afternoon, and because they operate during peak periods, they experience high levels of congestion. Importantly, existing RTA express routes are also not designed either to serve reverse commute trips. Morning service on all express routes only travels in-bound to Metro Nashville's Music City Central station. Table 6-2 provides 2040 ridership projections for four existing express routes in the I-65 corridor. Projected ridership could increase nearly fivefold over existing ridership on routes to and from Williamson County. Such an increase in ridership would necessitate service improvements to simply meet such demand.

Outside of Davidson County, local transit service near I-65 is only available in Franklin, however, both the RTA express and Franklin local services run limited schedules and do not complement one another, making it difficult for an individual to transfer. For example, the first Franklin Transit bus serving the park and ride lot at the Williamson Medical Center arrives at 7:20 AM, after the last commuter express bus leaves the medical center at 7:11 AM.

Table 6-2. I-65 RTA Regional Bus Service: 2040 Projected Daily Ridership

Route	Name	County	2040 Projected Daily Ridership
89X	Springfield/Joelton Express	Robertson	59
91X	Franklin Express	Williamson	797
92X	Hendersonville Express	Sumner	235
95X	Spring Hill Express	Maury	417
	Projected Daily Ridership:		1,508

Note: Route 87X was not included in the model output that was used to generate these projections.

Source: Nashville Area MPO Travel Demand Model

Table 6-1. I-65 RTA Regional Bus Service: 2014-2015 Average Daily Ridership

Route	Name	County	AM / PM Trips	Existing Average Daily Ridership
87X	Gallatin Express	Davidson	2/3	96
89X	Springfield/Joelton Express	Robertson	2/2	79
91X	Franklin Express	Williamson	3/3	172
92X	Hendersonville Express	Sumner	2/3	115
95X	Spring Hill Express	Maury	2/2	90
		Total Existing Average Daily Ridership:		552

Source: RTA Ridership Data – February 2014 to January 2015

6.2 Access to Activity Centers

Transit systems support access to everyday needs, such as work, school, and shopping, as well as leisure activities, including entertainment and tourism. Existing express bus routes along I-65 serve downtown Nashville, and except for the Spring Hill route (Route 95X), also connect to midtown Nashville and Vanderbilt University Medical Center. Riders can access other areas of Nashville via a transfer, but it is less convenient or practical from a travel time standpoint. Beyond the Nashville core, there is an overall lack of access to activity centers, especially in Williamson and Sumner Counties.

Projected population and employment increases in the I-65 corridor, especially job growth near I-65 interchanges, will also generate greater demand for new or expanded regional transit services to and from Nashville and other major activity centers. Given current county-to-county work flows, reverse commute and all day service along I-65 south of Nashville, connecting to Brentwood, Cool Springs, Franklin, and Spring Hill, demonstrates the greatest potential. Additional services should be considered for Goodlettsville, Hendersonville, and Gallatin.

6.3 Nashville MTA/RTA Strategic Plan: nMotion

The MTA and RTA recently completed and adopted nMotion, a regional strategic transit plan to improve access and mobility throughout middle Tennessee. The recommended regional plan is shown in Figure 6-1. The nMotion plan includes recommendations for Bus Rapid Transit (BRT), BUS on-Shoulder Service (BSS), Light Rail Transit (LRT), express bus transit, regional rapid bus, and improved local services.

In the I-65 corridor, proposed improvements can be divided between proposed services north and south of downtown Nashville. To the north, proposed improvements include:

- Freeway BRT to Gallatin, Hendersonville, Springfield, and White House;
- Express bus/BSS to White House north of the I-65/SR 386 interchange and Springfield;
- LRT on Gallatin Pike to Rivergate area;
- Regional rapid bus from Gallatin and Hendersonville to the LRT on Gallatin Pike;
- BRT on Dickerson Pike; and
- Local service in Gallatin, Goodlettsville, Hendersonville, and Millersville.

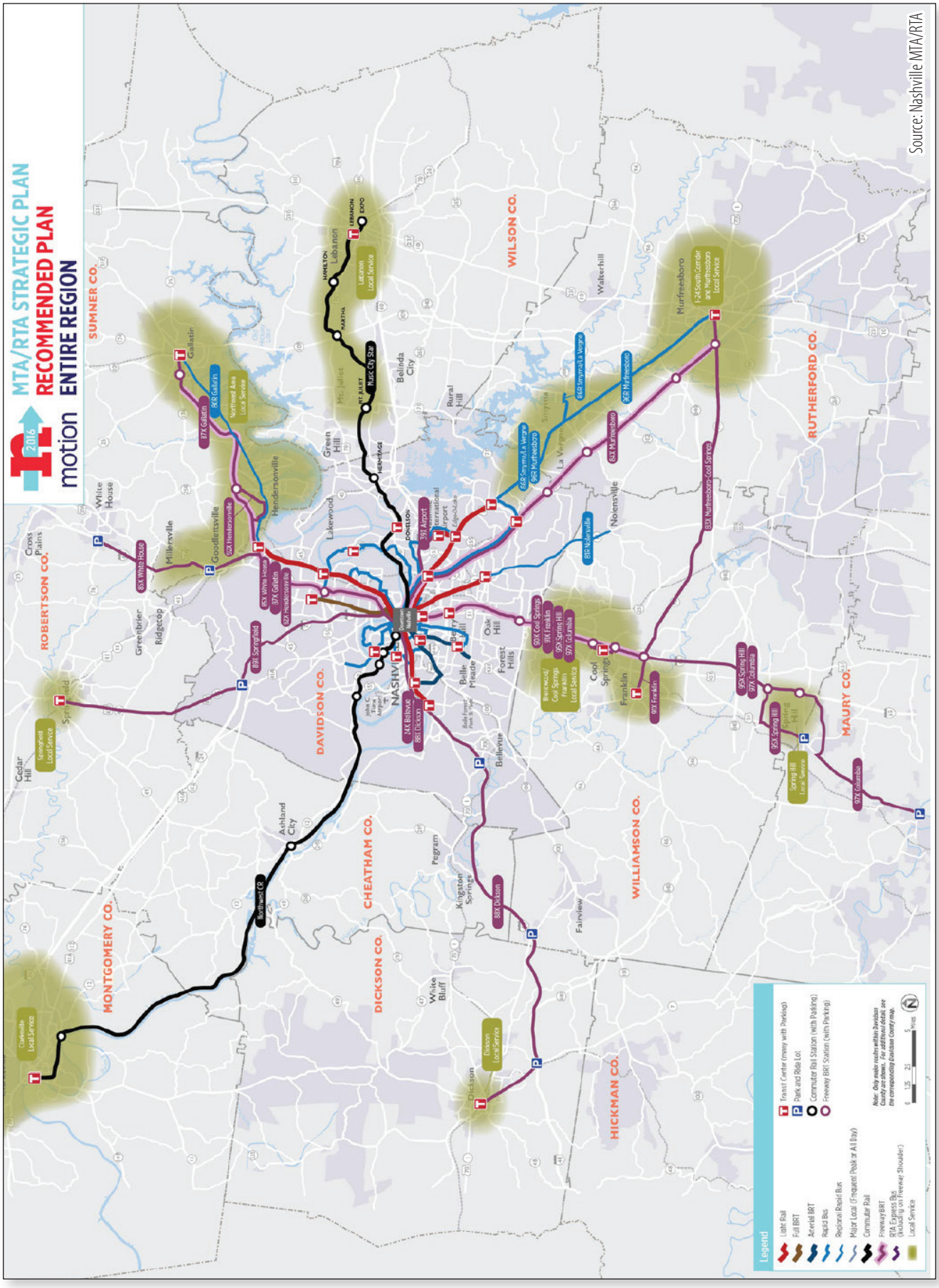
Proposed improvements in the I-65 corridor south of downtown Nashville include:

- Freeway BRT to Columbia, Cool Springs, Franklin, and Spring Hill;
- LRT on Nolensville Pike to Harding Place;
- Regional rapid bus from Nolensville to the LRT on Nolensville Pike;
- Express bus/BSS from Columbia, Murfreesboro, and Spring Hill to the freeway BRT in Franklin; and
- Local service in Brentwood, Cool Springs, Franklin, and Spring Hill.

One route in each corridor (Route 91X Franklin Express and Route 87X Gallatin Express) is also recommended to provide all day reverse commute service. In addition, nMotion recognizes that the first and last mile to and from transit are a significant barrier in the region. MTA and RTA plan to implement and participate in efforts to improve bicycle and pedestrian facilities and more convenient park-and-ride lots. Finally, the plan calls for MTA and RTA to work with local communities and businesses to provide new connections to transit services. New connections include the development of Transportation Management Associations (TMAs) to provide private services, private rideshare services such as Uber and Lyft, and car share/private short-term car rental companies, such as ZipCar and Car2Go.

Additionally, the Nashville Area MPO will be examining transit alternatives along I-65 between Nashville and Maury County. The *South Corridor Transit Alternatives Analysis* is intended to provide the transit agencies, community leadership, and stakeholders within the MPO area a series of short-, mid-, and long-term recommendations to implement the vision for rapid transit between Nashville and communities along the south corridor into Maury County, as defined by the MPO's *2040 Regional Transportation Plan* and the *nMotion Strategic Plan*.

Figure 6-1. nMotion Recommended Plan



6.4 Cool Springs Multimodal Transportation Study

The Cool Springs Multimodal Transportation Study outlines strategies for expanding transportation options and supporting transit riders, bicyclists, pedestrians, and transportation demand management. Short-term recommendations focus on:

- Extending and reconfiguring local Franklin Transit routes to better serve the Cool Springs area;
- Adding express bus services (Figure 6-2);
- Introducing a free lunchtime shuttle;
- Enhancing area bus stops with shelters and concrete pads;
- Establishing a new park-and-ride lot;
- Providing pedestrian infrastructure, additional bike lanes, and off-street trails; and
- Working closely with area employers, property managers, and developers to establish a transportation demand management program.

Longer term recommendations focus on regional connectivity. Depending on improved express bus route ridership levels, the study calls for evaluating a variety of high-capacity transit services to enhance connectivity between Nashville, Franklin, and Spring Hill, including bus rapid transit, commuter rail, light rail, and maglev rail. A proposed transit center east of I-65 on SR 96 is also recommended, allowing express and local bus riders to connect with vanpools, airport shuttles, carsharing and bikesharing stations, and intercity bus lines. Additional bike and pedestrian enhancements, including proposed pedestrian bridges over I-65, would focus on connecting Cool Springs with the rest of Franklin and the greater region.

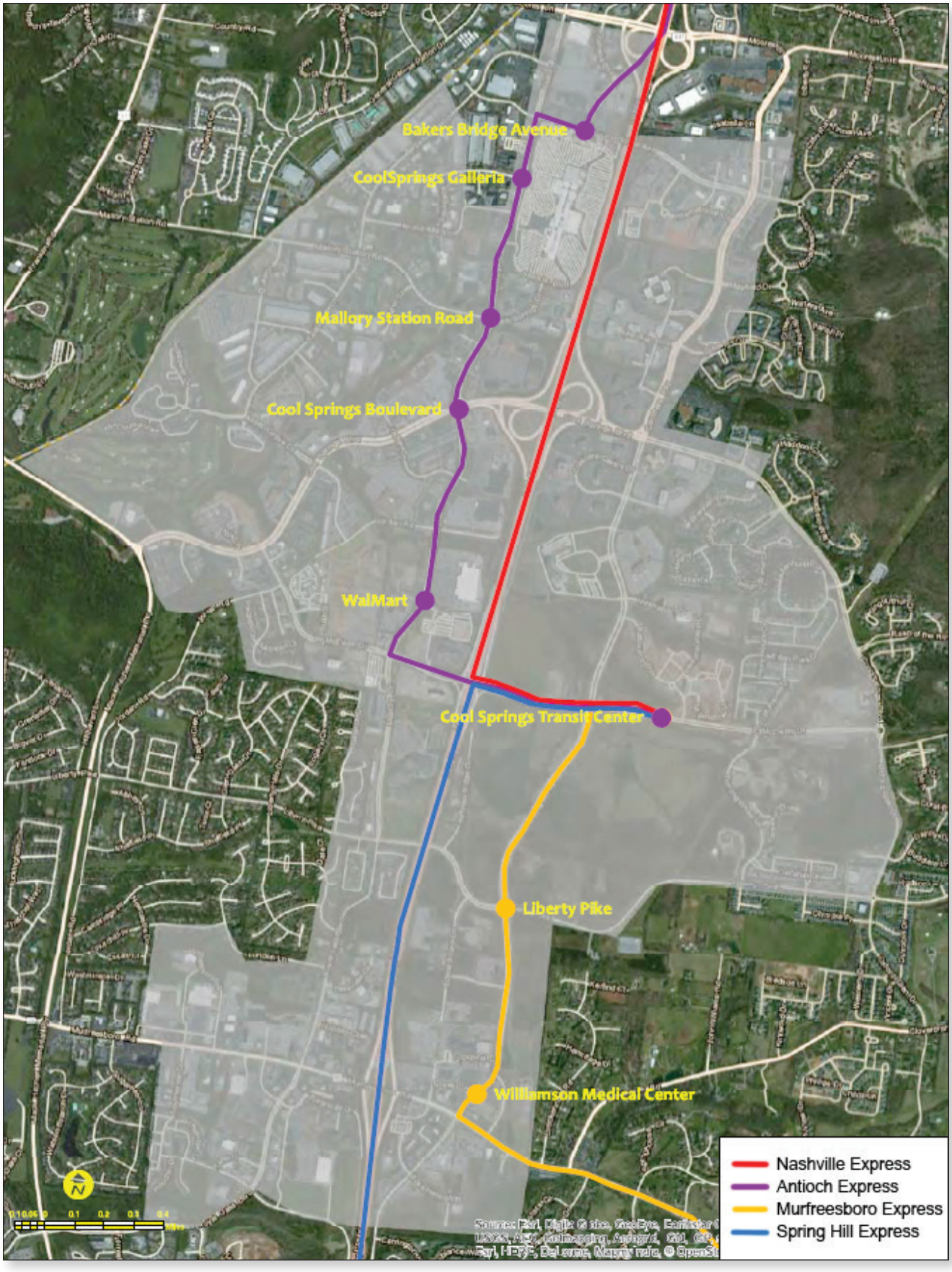
6.5 Rural Transit Services

Rural transit in the study area is provided by the Mid-Cumberland Human Resource Agency (MCHRA) and the South Central Tennessee Development District (SCTDD) primarily as demand response systems. Generally, the North and Central Sub-Area counties of Cheatham, Dickson, Robertson, Rutherford, Sumner, Williamson, and Wilson are serviced by MCHRA. MCHRA does transport customers to destinations in Davidson County from outside counties, however, it does not provide service within Davidson County. The South Sub-Area, consisting of Bedford, Giles, Lincoln, Marshall, and Maury counties, is serviced by SCTDD. As demand response systems, riders must make reservations to use either of the services. Demand response transit services are available to anyone regardless of age or income on a first-call, first-served basis. Both MCHRA and SCTDD operate Monday through Friday from 6:00 AM to 6:00 PM. There is currently no demand response service on weekdays after 6:00 PM or on weekends.

Additionally, SCTDD offers deviated fixed route service for Maury County to surrounding areas. The service includes four routes running hourly. Two routes provide services from the Columbia area to Mt. Pleasant and to Spring Hill. These routes connect to two routes in downtown Columbia. Deviated service is offered to anyone within 3/4-mile radius of the regular scheduled route. Finally, SCTDD offers fixed route commuter bus service from Lawrenceburg to Nashville and Murfreesboro. Two daily round trips from Lawrenceburg to Nashville are made on Monday, Tuesday, Thursday, and Friday. Trips from Lawrenceburg to Murfreesboro are scheduled on Wednesdays. SCTDD provided nearly 14,000 passenger trips on their commuter bus routes in 2014.

While future population and employment densities in the rural areas of the I-65 corridor will not support conventional fixed route transit services, population and employment growth in the I-65 corridor will generate needs for additional services. Increased services may come in the form of expanded service hours or service areas. The markets served by demand response providers, however, present significant operating challenges due to specialized trips for the elderly and people with disabilities and longer distances required to serve destinations. Private rideshare companies, such as Uber and Lyft, may provide a partnership opportunity for transit providers in lower demand areas. While the development of these types of partnerships is still in the very early stages, they provide the potential to start service more quickly, provide service at lower costs, and better tie expenditures to utilization levels.

Figure 6-2. Cool Springs Transportation Study Regional Express Bus Recommendations



6.6 Existing Deficiencies and Future Needs

Throughout the country, there has been an increased emphasis on the development of higher capacity transit services to support population and employment growth in metropolitan regions. Building on existing local and regional services, similar efforts are underway in the I-65 corridor.

A. **Existing Transit Services:** MTA and RTA services in the I-65 corridor are largely limited to express route service targeting commuters traveling between Maury, Sumner, Robertson, and Williamson Counties and downtown Nashville. All I-65 based express routes are limited to two or three inbound and outbound trips in the morning and afternoon, and because they operate during peak periods, they encounter high levels of congestion. Importantly, existing RTA express routes are not designed either to serve reverse commute trips. Also, services from different providers need to be better aligned to provide more seamless regional transit service for commuters.

B. **Access to Activity Centers:** Existing express bus routes along I-65 serve downtown Nashville, and except for the Spring Hill route (Route 95X), also connect directly to midtown Nashville and Vanderbilt University Medical Center. Riders can access other areas of Nashville via a transfer, but it is less convenient or practical from a travel time standpoint. Beyond the Nashville core, there is an overall lack of access to activity centers, especially in Williamson and Sumner Counties.

C. **Nashville MTA/RTA Strategic Plan:** The MTA and RTA recently completed and adopted nMotion, a regional strategic transit plan to improve access and mobility throughout middle Tennessee. The nMotion plan includes more than 24 recommendations for Bus Rapid Transit (BRT), BUS on-Shoulder Service (BSS), Light Rail Transit (LRT), express bus transit, regional rapid bus, and improved local services in the I-65 corridor.

D. **Cool Springs Multimodal Transportation Study:** The Cool Springs Multimodal Transportation Study outlines strategies for expanding transportation options and supporting transit riders, bicyclists, pedestrians, and transportation demand management. In addition to expanding express bus route services in the short-term, the study calls for evaluating high-capacity transit as ridership levels grow.

E. **Rural Transit:** Through MCHRA and SCTDD, demand response transit services are available to anyone regardless of age or income on a first-call, first-served basis Monday through Friday from 6:00 AM to 6:00 PM. There is currently no demand response service on weekdays after 6:00 PM or on weekends. Additionally, SCTDD offers deviated fixed route service for Maury County to surrounding areas and fixed route commuter bus service from Lawrenceburg to Nashville and Murfreesboro. Projected population and employment growth in the I-65 corridor will generate needs for these services. Importantly, private rideshare companies may provide a partnership opportunity for transit providers in lower demand areas. While the development of transit-ridesharing partnerships is still in the very early stages, they can provide the potential to start service more quickly, provide service at lower costs, and better tie expenditures to utilization levels.

7. Walking and Bicycling

For walking and bicycling systems to support daily travel, they need to be safe, comfortable and convenient. Overall, bicycle and pedestrian facilities in the I-65 corridor are too often either absent, disconnected, and/or designed to minimum standards. Moreover, the lack of walking and bicycling facilities undermines potential transit use. While the development of bicycle and pedestrian networks relies primarily on local governments, either through standalone projects or land development regulations, federal and state transportation facilities represent critical opportunities and challenges as high demand corridors, barriers, or gaps in local and regional systems.

7.1 State Bicycle Routes

A bicycle route is any roadway or bikeway designated with a unique route designation or "Bike Route" sign. A bicycle route network is a system of suggested routes to reach specific destinations, and should include wayfinding and destination information. Bicycle route designation indicates to bicyclists that the route provides advantages over other non-designated

routes – including roadway factors (e.g., adequate width, high quality pavement, good sight distance), traffic factors (e.g., traffic volumes, posted speed limits, percentage of trucks), and network factors (e.g., high demand destinations, directness, available services).

It is also important to note that a bicycle route system differs from the routine pedestrian and bicycle accommodation required by the United States Department of Transportation (USDOT) Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations on federal-aid projects. Effectively, the USDOT policy calls for the provision of pedestrian and bicycle facilities as a matter of routine, except where pedestrians and bicyclists are prohibited by law from using a roadway, cost is excessively disproportionate to the need or probable use, and in sparsely populated areas. A bicycle route system builds on routine accommodation improvements to identify preferred routes.

There are both existing and planned state bicycle routes throughout the I-65 corridor, although the two categories do not align in all cases (Figure 7-1). Many of the existing state bicycle routes were signed as "Bike Routes" if the highway had paved shoulders four-feet or wider. The newer planned state bicycle routes were defined during the most recent state bicycle route plan update in 2011. Within the limited definition of an existing state bicycle route, several existing state bicycle routes provide connectivity through the I-65 corridor, notably:

- US 31W in Robertson and Sumner Counties;
- SR 52 in Sumner County;
- US 41 in Robertson County;
- Dickerson Pike (US 31W) in Davidson County;
- Franklin Pike/Columbia Pike (US 31) in Williamson and Maury Counties;
- SR 96 in Rutherford and Williamson Counties;
- US 412 in Maury and Marshall Counties;
- US 31/US 31A in Giles and Marshall Counties,
- US 64 in Giles and Lincoln Counties; and
- US 431 in Lincoln and Marshall Counties.

Like the existing state bicycle routes, the planned bicycle routes are proposed mostly on US highways in the I-65 corridor, but do not augment local or intercity connections significantly. Finally, TDOT established US Bicycle Route (USBR) 23 in 2013 as part of the US Bicycle Route System. USBR 23 travels in the I-65 corridor from Kentucky to Alabama on lower volume roads through Lewisburg, Franklin, Nashville, Goodlettsville, Millersville, White House, and Portland.

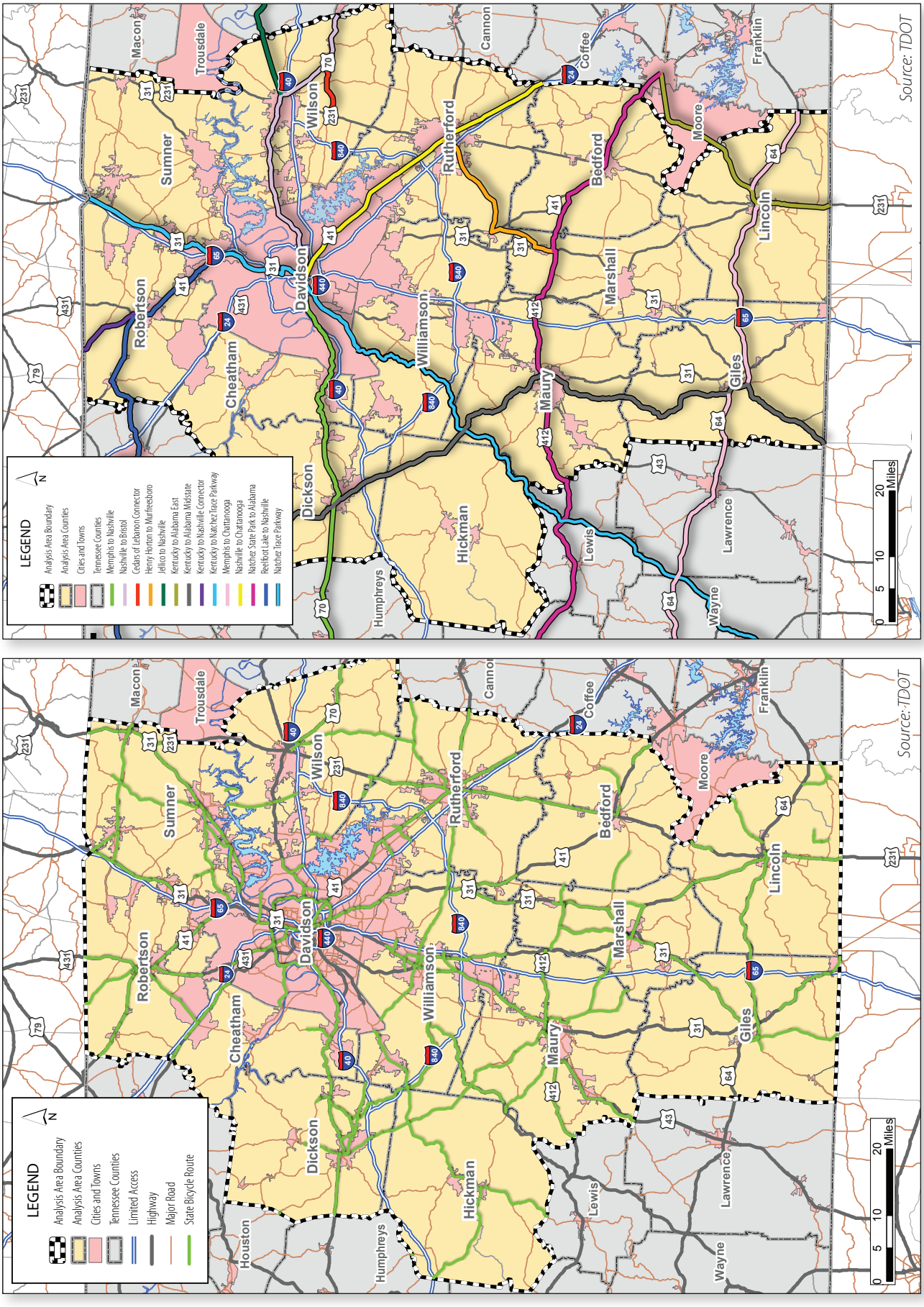
7.2 Regional and Local Bicycle and Pedestrian Plans

The Nashville Area MPO Regional Bicycle and Pedestrian Study (2009) identifies both sidewalk and bikeway priorities in the five-county MPO region, including the I-65 corridor. In many respects, the 2009 regional bikeway network vision map (Figure 7-2) combines the existing and proposed state bicycle routes into a single plan. The primary exceptions are the greater number of routes, especially Old Hickory Boulevard (SR 254), in Davidson County. Like the traditional approach to designating state bicycle routes, the MPO plan highlights paved shoulders four-feet or greater as the primary bikeway design accommodation.

Prioritized sidewalk improvements in the regional study focus on arterials and collectors within urban growth boundaries. Pedestrian improvements are assumed to include five-foot sidewalks on both sides of the road, and as proposed, 662 miles of sidewalks would be added. While the sidewalk improvements would result in a connected network of pedestrian facilities in the I-65 corridor, they too represent a minimum design standard. Bicycle and pedestrian planning and design have changed substantially since 2009, and now place a much greater emphasis on users of all ages and abilities and a broader range of facility design options.

In addition to the regional bicycle and pedestrian study, several communities in the I-65 corridor have developed bicycle, pedestrian, greenway, and trail plans, including Franklin, Hendersonville, Metro Nashville, and Sumner County. While some of the local plans, like the regional study, are more than five years old, Metro Nashville recently completed an update to its bicycle and pedestrian plan. Nashville's WalknBike plan reviews national best practices and can serve as a template for state-of-the-art bicycle and pedestrian networks.

Figure 7-1. Existing and Planned State Bicycle Routes



7.3 20-Minute Walking and Bicycling Districts

The lack of well-connected and well-designed bicycle and pedestrian systems makes it difficult for individuals to walk and bike to destinations or to other modes such as transit. Accordingly, commercial areas, residential neighborhoods, mixed-use districts, and adjacent transportation systems can all benefit from improved bicycle and pedestrian facilities and networks. Planning for a 20-minute walking (1.0 mile) and bicycling (3.0 miles) district around or near interstate interchanges, in particular, can help balance competing demands for local and regional, work and non-work travel. Benefits of establishing walking and bicycling districts, zones, or priority areas include:

- Reduced traffic congestion and pollution;
- Reduced parking requirements for development;
- Reduced personal transportation costs;
- Increased access to everyday needs;
- Increased development opportunities;
- Increased property values;
- Increased consumer spending; and
- Increased markets for transit services.

Complementing walking and bicycling, transit and shared mobility services can expand and extend bicycle and pedestrian networks in the I-65 corridor. For commuters, RTA express buses can accommodate bicycles in their luggage compartments, and for travelers without bicycles, the Nashville B-Cycle bike sharing program allows individuals to rent a bicycle throughout the city. Similarly, the TMA Group has been awarded funding to start a bike share program in Franklin, which is expected to begin soon. Nevertheless, as with any bicycle travel, bike share programs will be constrained by the safety, comfort, and convenience of the underlying bikeway network.

Finally, as noted in both the MPO regional bicycle and pedestrian study and the nMotion plan, one of the most significant pedestrian obstacles facing communities is the number of sidewalk facilities that are not compliant with the Americans with Disabilities Act (ADA) guidelines. Many sidewalks lack adequate flared sides, transitions, curb ramps, and other components that allow those with disabilities greater accessibility. Furthermore, many sidewalks have obstacles such as utility poles, mailboxes, or other impediments that make it difficult for individuals with mobility impairments.

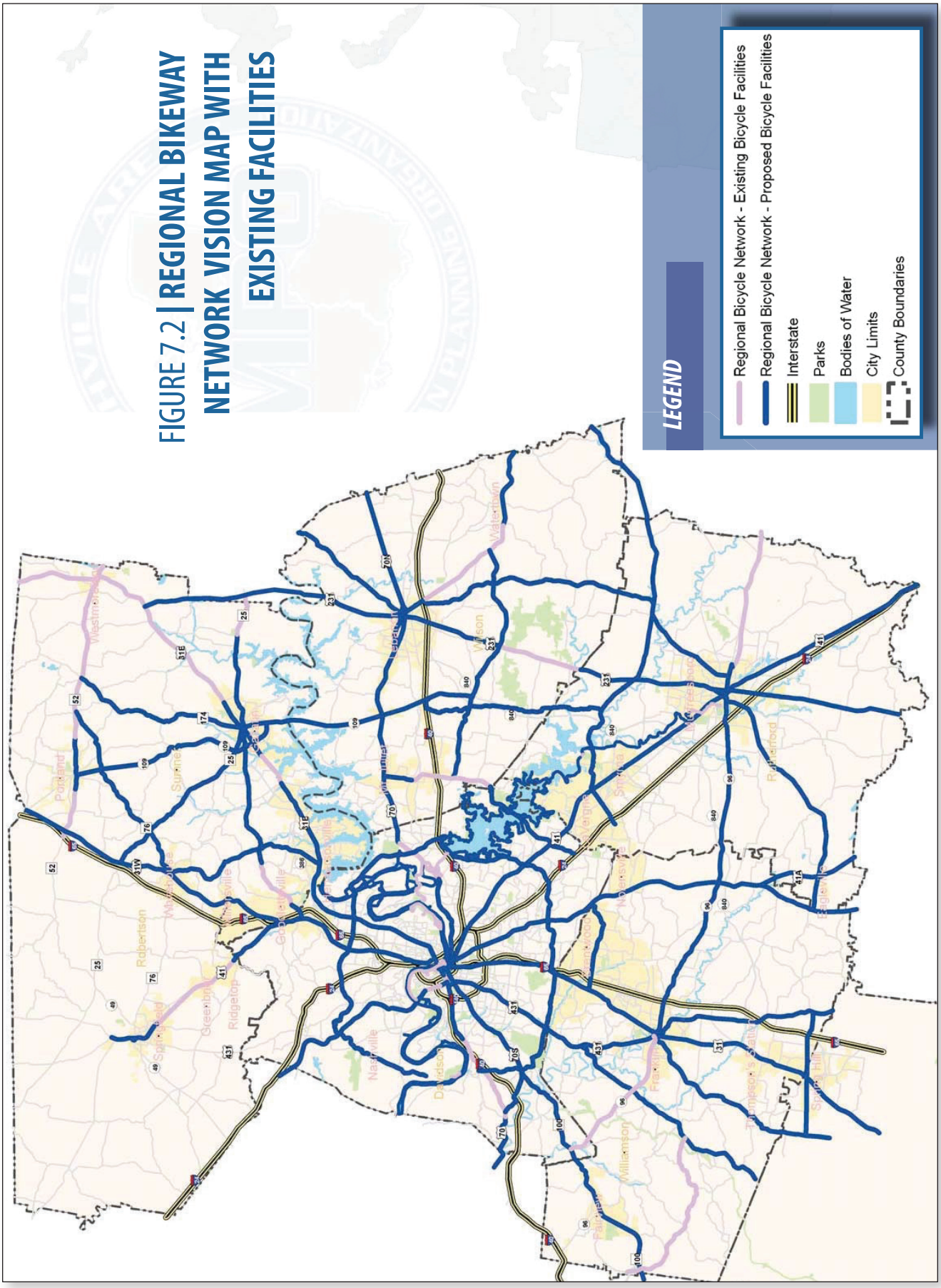
7.4 Existing Deficiencies and Future Needs

Walking and, increasingly, bicycling are fundamental components of a multimodal transportation system, especially for communities experiencing strong growth like many cities and towns in the I-65 corridor. For walking and bicycling systems to support daily travel, access to everyday needs, and local economic development, they need to be safe, comfortable and convenient. Existing bicycle and pedestrian facilities in the I-65 corridor are too often either absent, disconnected, and/or designed to minimum standards.

A. **State Bicycle Routes:** There are both existing and planned state bicycle routes throughout the I-65 corridor, although the two categories do not align in all cases. Many of the existing state bicycle routes were signed as "Bike Routes" if the highway had paved shoulders four-feet or wider. The newer planned state bicycle routes were defined during the most recent state bicycle route plan update in 2014. Like the existing state bicycle routes, the planned bicycle routes are proposed mostly on US highways in the I-65 corridor, and do not augment local or intercity connections significantly.

B. **Regional and Local Bicycle and Pedestrian Plans:** The Nashville Area MPO Regional Bicycle and Pedestrian Study (2009) identifies both sidewalk and bikeway priorities in the five-county MPO region, including the I-65 corridor. In many respects, the 2009 regional bikeway network vision map combines the existing and proposed state bicycle routes into a single plan. Like the traditional approach to designating state bicycle routes, the MPO plan highlights paved shoulders four-feet or greater as the primary bikeway design accommodation. Prioritized sidewalk improvements in the regional study focus on arterials and collectors within urban growth boundaries, and assume five-foot sidewalks on both sides of the road. Bicycle and pedestrian planning and design have changed substantially since 2009, and now place a much greater emphasis on users of all ages and abilities and a broader range of facility design options. In addition to the regional study, several communities in the I-65 corridor have developed bicycle, pedestrian, greenway, and trail plans.

Figure 7-2. Nashville Area MPO: Regional Bikeway Network Vision



C. **20-Minute Walking and Bicycling Districts:** Commercial areas, residential neighborhoods, mixed-use districts, and adjacent transportation systems can all benefit from improved bicycle and pedestrian facilities and networks. Planning for a 20-minute walking (1.0 mile) and bicycling (3.0 miles) travel shed around or near interstate interchanges, in particular, can help balance competing demands for local and regional, work and non-work travel. Complementing walking and bicycling, transit and shared mobility services can expand and extend transportation options in the I-65 corridor.

8. Transportation Demand Management

Like ITS and ATDM, in particular, Transportation Demand Management (TDM) is experiencing dramatic changes as new technologies and services are introduced. TDM is largely a congestion relief strategy, attempting to reduce travel and shift trips across modes and across time periods. While TDM has traditionally focused on recurring congestion and associated with car and van pools, telecommuting, and transit benefits, the range of tools has expanded and now includes efforts to help manage non-recurring congestion (e.g., traffic incidents, weather events, special events, and work zones) as well.

TDM measures improve mobility, reduce congestion during peak commuting hours, and can improve local air quality by reducing CO2, NOx and VOC pollutants which can trigger a variety of health problems including bronchitis, emphysema and asthma. In addition, TDM offers an alternative to building new roadway facilities, encouraging commute alternatives and better balancing transportation systems.

An underlying objective of TDM is shifting trips away from single occupancy vehicles and managing the transportation system more effectively. Table 8-1 identifies commuter mode split from the US Census Bureau's 5-year American Community Survey (2006-2010). Mode splits in the study area for ridesharing are consistent with statewide and national rates. However, in the I-65 corridor's key Origin-Destination pairs, ridesharing rates are as much as two-thirds higher than statewide and national averages, specifically from Spring Hill to the Nashville Core. Mode splits for transit and other modes of travel, such as bicycle and pedestrian, are significantly below national rates in the study area, and even lower in the key O-D pairs.

Table 8-1. Commuter Mode Split

Origin-Destination Pair	Mode			
	Single Occupancy Vehicle	Rideshare	Transit	Other Travel Mode (Bike,Ped, Etc.)
Franklin to Brentwood	86.9%	12.1%	0.6%	0.5%
Brentwood to Franklin	89.4%	10.4%	0.6%	0.0%
Giles to Franklin	76.4%	23.6%	0.0%	0.0%
South Nashville to Franklin	86.3%	13.3%	0.0%	0.3%
South Nashville to Nashville Core	85.8%	10.6%	1.6%	1.8%
Franklin to Nashville Core	86.0%	14.0%	0.2%	0.0%
Portland to Nashville Core	85.8%	14.2%	0.0%	0.0%
Hendersonville to Nashville Core	86.6%	11.8%	1.0%	0.2%
Spring Hill to Nashville Core	83.2%	15.9%	0.0%	0.9%
Spring Hill to Franklin	87.2%	12.4%	0.0%	0.4%
Study Area	**82.2%**	**10.4%**	**0.9%**	**6.4%**
Tennessee	**83.9%**	**9.6%**	**0.8%**	**5.8%**
Nationwide	**76.4%**	**9.7%**	**5.0%**	**8.8%**

Source: US Census, 5-Year American Community Survey, 2006-2010

Figure 8-1 illustrates the existing hourly traffic volumes on I-65 at the Davidson-Williamson county line. There are only a few hours in the morning and afternoon each day where the interstate approaches capacity, resulting in congestion and delay. Conversely, there are many times during the morning, mid-day, and evening when I-65 has adequate capacity. TDM strategies can help balance travel demand across a day and improve system management and operations.

The Transportation Management Association Group (TMA Group) works with employers in the Nashville region on TDM strategies, including the VanStar vanpool program, staggered work hours, flexible scheduling, and transit subsidies. The State of Tennessee and Vanderbilt University are major employers in the region that utilize TDM. Additional efforts supported by Franklin Intermediate School and the Williamson County Chamber of Commerce Mobility Week demonstrate existing locally focused programs where TDM service provisions are likely better served due to direct, established relationships with employers and commuters.

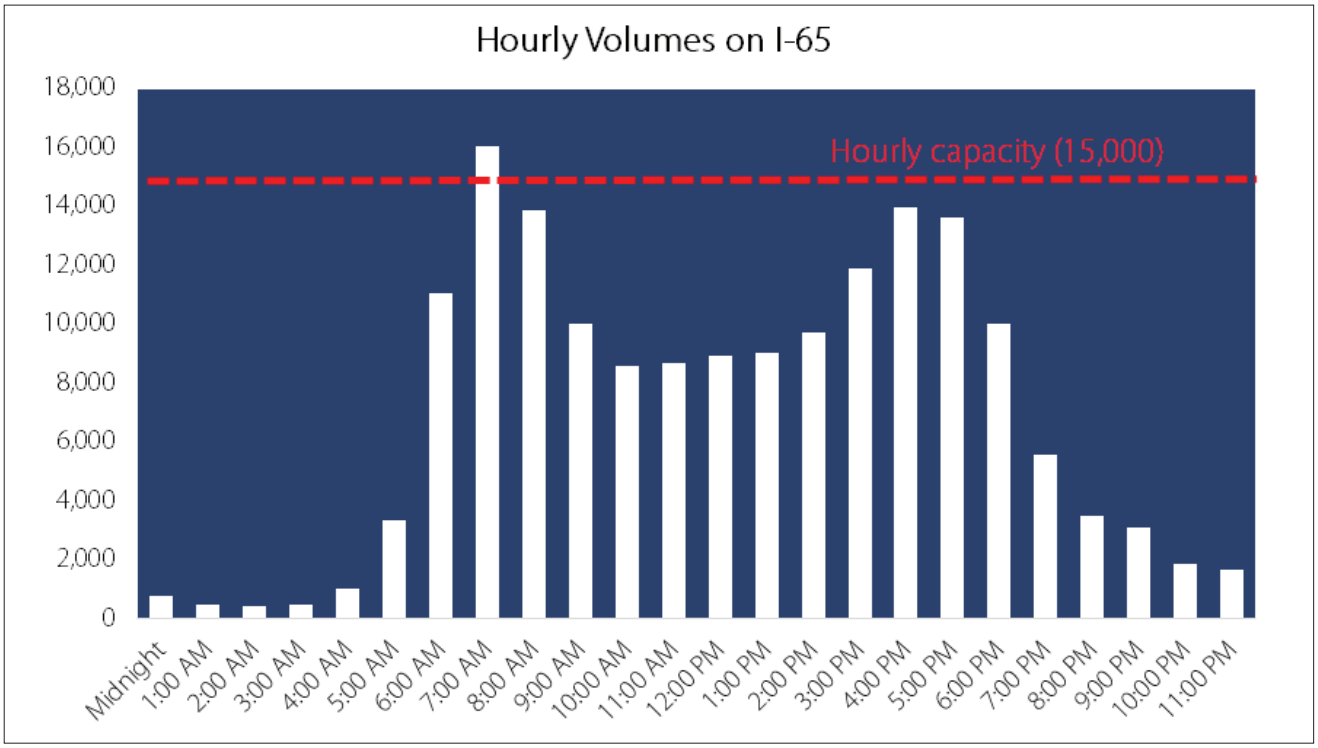
8.1 Vanpools

Both the RTA and TMA Group work with regional rideshare partners to manage a fleet of commuter vanpools throughout middle Tennessee. Twelve, fourteen, and fifteen-passenger vans carry riders from park-and-ride lots to workplaces. Riders pay a monthly fare, saving on fuel, parking, and maintenance costs associated with cars. A van driver, in exchange for driving and recording the vanpool's performance, can commute for free. According to the FTA's National Transit Database, vanpool ridership in the study area in 2014 was 241,000 trips.

8.2 HOV Lanes

High occupancy vehicle (HOV) lanes are another TDM tool currently used in the I-65 corridor. An HOV lane is a restricted traffic lane reserved at peak travel times for the exclusive use of vehicles with a driver and one or more passengers, including car or vanpools and transit vehicles. HOV lanes are typically implemented on freeways to increase vehicle occupancies and reduce traffic congestion and air pollution. Since 1993, Tennessee has used HOV lanes to promote ridesharing. Each vehicle that travels in an HOV lane in Tennessee must carry a minimum of two people or be an inherently low emission vehicle with a Smart Pass

Figure 8-1. I-65 Hourly Traffic Volumes: Davidson-Williamson County Line



Source: Statewide Travel Demand Model

sticker. Motorcycles are also allowed to travel in the HOV lane.

Table 8-2 lists the existing HOV lane limits for the Nashville region. All existing HOV facilities are immediately adjacent to general purpose lanes and are identified by pavement markings consisting of a white skip line and standard HOV diamonds. Posted signs indicating the minimum required occupancy (2+ persons) and the hours of operation (7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM on weekdays) are present along each of the segments.

Table 8-2. HOV Lane Limits in the Nashville Region

Route	Begin HOV Lanes	End HOV Lanes
Interstate 24 (East of Nashville)	SR 255 (Harding Place)	US 231 (Shelbyville Highway)
Interstate 40 (East of Nashville)	SR 155 (Briley Parkway)	SR 109
Interstate 65 (North of Nashville)	SR 155 (Briley Parkway)	SR 386 (Vietnam Veterans Parkway)
Interstate 65 (South of Nashville)	I-840	SR 255 (northbound) Armory Drive (southbound)

Source: Tennessee Department of Transportation

Table 8-3. HOV Lane Observed Violation Rates

Route	Limit	Inbound Rate	Outbound Rate
Interstate 24 (East of Nashville)	Haywood Lane	89 %	80 %
	SR 266 (Sam Ridley Pkwy)	65 %	65 %
Interstate 40 (East of Nashville)	SR 45 (Old Hickory Blvd)	74 %	68 %
Interstate 65 (North of Nashville)	SR 45 (Old Hickory Blvd)	96 %	94 %
Interstate 65 (South of Nashville)	Cool Springs Boulevard	71 %	63 %
	SR 253 (Concord Road)	82 %	85 %
	SR 254 (Old Hickory Blvd)	77 %	96 %

Source: Tennessee Department of Transportation

Violation Rates

In July and August 2012, data was collected on the existing HOV lanes in the Nashville region as part of an effort by TDOT to document the system's operational performance. The data collected included vehicle classification and occupancy traffic counts, as well as travel speeds. Table 8-3 lists the observed violation rates for HOV lanes in the Nashville region. Violation rates ranged from 63 percent to 96 percent on I-65, similar to other HOV lanes in the region. According to FHWA, non-barrier separated HOV facilities typically have violation rates between 10 and 20 percent and up to 60 percent during peak periods of congestion in the absence of effective enforcement.

Speeds

Table 8-4 shows the average speed of vehicles in the HOV lane during peak periods on I-65. Based on the data, I-65 southbound in southern Davidson County and I-65 northbound in northern Davidson County may be approaching degradation. FHWA defines degradation as failing to maintain a minimum average operating speed 90 percent of the time over a consecutive 180-day period during peak periods. Minimum average operating speed is defined as 45 mph for HOV facilities with a speed limit of 50 mph or greater.

Table 8-4. Observed HOV Lane Speeds

Route	Direction/Location	Time	Speed
Interstate 65 (South of Nashville)	Northbound – Northern Davidson County	PM	39.5
	Southbound – Southern Davidson County	PM	48.4
	Southbound – Williamson County	PM	61.0
	Southbound – Northern Davidson County	AM	61.2
	Northbound – Southern Davidson County	AM	66.9
	Northbound – Williamson County	AM	67.4

Source: Tennessee Department of Transportation

8.3 Park-and-Ride Facilities

Park-and-ride facilities can support HOV lanes by providing parking for transit services and car or vanpool programs. Park-and-ride facilities can also promote other TDM strategies such as high capacity transit services and other managed lanes concepts. In the fall of 2015, MTA/RTA conducted an inventory of the region's park-and-ride facilities. The lots were inventoried on weekdays (Tuesday – Thursday) during the months of October and November. The occupancy count was made after the last inbound bus departure between 8:00 AM and 11:00 AM. Table 8-5 lists the park-and-ride facilities that serve commuter fixed routes and travel via I-65 for all or some portion of their route. All the lots, except for the Greensboro North lot, are parking facilities shared with other uses (e.g., churches and shopping centers).

The usage rates for lots range from 82 percent, for the Kohls Hendersonville lot serving the express bus Route 92X, to 3 percent, for the Greensboro North Park-and-Ride serving Route 87X. Park-and-ride lots along the I-65 corridor are generally underutilized compared to the overall system, 36 percent to 53 percent, respectively. Many of the park-and-ride lots also lack ADA accessibility and sidewalks. None of the lots have bicycle parking facilities. Further, only the Hendersonville-Drakes Creek Park and Franklin park-and-ride lots are connected to bikeways. However, the bikeways are not part of a comprehensive network and only serve one direction of travel.

Assessments of the Nashville region's park-and-ride lots have also been completed as part of the nMotion plan. The plan found that most park-and-ride lots are located at places where local businesses, churches, or other organizations have agreed to share use of their lots. While these lots may be less expensive to construct and maintain, they may also be at locations that are less convenient to users. Consequently, many

Table 8-5. Park-and-Ride Lot Inventory

Route	Agency	Name	County	Approx. # of Parking Stalls	Occupancy During Field Visit	Usage Rate	ADA Accessible	Sidewalks	Bicycle Parking
87X	RTA	Greensboro North Park-and-Ride	Davidson	144	4	3%	✓	✓	---
87X	RTA, MTA	Gallatin Walmart	Sumner	50	29	58%	---	---	---
89X	RTA	Joelton Park-and-Ride	Rutherford	50	10	20%	---	---	---
89X	RTA	Downtown Springfield Park-and-Ride	Robertson	30	6	20%	✓	✓	---
89X	RTA	Springfield Walmart	Robertson	50	16	32%	✓	✓	---
91X	RTA	Franklin-Williamson Medical Center (WMC)	Williamson	50	40	80%	✓	✓	---
92X	RTA, MTA	Kohls Hendersonville	Sumner	50	41	82%	---	---	---
92X	RTA	Drakes Creek Park	Sumner	Unknown	---	---	---	---	---
95X	RTA	Spring Hill – Church of the City	Williamson	50	8	16%	---	---	---
95X	RTA	Spring Hill Kroger	Maury	50	33	66%	---	---	---
		Total along I-65:		524	187	36%	40%	40%	0%
		Total RTA Systemwide:*		883	467	53%	25%	25%	0%

** RTA systemwide totals do not include lots serving the Music City Star commuter train*

Source: Nashville MTA/RTA

people either travel out of direction, or would have to travel out of direction, to access express bus services, increasing travel times and deterring individuals from using transit services.

8.4 TDM State of the Practice

As noted earlier, increasingly, traditional TDM programs are coupled with traffic management programs as new technologies support a more integrated approach to matching travel supply and demand. Active Traffic and Demand Management or ATDM now combines demand management, traffic management, parking management, and other transportation modes and assets. Within TDM, technologies that support real-time information and individual choice can provide a greater number of travel options throughout the day for a wider variety of people. Traditional TDM programs are typically organized around commuting and include:

- Travel options (e.g., transit, ridesharing, walking, and bicycling);
- Financial and time incentives (e.g., transit benefits, parking policies, flexible work hours, employer incentives, telecommuting, and land use planning);
- Information and education programs (e.g., trip planning, ride matching, maps, and websites); and
- Public-private partnerships.

While continuing to emphasize a reduction in single occupancy vehicle commute trips, ATDM utilizes ITS systems and consumer information and communication technologies to expand the traditional set of TDM programs and improve travel reliability. Emerging TDM-oriented technologies are currently focusing on:

- Pre-trip and in route travel information (e.g., road conditions, optimal departure times, dynamic routing, travel choices, and comparative real-time information);
- Parking management (e.g., real-time parking information, variable pricing, and guidance systems);
- Road pricing (e.g., zone pricing and managed lanes);
- Ridesharing and ridesourcing (e.g., real-time passenger information, variable pricing, and automated payment); and



- Transit technologies (e.g., real-time arrival/ departure information, automated fare payment, dynamic routing, and vehicle amenities).

Beyond the technology changes remaking TDM programs and services, there are also strategic policies that can strengthen TDM performance across different scales and over time. Policy best practices include:

- Integrating TDM programs regionally and across the public and private sectors;
- Measuring and reporting performance on a quarterly or annual basis;
- Incorporating TDM into land use planning and development review processes; and
- Establishing comprehensive customer marketing and information programs.

Combining traditional TDM goals and strategies with new technologies and best practices can have a substantial impact on trip making and recurring and non-recurring congestion. Table 8-6 highlights estimated reductions of various employer-based TDM strategies.

Table 8-6. Impact of Selected Employer-Based TDM Strategies

Strategy	Details	Employee Vehicle Trip Reduction Impact
Parking Charges	Previously free parking	20%-30%
Information Alone	Information on available alternatives	1.4%
Services Alone	Ridematching shuttles, guaranteed ride home	8.5%
Monetary Incentives Alone	Subsidies for carpool, vanpool, transit	8%-18%
Services and Monetary Incentives	Example: transit vouchers and guaranteed ride home	24.5%
Cash Out	Cash benefit offered in lieu of accepted free parking	17%

Source: Smart Growth America

8.5 Existing Deficiencies and Future Needs

Although the I-65 corridor includes some TDM programs and strategies, commuting mode splits in the corridor underscore the opportunity to reduce trips and shift more trips to different modes or different time periods. Moreover, as new technology driven services are introduced, TDM policies and programs will need to adapt to fully maximize the available opportunities.

A. **Commute Mode Split:** Mode splits in the study area for ridesharing are consistent with statewide and national rates. However, in the I-65 corridor's key Origin-Destination pairs, ridesharing rates are as much as two-thirds higher than statewide and national averages, specifically from Spring Hill to the Nashville Core. Mode splits for transit and other modes of travel, such as bicycle and pedestrian, are significantly below national rates in the study area, and even lower in the key O-D pairs.

B. **Vanpools:** Both the RTA and TMA Group work with regional rideshare partners to manage a fleet of commuter vanpools throughout middle Tennessee. According to the FTA's National Transit Database, vanpool ridership in the study area in 2014 was 241,000 trips. While the commuter mode share for ridesharing is high, high HOV violation rates and low park-and-ride utilization highlight the opportunities to create move effective ridesharing and transit systems.

C. **HOV Lanes:** HOV lane violation rates ranged from 63 percent to 96 percent on I-65, similar to other HOV lanes in the region. Nationally, non-barrier separated HOV facilities typically have violation rates between 10 and 20 percent and up to 60 percent during peak periods of congestion in the absence of effective enforcement.

D. **Park-and-Ride Lots:** Park-and-ride lots along the I-65 corridor are generally underutilized compared to the overall system, 36 percent to 53 percent, respectively. Many of the park-and-ride lots lack ADA accessibility and sidewalks, do not have bicycle parking facilities, and are not conveniently located.

E. **TDM State of the Practice:** increasingly, traditional TDM programs are coupled with traffic management programs as new technologies support a more integrated approach to matching travel supply and demand. Within TDM, technologies that support real-time information and individual choice can provide a greater number of travel options throughout the day for a wider variety of people. Combining traditional TDM goals and strategies with new technologies and best practices, then, can have a substantial impact on trip making and recurring and non-recurring congestion.

9. Freight and Intermodal Facilities

Freight movement varies considerably across the I-65 corridor. Current and future truck volumes, network deficiencies, potential for freight diversion, intermodal freight facilities, and possible impacts from the increase of e-commerce, the Panama Canal expansion, and the relocation of the Radnor Rail Yard are analyzed based on data from AirSage, Transearch, InfoUSA, and the Tennessee Statewide Travel Demand Model.

9.1 Freight Movement

Truck is the major mode for freight movement in the study area and truck volumes are projected to increase by more than 50 percent on most of the study area roadway network between 2010 and 2040 (Figure 9-1). These increases will affect the entirety of I-65 as well as most of the connecting and supporting routes throughout the corridor. Between 2010 and 2040, truck volumes on I-65 north of Nashville will significantly increase (68 percent), and more than double on I-40 east and west of Nashville (110 percent). Interstate 24 south of Nashville currently serves more than 10,000 trucks daily, but demand is projected to be nearly 17,000 trucks by 2040. The overlap of I-65 and I-24 is projected to carry nearly 24,000 trucks in 2040.

9.2 Inbound/Outbound Freight Demand: 2012 and 2040

Inbound and outbound freight to the study area (Table 9-1) is primarily transported by trucks with inbound tonnage projected to more than double by 2040. Air freight shows a large percentage increase by 2040 for both inbound and outbound volumes, but this represents a relatively small increase in tonnage as compared to other modes. Outbound freight transported by rail is projected to grow by roughly 147 percent by 2040 which may result in rail capacity issues and freight diversion to truck and water.

Inbound/Outbound Freight by Commodity: 2012 and 2040

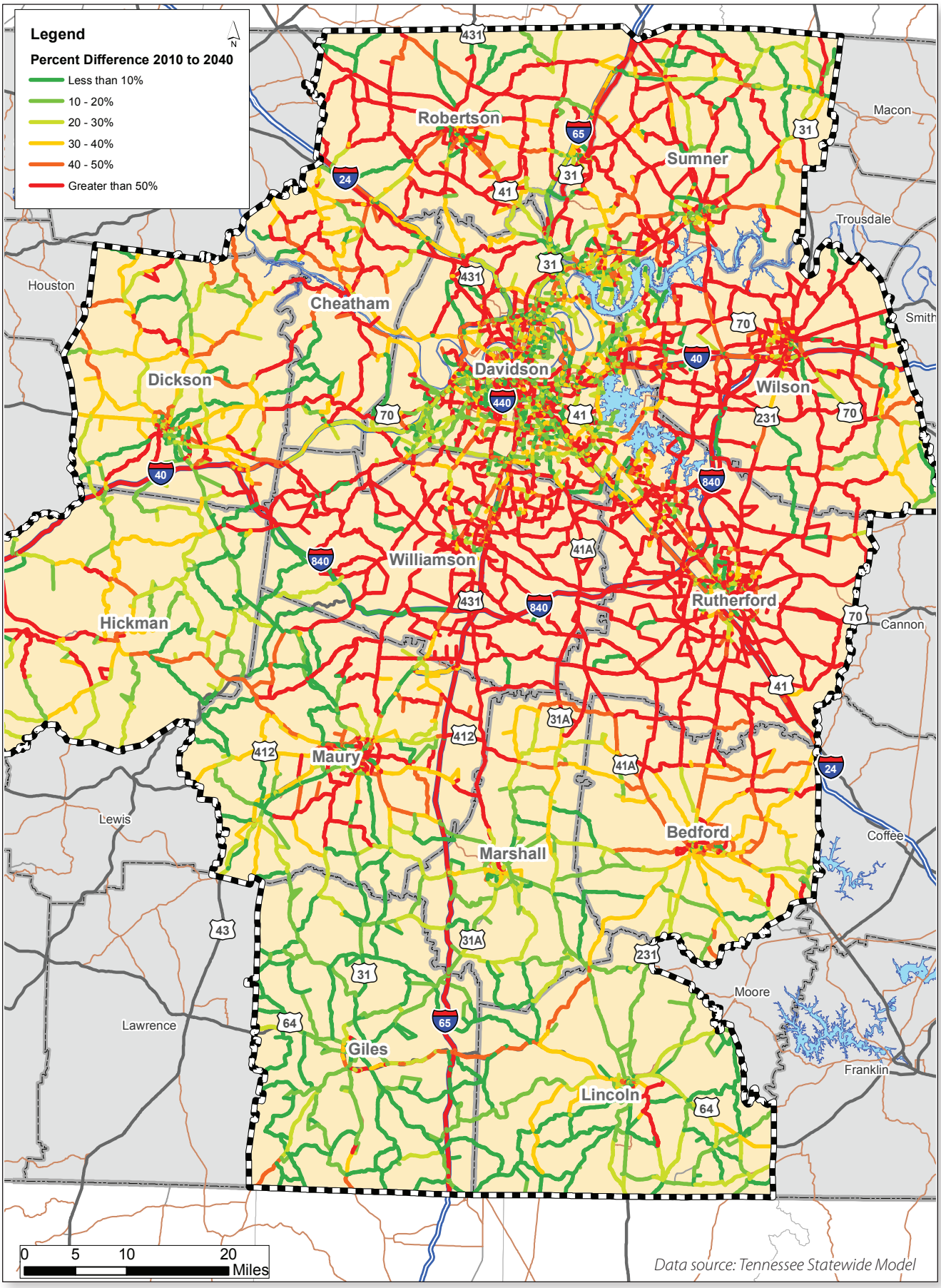
A review of the Transearch database indicates that the top ten commodities, both inbound and outbound, are largely similar between 2012 and 2040. Coal (SCTG 15), gravel (SCTG 12), motorized and other vehicles (SCTG 36), and waste products (SCTG 41) dominate both the inbound and outbound movements by tonnage and are mostly transported by truck followed by water, which primarily carries coal and gravel. Electronic components and parts, media and entertainment components, motor vehicles, and scrap metal tend to be the highest value inbound and outbound freight commodities.

Table 9-1. Inbound and Outbound Freight Volumes by Mode for the Years 2012 and 2040

		2012		2040		
	Mode	Tons (millions)	Value (millions)	Tons (millions)	Value (millions)	Percent Increase
Inbound	Trucks	46.9	49.9	101.9	129.4	117%
	Air	0.017	2.2	0.035	5.9	109%
	Water	7.8	0.8	12.8	1.1	64%
	Rail	2.1	5.6	3.6	10.1	70%
	TOTAL	56.8	58.4	118.3	146.6	108%
Outbound	Trucks	39.1	42.1	62.5	95.9	60%
	Air	0.023	2.2	0.043	4.8	88%
	Water	0.4	0.1	0.2	0.09	-57%
	Rail	1.3	8.1	3.2	22.3	147%
	TOTAL	40.8	52.4	65.9	123.7	62%

Data source: Tennessee Statewide Model

Figure 9-1. Percent Difference in Truck Volume from Year 2010 to 2040



Major Truck Origin-Destination Pairs by Entry/Exit Road: 2012 vs. 2040

Table 9-2 and Table 9-3 show inbound and outbound freight tonnage by entry/exit road and destination/origin county. Davidson County is the destination for over 40 percent of the total freight tonnage in the study area with I-65 accounting for nearly the combined total of I-24 and I-40 in terms of tonnage. Davidson and Rutherford counties are the origin of roughly 25 and 12 percent of the total freight tonnage, respectively, with a large portion of that exiting the study area by I-65. The data indicates that I-65 carries a similar share of outbound freight (49 percent) as it does inbound freight (53 percent).

Table 9-4 shows multi-unit (MUT) and single-unit truck (SUT) trips produced and attracted from/to the study area counties for 2010. Davidson and Rutherford Counties produce and attract the most MUT and SUT trips, which is expected given the many intermodal freight facilities in those two counties.

Freight Generating Facilities

According to InfoUSA employment and revenue data, Davidson, Rutherford, Williamson, and Sumner counties account for roughly 74 percent of the total employment in the I-65 corridor study area with the majority allocated to retail and manufacturing activities. Davidson, Rutherford, Robertson, and Williamson Counties account for roughly 70 percent of the total revenue in the study area with the majority produced by manufacturing and wholesale and retail trade. Retail, manufacturing, and construction account for roughly 76 percent of the total employment, while manufacturing and wholesale and retail trade account for roughly 90 percent of the revenue in the study area.

Major Origin-Destination Pairs by Other Modes: 2012 vs. 2040

A review of the Transearch Database indicates that Davidson County is the dominant origin and destination in the region for all modes with two notable exceptions. Sumner County has a higher inbound tonnage by water and a much lower inbound value by water. Rutherford County has a high outbound value by rail and lower outbound tonnage by rail.

Through Traffic: 2012 and 2040

I-65 and I-40 serve as major routes for freight transported by truck through the study area (Table 9-5). Through truck traffic entering and exiting on I-65 is projected to increase by 89 percent by 2040. Total truck traffic entering I-65, I-24, and I-40 and exiting I-65 is forecasted to increase by 82 percent, which will translate into higher truck volumes on I-65, I-440, and I-840. Significant increases are also projected for truck traffic that either enters or exits the study area through I-40 and uses I-65 (113 and 130 percent, respectively). I-65 also carries a significant amount of through traffic entering Tennessee from other states (e.g., approximately 5,000 and 8,300 thousand tons of through truck traffic enter Tennessee using I-75 and exit using I-65 in 2012 and 2020, respectively).

Table 9-6 shows through freight traffic by tonnage and value for air, water, and rail in 2012 and 2040. In 2012, there were over 240 million tons of through freight utilizing the rail network in the study area which is far more than the other modes including trucks. Air freight is projected to increase substantially by both tonnage and value, while water freight will experience more modest increases. Rail freight, in both tonnage and value, will decrease by 12 and 29 percent, respectively.

9.3 Intermodal Facilities: Air, Rail, and Water

Figure 9-2 shows the locations of air, rail, and water facilities with the V/C ratio for the roadway network. The major air freight generator is the Nashville International Airport in an area with high V/C ratios indicating access issues for inbound and outbound freight by air. The major rail facility, Radnor Yard, is located just south of Nashville along I-65 in an area also with high V/C ratios indicating access issues. The major water facility, the Nashville Port, is located along the Cumberland River in Nashville where the V/C ratios are the highest.

Table 9-2. Inbound Freight Tonnage and Value for 2012 and 2040 by Entry Road and Destination County

Tons (in thousands)

Destination County	2012 Entry Road I-24	2012 Entry Road I-40	2012 Entry Road I-65	2012 Grand Total	2040 Entry Road I-24	2040 Entry Road I-40	2040 Entry Road I-65	2040 Grand Total
Bedford	121	56	224	401	253	151	564	968
Cheatham	112	67	202	381	214	171	501	887
Davidson	2,246	1,868	4,269	8,382	3,161	2,866	7,361	13,387
Dickson	115	139	197	450	195	278	471	944
Giles	54	63	191	308	102	124	384	610
Hickman	11	29	43	83	15	49	94	158
Lincoln	72	54	104	230	151	113	284	548
Marshall	72	74	286	432	82	105	367	554
Maury	165	205	528	897	353	412	1,376	2,142
Robertson	176	169	663	1,009	434	624	1,891	2,950
Rutherford	1,039	728	473	2,240	2,825	2,282	1,258	6,366
Sumner	318	291	1,144	1,752	906	866	3,894	5,666
Williamson	666	698	1,622	2,986	1,459	1,666	4,564	7,688
Wilson	306	329	125	761	600	799	293	1,693
Grand Total	5,472	4,770	10,071	20,313	10,752	10,507	23,303	44,562

Value (in millions)

Destination County	2012 Entry Road I-24	2012 Entry Road I-40	2012 Entry Road I-65	2012 Grand Total	2040 Entry Road I-24	2040 Entry Road I-40	2040 Entry Road I-65	2040 Grand Total
Bedford	$131	$102	$310	$542	$358	$368	$902	$1,628
Cheatham	$55	$80	$138	$272	$129	$308	$364	$800
Davidson	$1,909	$3,262	$4,840	$10,010	$3,546	$7,983	$9,765	$21,294
Dickson	$98	$187	$214	$499	$189	$537	$571	$1,298
Giles	$36	$81	$168	$286	$76	$235	$343	$655
Hickman	$7	$26	$27	$59	$9	$53	$53	$115
Lincoln	$55	$69	$109	$233	$133	$232	$342	$706
Marshall	$39	$86	$180	$305	$65	$283	$320	$668
Maury	$149	$444	$700	$1,293	$201	$1,127	$1,322	$2,651
Robertson	$148	$293	$724	$1,166	$414	$1,650	$2,862	$4,926
Rutherford	$1,044	$2,011	$485	$3,540	$3,387	$8,755	$1,126	$13,268
Sumner	$203	$399	$885	$1,487	$438	$1,449	$2,425	$4,312
Williamson	$342	$968	$1,113	$2,423	$812	$3,085	$2,999	$6,895
Wilson	$133	$408	$73	$614	$321	$1,385	$191	$1,896
Grand Total	$4,348	$8,416	$9,965	$22,729	$10,079	$27,450	$23,585	$61,113

Data source: Transearch Database

Table 9-3. Outbound Freight Tonnage and Value for 2012 and 2040 by Exit Road and Destination County

Tons (in thousands)

Destination County	2012 Entry Road I-24	2012 Entry Road I-40	2012 Entry Road I-65	2012 Grand Total	2040 Entry Road I-24	2040 Entry Road I-40	2040 Entry Road I-65	2040 Grand Total
Bedford	354	142	801	1,296	796	194	918	1,907
Cheatham	89	64	177	331	144	125	372	641
Davidson	1,101	1,093	2,825	5,020	1,251	1,709	3,438	6,397
Dickson	88	187	258	533	137	352	345	835
Giles	75	149	493	716	112	273	623	1,007
Hickman	50	157	299	505	63	193	293	548
Lincoln	79	112	118	308	241	266	325	832
Marshall	113	188	681	982	177	225	649	1,051
Maury	91	293	486	870	163	552	699	1,414
Robertson	591	316	1,430	2,336	708	620	2,159	3,487
Rutherford	1,010	590	562	2,162	1,518	956	695	3,168
Sumner	160	216	730	1,107	273	625	1,793	2,690
Williamson	216	523	754	1,493	299	775	1,123	2,197
Wilson	233	521	328	1,081	356	1,055	414	1,825
Grand Total	4,249	4,552	9,940	18,741	6,236	7,920	13,844	28,000

Value (in millions)

Destination County	2012 Entry Road I-24	2012 Entry Road I-40	2012 Entry Road I-65	2012 Grand Total	2040 Entry Road I-24	2040 Entry Road I-40	2040 Entry Road I-65	2040 Grand Total
Bedford	$277	$153	$523	$953	$1,046	$447	$1,564	$3,057
Cheatham	$122	$218	$199	$538	$187	$347	$411	$945
Davidson	$1,713	$2,031	$3,238	$6,982	$2,187	$4,182	$5,904	$12,272
Dickson	$110	$218	$283	$611	$252	$559	$632	$1,443
Giles	$68	$153	$347	$568	$160	$413	$900	$1,473
Hickman	$19	$75	$84	$179	$37	$159	$205	$401
Lincoln	$94	$127	$194	$414	$325	$339	$597	$1,261
Marshall	$117	$183	$404	$704	$229	$333	$822	$1,383
Maury	$99	$290	$351	$741	$246	$744	$945	$1,935
Robertson	$672	$506	$1,776	$2,954	$902	$1,330	$3,941	$6,173
Rutherford	$895	$1,105	$370	$2,369	$1,745	$3,110	$693	$5,548
Sumner	$246	$471	$936	$1,653	$425	$1,437	$2,444	$4,305
Williamson	$144	$404	$497	$1,045	$337	$1,127	$1,584	$3,048
Wilson	$95	$276	$60	$431	$246	$1,044	$149	$1,439
Grand Total	$4,670	$6,211	$9,262	$20,143	$8,324	$15,571	$20,790	$44,684

Source: Transearch Database

Table 9-4. MUT and SUT Productions and Attractions by County for 2010 (daily trips)



County	MUT		SUT	
	Attractions	Productions	Attractions	Productions
Bedford	2,424	2,383	2,219	2,059
Cheatham	860	840	1,443	1,496
Davidson	34,239	32,343	54,458	53,859
Dickson	2,480	2,277	3,410	3,513
Giles	1,162	1,100	1,953	2,016
Hickman	242	265	1,166	1,301
Lincoln	762	801	1,965	1,840
Marshall	1,241	1,241	2,082	2,139
Maury	2,889	3,050	4,969	4,877
Robertson	4,138	3,849	2,938	2,969
Rutherford	17,089	18,371	15,679	15,808
Sumner	5,829	6,479	8,591	9,382
Williamson	6,814	6,821	10,392	10,254
Wilson	6,120	5,790	5,171	5,257

Data source: AirSage Database

Table 9-5. Through Truck Traffic Tonnage (in Thousands) by Entry and Exit Road for 2012 and 2040

Entry Road	2012				2040				% Change 2012 to 2040			
	Exit Road			Grand Total	Exit Road			Grand Total	Exit Road			Grand Total
	I-24	I-40	I-65		I-24	I-40	I-65		I-24	I-40	I-65	
I-24	0	2,491	2,156	4,647	0	4,252	3,104	7,357	-	71%	44%	58%
I-40	2,575	3,765	7,237	13,576	4,505	5,822	15,396	25,723	75%	55%	113%	89%
I-65	1,128	8,549	20,771	30,447	1,634	19,639	36,323	57,596	45%	130%	75%	89%
Grand Total	3,702	14,805	30,163	48,671	6,139	29,713	54,823	90,676	66%	101%	82%	86%

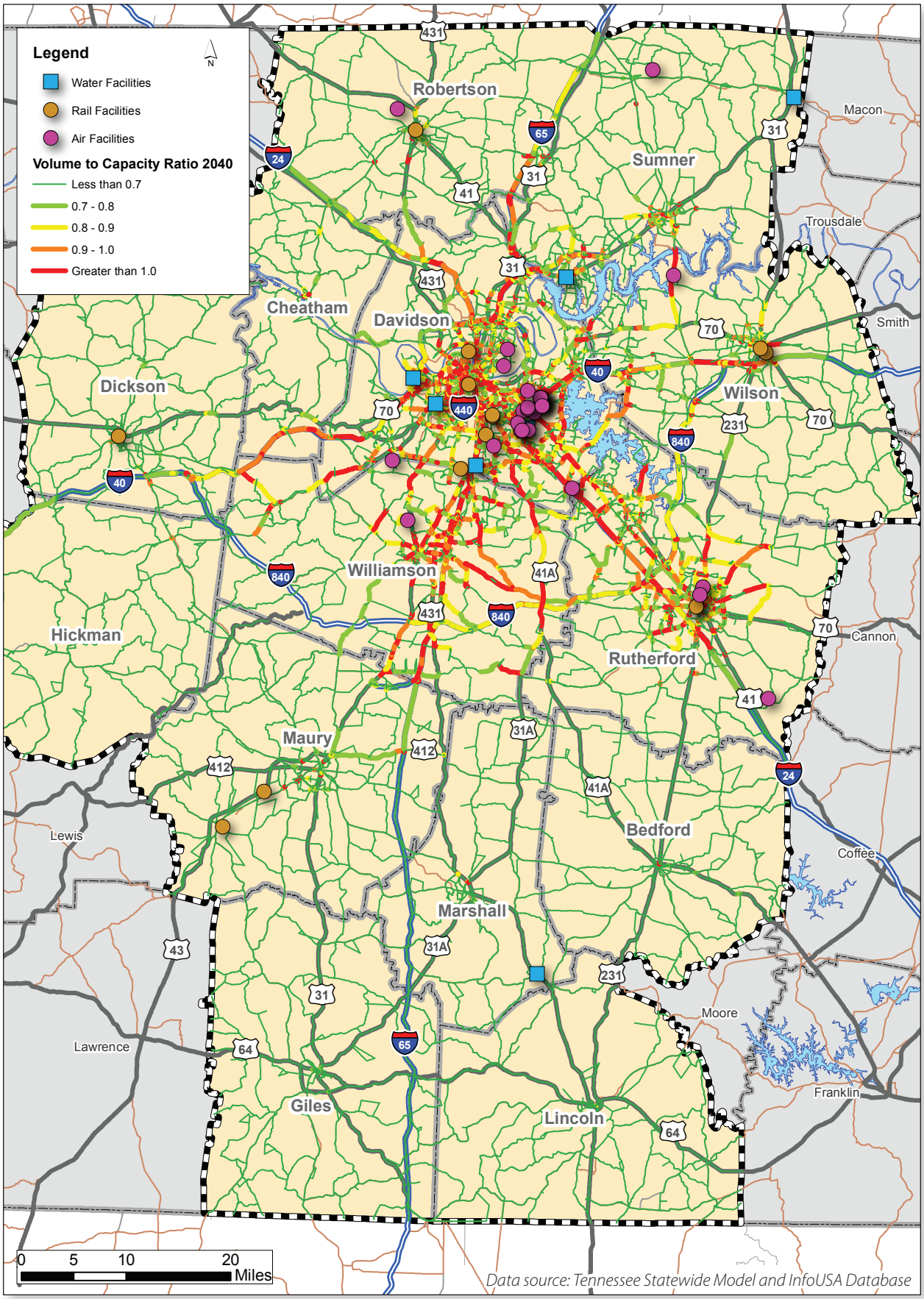
Source: Transearch Database

Table 9-6. Through Freight Tonnage (in Thousands) and Value (in Millions) for Air, Water, and Rail for 2012 and 2040

	2012		2040		% Change	
	Tons	Value	Tons	Value	Tons	Value
Air	0.1	$16	0.4	$55	300%	244%
Water	926	$271	1,150	$322	24%	19%
Rail	240,205	$259,534	211,486	$184,495	-12%	-29%
Total	241,132	$259,820	212,636	$184,871	-12%	-29%

Source: Transearch Database

Figure 9-2. Air, Rail, and Water Facility Locations with V/C Ratio for 2040



9.4 Freight Diversion: From Truck to Rail/Water

The two main requirements for freight diversion are: (1) existing infrastructure for an alternate mode and (2) competitiveness of alternate modes. Different commodities may require different handling procedures and technology, and therefore, freight diversion has a greater potential where there is an existing supply chain for the commodities to be diverted. The following two subsections focus on the potential for freight diversion of inbound and outbound freight. A lack of data available on logistic costs and mode utilization do not allow for a freight diversion model to be developed.

Freight Diversion Potential: Existence of Supply Chains

Table 9-7 shows major commodities based on total tonnage inbound to the study area moved by truck, rail, and water. From an infrastructure/logistics perspective, the potential exists for modal shift with all three modes. For example, gravel is transported from Kentucky to Davidson County by both truck (978,907 tons) and water (446,809 tons). Table 9-7 also indicates that the potential exists for modal shift for two major commodities, gravel and non-metallic minerals. In most cases, either commodity is primarily moved by truck with little volume travelling by rail or by water, highlighting the potential for freight diversion. Other commodities are not considered fit for modal shift because existing supply chains are either heavily committed to a single mode or transport very little tonnage.

Table 9-8 shows waste and scrap as a major outbound commodity moved by truck, rail, and water with a potential for modal shift. In most cases, waste and scrap is primarily moved by rail or by water with little volume travelling by truck. Assuming rail and water facilities are not at capacity, a potential for freight diversion may exist. For example, waste and scrap is transported from Davidson County to Alabama by rail (31,884 tons), truck (86,634 tons), and water (102,646 tons). Other commodities are not considered fit for modal shift since the existing supply chains are either heavily committed to a single mode or transport very little tonnage

Table 9-7. Inbound Freight Diversion Potential

Commodity	Destination County	Origin State	Mode	Tons	Value
 GRAVEL	Davidson	KY	Truck	978,907	$7,954,900
			Water	446,809	$3,418,087
		MO	Truck	304,490	$2,656,107
			Water	66,227	$506,633
		OH	Rail	20,000	$1,741,592
			Truck	173,565	$1,360,607
	Sumner	KY	Truck	192,392	$1,534,914
			Water	27,027	$206,755
 NON-METALLIC MINERAL	Davidson	AL	Rail	3,080	$1,652,672
			Truck	45,726	$21,092,477
		IL	Truck	10,568	$3,453,007
			Water	101,195	$14,275,856
		IN	Rail	17,440	$1,495,423
			Truck	46,878	$12,726,710
		KY	Rail	3,760	$763,220
			Truck	48,498	$9,639,233
			Water	3,294	$454,191
		MO	Rail	7,840	$1,719,743
			Truck	7,134	$2,493,319
			Water	317,929	$37,074,134

Data source: Transearch Database

Table 9-8. Outbound Freight Diversion Potential

Commodity	Origin County	Destination State	Mode	Tons	Value
 WASTE AND SCRAP	Davidson	AL	Rail	31,884	$8,040,356
			Truck	86,634	$22,904,555
			Water	102,646	$28,430,172
		GA	Rail	23,000	$4,535,408
			Truck	52,822	$13,925,077
		IA	Rail	3,432	$1,016,589
			Truck	935	$247,955
		IL	Rail	5,236	$1,550,950
			Truck	26,541	$7,597,963
			Water	112	$30,903
		IN	Rail	3,600	$1,066,352
			Truck	47,927	$12,839,206
			Water	7	$2,014
		KY	Truck	124,340	$31,495,958
			Water	76,423	$21,167,063
		LA	Truck	5,122	$1,434,757
			Water	28,369	$7,857,373
		OH	Truck	29,142	$6,956,751
			Water	1,670	$462,594
		OK	Rail	2,320	$556,077
			Truck	1,393	$380,503
		PA	Air	0	$13,314
			Truck	6,509	$1,616,371
			Water	1,130	$312,959
		SC	Rail	840	$201,338
			Truck	13,446	$3,815,767
		TX	Truck	5,138	$1,725,920
			Water	4,647	$1,287,083
	Dickson	AL	Rail	16,960	$5,023,702
			Truck	4,481	$1,163,499
		MS	Rail	4,480	$1,327,016
			Truck	1,652	$446,169
	Marshall	GA	Rail	1,440	$345,151
			Truck	3,188	$841,590
	Rutherford	AL	Rail	6,456	$1,912,324
			Truck	35,123	$9,473,104
		MS	Rail	30,376	$8,997,640
			Truck	2,849	$798,353
	Sumner	IL	Rail	4,040	$968,341
			Truck	7,876	$2,459,062

Data source: Transearch Database

Freight Diversion Potential: Freight Volume Projections

Tables 9-9 and 9-10 show the modal split of inbound/outbound commodities by modes for 2040. Rail has the greatest future potential for attracting outbound diverted freight as it is the primary transport mode for basic chemicals, paper products, and motor vehicles. The remainder of outbound commodities are overwhelmingly (greater than 90 percent) transported by trucks. For inbound freight, paper products, basic chemicals, and base metal have the greatest future potential for diversion since they are heavily transported by truck and by rail. The potential for diversion assumes that rail will have the capacity available to accommodate the additional demand.

Table 9-9. Top Inbound Commodities Transported by Multiple Modes for the Year 2040

Commodity	Modal Split			
	Truck	Air	Water	Rail
Coal	<1%	0%	99%	0%
Fertilizers	5%	0%	47%	48%
Pulp, Newsprint, Paper and Paperboard	21%	0%	0%	79%
Basic Chemicals	33%	0%	0%	66%
Base Metal	55%	0%	13%	31%
Transportation Equipment	79%	0%	4%	17%
Plastics and Rubber	80%	0%	0%	19%
Motorized and Other Vehicles	82%	0%	0%	18%
Milled Grain Products	87%	0%	0%	13%
Alcoholic Beverages	88%	0%	0%	12%
Other Chemical Products	89%	0%	0%	11%
Other Non-Metallic Minerals	90%	0%	9%	1%
Natural Sands	91%	0%	9%	1%
Animal Feed	91%	0%	0%	9%

Data source: Transearch Database

Table 9-10. Top Outbound Commodities Transported by Multiple Modes for the Year 2040

Commodity	Modal Split			
	Truck	Air	Water	Rail
Coal	<1%	0%	99%	0%
Fertilizers	5%	0%	47%	48%
Pulp, Newsprint, Paper and Paperboard	21%	0%	0%	79%
Basic Chemicals	33%	0%	0%	66%
Base Metal	55%	0%	13%	31%
Transportation Equipment	79%	0%	4%	17%
Plastics and Rubber	80%	0%	0%	19%
Motorized and Other Vehicles	82%	0%	0%	18%
Milled Grain Products	87%	0%	0%	13%
Alcoholic Beverages	88%	0%	0%	12%
Other Chemical Products	89%	0%	0%	11%
Other Non-Metallic Minerals	90%	0%	9%	1%
Natural Sands	91%	0%	9%	1%
Animal Feed	91%	0%	0%	9%

Data source: Transearch Database

9.5 Truck Parking

Figure 9-3 shows the locations in the study area for rest areas and trucks stops. There are only six public locations with truck parking in the study area: three on I-65 south of Nashville, one on I-65 at the border with Kentucky, and two on I-40 west of Nashville. Figure 9-3 highlights the lack of truck parking and rest areas along I-840. There are only private rest areas east of Nashville on I-40 and along I-24. With I-24 poised to see significant increases in truck volumes by the year 2040, the lack of public truck parking could create safety issues ranging from trucks parking illegally on ramps to increased accidents from drowsy driving.

9.6 Other Emerging Freight Issues

There are several emerging global and national freight issues that will impact freight movement in the I-65 corridor. While the potential impacts are largely uncertain at this time, policy options and scenarios related to each issue should be considered and evaluated.

Impact of Panama Canal Expansion

The addition of a new wider lane to the Panama Canal is predicted to make large changes to freight logistics. The new lane can allow Neo-Panamax ships to pass with a capacity of 14,000 20-foot equivalent units (TEU), almost three times the previous Panamax ships at 5,000 TEU's. With the more efficient capacity, the costs to ship cargo from Asia to US ports on the gulf and east coasts will be decreased, and could entice traffic to shift from west coast ports to east coasts ports. Despite a projected 10 percent shift in traffic from west coast to east coast ports, however, freight traffic on west coast ports is expected to increase due to the rising demand for containerized transport. Moreover, it will remain faster to ship to west coast ports and then utilize rail transport. For example, shipping from Shanghai to New York takes 19-22 days using west coast ports and rail, but the same shipment takes 25-26 days using the Panama Canal.

Boston Consulting Group estimates that the battleground region upon which US ports compete for customers will expand west to encompass Memphis, Chicago, and Columbus, representing 15 percent of the national GDP. In this region, customers will weigh the trade-offs of time and cost to determine which coast to import/export their cargo. Most of Tennessee falls within the battleground region, meaning the state will see cargo being brought from both east and west coast ports. Another important consideration is that many of the east coast ports are not prepared for the larger capacity ships and are currently undergoing improvements that are to be completed by 2020.

As supply chains settle into a new reality of liner shipping overcapacity, volatile rates, alliances, bankruptcies, new port infrastructure, e-commerce growth, and changing warehousing technologies and policies, improved data will be able to provide a more quantitative analysis of the Panama Canal expansion. It is interesting to note that recent data shows a reallocation of capacity from the Suez-US East Coast to routes through the Panama Canal while at the same time the Panama Canal authority is preparing to build a 5 million TEU container terminal, which most likely will result in additional reallocation of capacity to take advantage of transshipment capabilities.

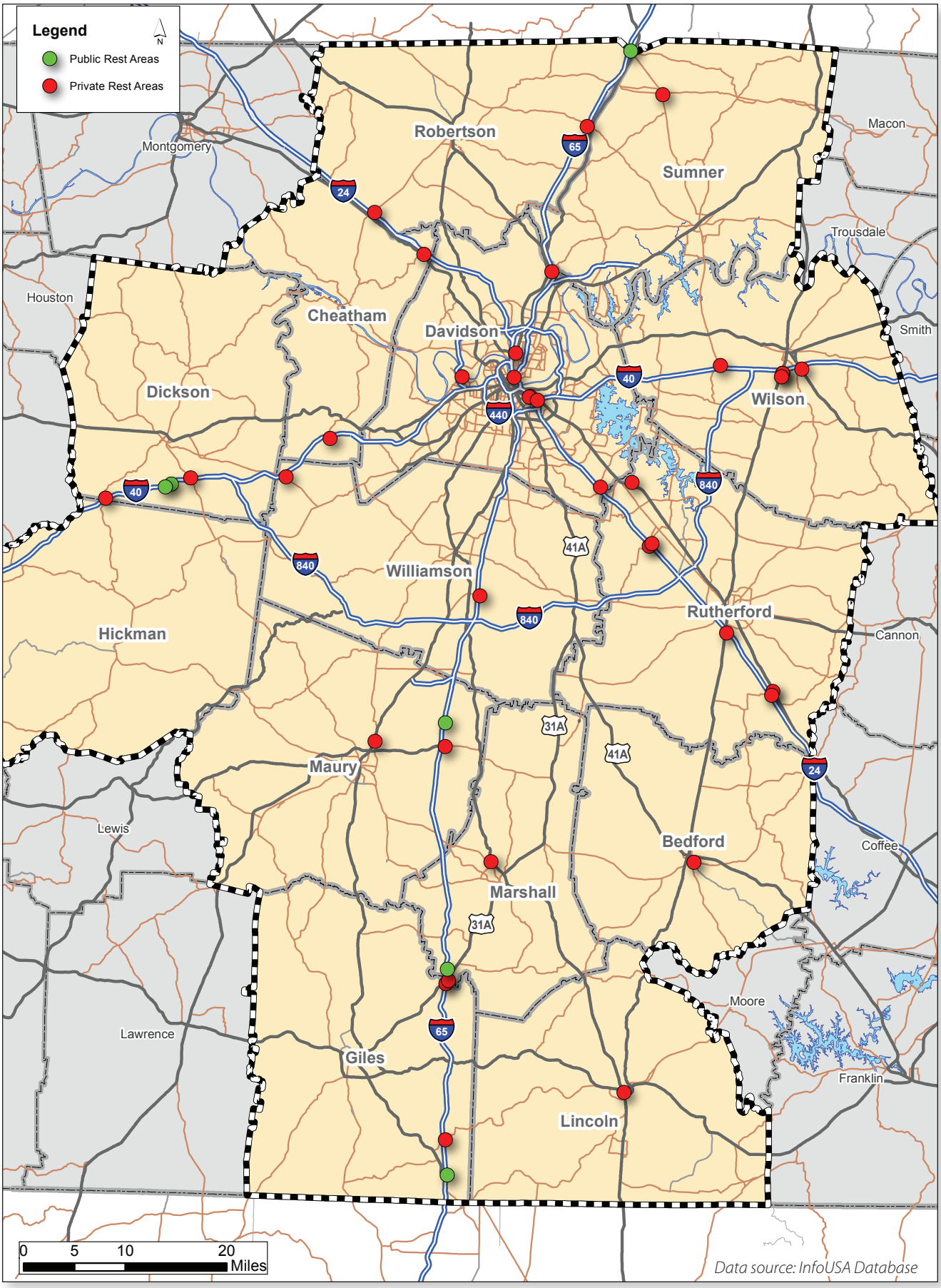
Radnor Yard – Potential for Freight Diversion

The Radnor Rail Yard is the second largest CSX railyard in the southeast residing on 517-acres in Nashville immediately adjacent to I-65. In terms of access, it is in a prime location next to the interstate, but the railyard is landlocked by nearby residential and industrial areas. Due to expansion constraints, the railyard operates as a bottleneck for the CSX railroad which has led to discussions of relocating the railyard. Another motivation for relocation is growing interest in regional passenger trains. To date, TDOT, the Nashville Area MPO, and the Nashville Chamber of Commerce have either identified the relocation of Radnor Yard as a future project and/or regional priority. Relocating Radnor Yard, estimated to cost $767 million in TDOT's multimodal freight plan, to the I-24 corridor near Smyrna would potentially reduce conflicts due to lower population densities and easy access to major interstates.

Last Mile Freight

Last mile freight connections have become increasingly complex for both urban pick-up and delivery and major intermodal terminals. In urban areas, multiple stakeholders, goods, and transport modes add up to a wide range of competing interests and objectives including transportation costs, traffic congestion, pollution, and safety, security, and neighborhood impacts. Arthur D. Little's Future of

Figure 9-3. Truck Rest Areas in the Study Area (Public and Private)



Urban Mobility Lab outlines the four key elements of a comprehensive urban logistics strategy:

- Regulatory and land planning – restricted access, time slots, exclusivity zones, and retail and logistic clusters;
- Infrastructure – urban distribution centers, dedicated loading spaces, and e-commerce pick-up points;
- Financial incentives – urban congestion charges and freight infrastructure subsidies and tax deductions; and
- Equipment and technology – green trucks, alternative freight delivery modes, and ITS.

9.7 Existing Deficiencies and Future Needs

The analysis of the available freight data highlights deficiencies and needs in the study area's freight network.

A. **Freight Movement:** Truck is the major mode for freight movement in the study area and truck volumes are projected to increase by more than 50 percent on most of the study area roadway network between 2010 and 2040. Between 2010 and 2040, truck volumes on I-65 north of Nashville will significantly increase (68 percent), and more than double on I-40 east and west of Nashville (110 percent). Interstate 24 south of Nashville currently serves more than 10,000 trucks daily, but demand is projected to be 17,000 trucks by 2040. The overlap of I-65 and I-24 is projected to carry nearly 24,000 trucks in 2040.

B. **Inbound/Outbound Freight Demand:** Inbound and outbound freight to the study area is primarily transported by trucks with inbound tonnage more than doubling by 2040. Air freight shows a large percentage increase by 2040 for both inbound and outbound volumes. Outbound freight transported by rail is projected to grow by roughly 147 percent by 2040 which may result in rail capacity issues and freight diversion to truck and water.

C. **Major Origin-Destination Pairs:** Davidson County is the destination for over 40 percent of the total freight tonnage in the study area with I-65 accounting for nearly the combined total of I-24 and I-40 in terms of tonnage. Davidson and Rutherford counties are the origin of roughly 25 and 12 percent of the total freight tonnage, respectively, with a large portion of that exiting the study area by I-65. Davidson and Rutherford Counties produce and attract the most MUT and SUT trips. Davidson County is also the dominant origin and destination in the region for all modes with two notable exceptions. Sumner County has a higher inbound tonnage by water and a much lower inbound value by water. Rutherford County has a high outbound value by rail and lower outbound tonnage by rail.

D. **Through Traffic:** Through truck traffic entering and exiting on I-65 is projected to increase by 89 percent by 2040. Total truck traffic entering I-65, I-24, and I-40 and exiting I-65 is forecasted to increase by 82 percent, which will translate into higher truck volumes on I-65, I-440, and I-840. Significant increases are also projected for truck traffic that either enters or exits the study area through I-40 and uses I-65. In 2012, there were over 240 million tons of through freight utilizing the rail network in the study area which is far more than the other modes including trucks. Air freight is projected to increase substantially by both tonnage and value, while water freight will experience more modest increases. Through rail freight, in both tonnage and value, will decrease by 12 and 29 percent, respectively.

E. **Intermodal Facilities:** The major air freight generator is the Nashville International Airport in an area with high V/C ratios indicating access issues for inbound and outbound freight by air. The major rail facility, Radnor Yard, is located just south of Nashville along I-65 in an area also with high V/C ratios indicating access issues. The major water facility, the Nashville Port, is located along the Cumberland River in Nashville where the V/C ratios are the highest.

F. **Freight Diversion:** Freight diversion has a greater potential where there is an existing supply chain for the commodities to be diverted. From an infrastructure/logistics perspective, the potential exists for modal shifts across truck, rail, and water. Gravel and non-metallic minerals are the primary candidates for modal shift among inbound commodities, while waste and scrap is a major outbound commodity with a potential for modal shift. In 2040, rail has the greatest potential for attracting outbound diverted freight serving as the primary transport mode for basic chemicals, paper products, and motor vehicles. For inbound freight, paper products, basic chemicals, and

base metal have the greatest future potential for diversion since they are heavily transported by truck and by rail. The potential for diversion assumes that rail will have the capacity available to accommodate the additional demand.

G. **Truck Parking:** There are only six public locations with truck parking in the study area: three on I-65 south of Nashville, one on I-65 at the border with Kentucky, and two on I-40 west of Nashville.

H. **Other Emerging Freight Issues:** The Panama Canal expansion, potential Radnor Yard relocation, and last mile freight are emerging global and national freight issues that will impact freight movement in the I-65 corridor. While the potential impacts are largely uncertain at this time, policy options and scenarios related to each issue should be considered and evaluated.

10. Traditionally Underserved Populations

Transportation facilities, services, and conditions impact people and communities differently. Traditionally underserved populations, particularly communities that are predominately low-income and/or minority, benefit when transportation systems are balanced across modes and offer more transportation choices. In the I-65 corridor, the distribution of traditionally underserved populations throughout the study area suggests that equity, the provision of transportation facilities and services to all residents regardless of race, ethnicity, or income level, is best examined in both urban and rural contexts.

Minority populations reside primarily in Nashville, with smaller concentrations in the various smaller town centers in the corridor. Low-income populations live throughout the analysis area, with concentrations common within urban and small town centers as well as the most rural portions of the corridor in Giles, Hickman, and Lincoln Counties. Using a high-level analysis of where traditionally underserved populations are located and findings from both the technical analysis and public outreach, several key issues were identified for minority and low-income populations in both urban and rural areas of the corridor.

Additional environmental justice (EJ) analysis, as it relates to Title VI of the 1964 Civil Rights Act, will be conducted during the "fatal flaws" assessment in the next phase of the study. Additionally, detailed EJ analysis, consistent with the National Environmental Policy Act (NEPA), will be conducted for all projects advanced by TDOT on a project-by-project basis.

10.1 Urban Equity

Three equity issues facing minority and low-income communities within urban areas of the I-65 corridor are access to employment and activity centers, transportation choices, and safety. These topics are discussed in greater detail below.

Access to Employment and Activity Centers

Existing employment and activity centers within the corridor are projected to grow and new centers are planned and under development. Importantly, the new and growing centers will reshape the region's development and travel patterns, continuing the shift from a traditional hub-and-spoke form long defined by downtown Nashville to a network of multiple centers. As employment centers emerge and expand beyond Davidson County, affordable transportation and high levels of accessibility will be increasingly vital for workers at low- and moderate-income levels. Reverse commuting, already identified as a need between Davidson and Williamson Counties, will continue to grow among counties within the study area. Accordingly, local land use policies that support job-housing connections and a seamless multimodal transportation system with strong transit, TDM, pedestrian, and bicycle facilities and services are critical to ensure people of all ages and abilities can travel safely and efficiently throughout the corridor.

Transportation Choice

Closely related to access is the issue of transportation choice. Transportation systems that focus on optimizing automobile travel generate high individual, household, and community costs, including safety, congestion, environmental, and health costs. Additionally, automobile ownership is expensive, costing as much as ten times more than riding transit, and consequently, many low-income households own a single car or no car at all. Because regional transit, TDM, walking, and bicycling facilities and services are limited in the I-65 corridor, traditionally underserved populations and communities face barriers to economic and physical well-being.

Providing high quality multimodal transportation choices, including transit that is fast, frequent, and dependable and walking and bicycling facilities that are safe, comfortable, and convenient, can help reduce barriers for traditionally underserved individuals and communities to realize important transportation cost savings.

Safety

While all types of people and communities walk and bicycle, traditionally underserved populations can be particularly vulnerable in urban neighborhoods near major arterials or interstates. Individuals and households lacking private automobiles depend on walking and bicycling to access key destinations or transit service. Bicycle and pedestrian safety hotspots in Davidson County include areas near Trinity Lane (Exit 87); Jefferson Street; Charlotte Avenue, Church Street, and Broadway Avenue (Exit 209); and 4th Avenue and Lafayette Street (Exit 210).

10.2 Rural Equity

The primary equity issues facing minority and low-income communities within rural areas of the corridor are access to employment centers and transportation choice.

Access to Employment Centers

Population is projected to grow between now and 2040 in all counties within the study analysis area. However, many areas will experience employment decline, particularly the most rural portions of Giles, Lincoln, and Marshall Counties. The combination of modest population growth and employment decline in rural communities will result in some residents needing to find employment in other parts of the corridor, most likely in town centers or larger urban activity centers closer to Nashville. These commuters will need quality transportation connections to county seats and town centers, as well as facilities and services for longer distance commuting.

Transportation Choice

Transportation choices in rural areas within the corridor are limited. On-demand public transportation is offered by both the Mid-Cumberland Human Resource Agency and the South Central Tennessee Development District, though these services are often not convenient for unscheduled transportation needs. Additional transportation choices that serve commuting needs of rural residents should be examined, including express bus transit, expanded on-demand service, and ridesharing.

11. Public and Stakeholder Outreach

11.1 Public Workshops

As part of the existing and futures deficiencies phase of the I-65 Multimodal Corridor Study, TDOT held three public workshops throughout the analysis area to present an overview of the project, discuss preliminary findings, and solicit feedback on corridor vision, priorities, and specific areas of concern. The three meetings held were:

- **October 18, 2016 –** Nashville Main Public Library – 11:30 AM – 1:00 PM
- **October 25, 2016 –** Portland High School – 5:30 PM – 7:00 PM
- **November 15, 2016 –** Williamson County Public Library - 5:30 PM – 7:00 PM

Approximately 120 individuals attended the public workshops. The sections below explain the various methods of providing feedback and summarize the public feedback that was received.

Dot Board – Corridor Priorities

In the Corridor Priorities activity, attendees were asked to vote on their top priorities using a dot board. Attendees were given three dots and could distribute them however they pleased, whether voting for three priorities or voting three times for a single priority. The priorities reflected seven overarching themes: Safety, Congestion, Access and Connectivity, Operations and Maintenance, Livability and Beautification, Fiscal Responsibility, and Economic Development. A total of 167 votes were received. Figure 11-1 summarizes the results of the activity.

Establishing a Corridor Vision Statement – "Three Words or Phrases"

Meeting attendees were also asked to list words or phrases to describe their vision for the I-65 corridor. Figure 11-2, a "Wordle" word cloud, highlights key words and phrases based on the number of times they were mentioned. The words and phrases will be used in the coming months to guide the development of the draft vision statement for the corridor and the study's recommendations. While there was some regional variation in the words or phrases identified by the attendees, the graphic below represents all the feedback received.

Mapping Exercise – Issues and Opportunities

Meeting attendees were provided with a series of maps depicting the entire corridor and asked to identify specific issues or opportunities along the corridor. The following bullet points summarize, by county or counties, highlights of the input received:

- Robertson/Sumner Counties
  - Widen I-65 to Tennessee/Kentucky state line
  - Need direct access to SR 386 from SB I-65 and from SR 386 to NB I-65
  - Need additional lanes at SR 386 and Conference Drive
  - Improve Exit 98 interchange (US 41)
  - Restrict trucks to right lane
  - Complete SR 109 improvements
  - Incorporate transit into I-65 and SR 386 corridors
- Davidson County
  - Improve Trinity Lane interchange area
  - Need solutions to peak hour congestion in downtown Nashville loop
  - Enlarge Fern Avenue overpass
  - Provide better interchange access to I-65 from 4th Avenue South
  - Expand and widen exits at Armory Drive interchange (Exit 78)
  - Explore strategies that can reduce traffic volume on I-65
- Williamson County
  - Improve I-65/SR 254 (Old Hickory Blvd.) interchange
  - Enforce HOV lane restrictions
  - Integrate high-capacity transit service between Nashville and Franklin
  - Improve interchanges in the Franklin/Cool Springs area
  - Address safety issues at the I-65/I-840 interchange area
  - Coordinate growth and transportation improvements on key arterials
- Maury County

Figure 11-1. Summary of Priority Preferences

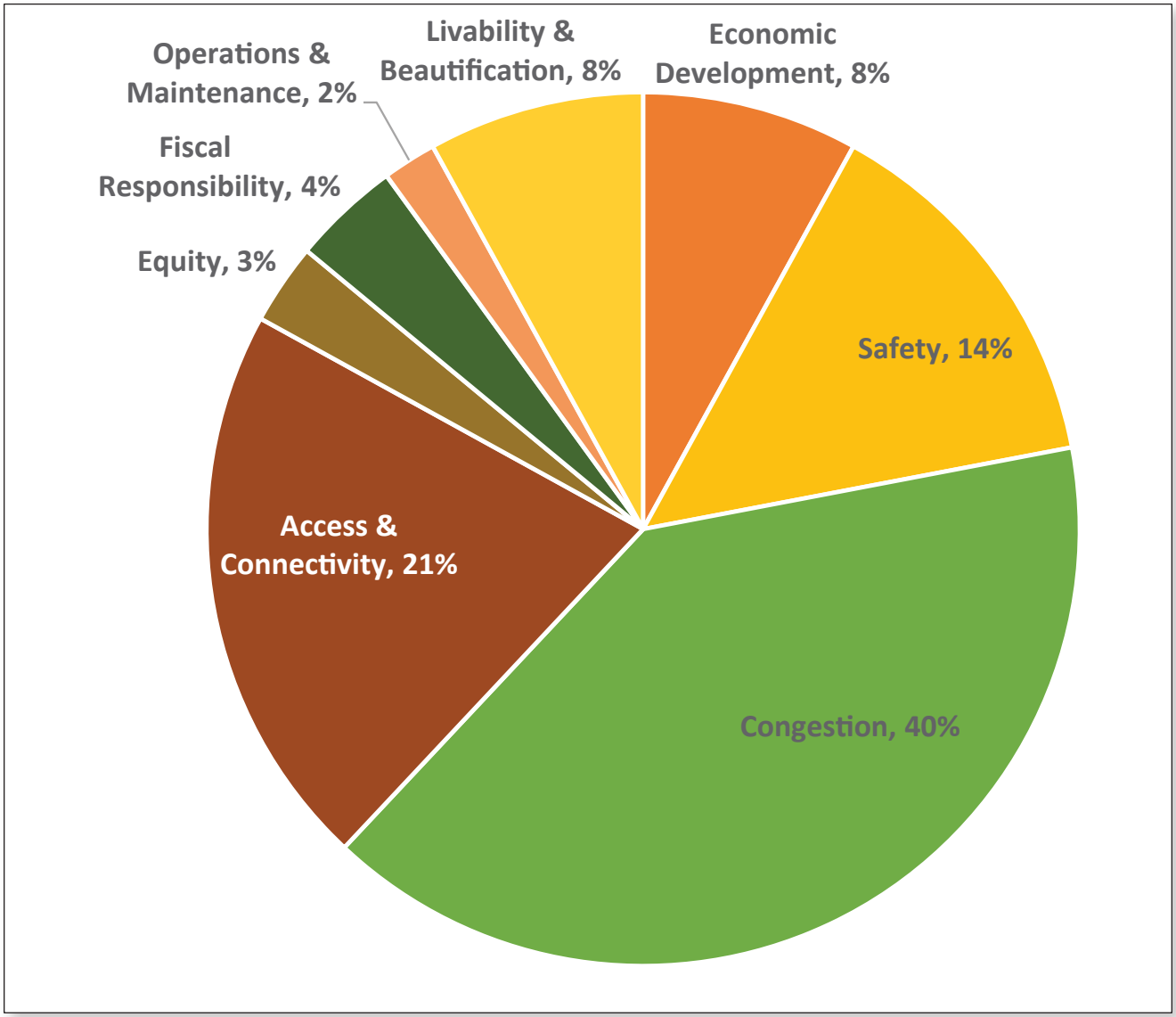
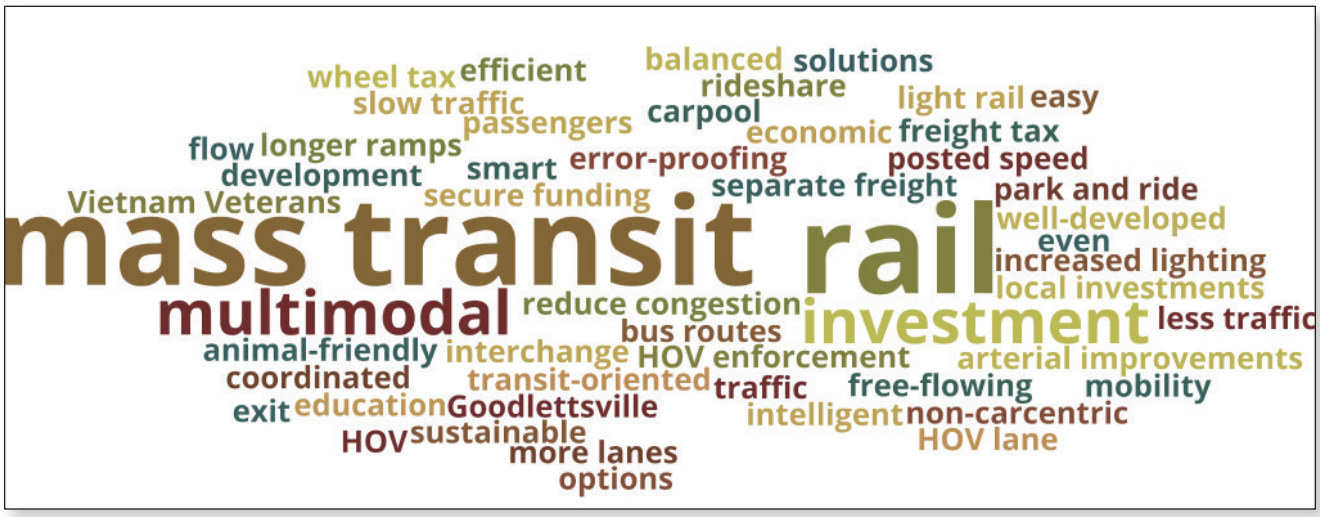


Figure 11-2. Word Cloud – Corridor Vision



  - Connect Saturn Parkway to Lewisburg
  - Review safety concerns on Saturn Parkway interchange (Exit 53)
  - Address spillover congestion on major arterials
- Giles/Lincoln/Marshall Counties
  - Add truck climbing lanes in hilly areas
  - Provide transportation options for residents in small towns and rural areas

11.2 Online Public Comment

Online Survey

Two outlets for public comment were offered on the project website. A survey hosted on a Survey Monkey platform was available for public input from February 2016 to April 2017. More than two thousand responses were received. Following is a summary of the survey feedback.

Respondents were first asked to rate, on a scale of one to five, the importance of three transportation needs along I-65: less congestion, safer travel, and better/more efficient interchanges. Table 11-1 shows a breakdown of the responses. Congestion was clearly rated as the most important concern. Safer travel and interchange concerns were both rated highly by at least half of the respondents. These findings are consistent with the feedback received at the public workshops.

The next series of questions were open-ended in nature. The following list shows the questions and includes a high-level summary of the themes expressed by respondents:

- **Question:** What specific problems/concerns do you have about the corridor?
  - Bottlenecks, particularly during peak hour
  - Interchange safety and congestion
  - Need for additional public transportation options
  - HOV lanes: increased enforcement or discontinuation
  - Increased law enforcement along corridor/ unsafe driver behavior
- **Question:** What ideas or suggestions do you have that could improve/correct your I-65 Corridor problems/concerns?
  - Additional lanes/widening
  - Improved public transit
  - Better legislation/enforcement
  - Improved operations and maintenance (e.g., additional HELP trucks, better lighting, improved signage, and pothole repair)
- **Question:** What are other transportation improvements along the stretch of I-65 in your area would you like to see TDOT research or consider?
  - Improved public transit
  - Additional lanes/widening
  - Interchange improvements and new interchanges
  - Improved operations and maintenance (e.g., additional HELP trucks, better lighting, improved signage, and pothole repair)

Table 11-1. Transportation Needs Responses



	Least Important		Neither Most nor Least Important		Most Important	
	Number	Percent	Number	Percent	Number	Percent
Less congestion	6	0.5%	276	21.9%	977	77.6%
Safer travel	28	2.2%	490	38.9%	741	58.9%
Better/more efficient interchanges	24	1.9%	603	47.9%	632	50.2%

Additional questions determined the average respondent's experience with the I-65 corridor, with over 50 percent of respondents using I-65 as a regular commuter route and an additional 30 percent using the route for personal or leisure travel. Additionally, 80 percent of respondents indicated they travel I-65 frequently.

Finally, respondents were asked to choose other transportation options they would consider using along I-65. Figure 11-3 represents the breakdown by mode for all responses received. Passenger and high-speed rail were the most preferred options, accounting for over 70 percent of responses. More conventional transportation options within the region, such as bus routes and carpools, accounted for a much smaller percentage of the responses.

Interactive Mapping Tool

An interactive mapping tool, similar to the one offered to attendees at the public workshops, was also available on the project website. The tool, hosted on a Wikimaps platform, asked participants to identify specific areas of concern along the corridor. While participants often included detailed comments associated with the areas they identified, the responses were analyzed at a higher level by both general topic area and geographic location. Figure 11-4 summarizes the categorical breakdown of the more than one hundred comments received to date. Figure 11-5 includes a heat map showing the geographic distribution of the comments.

Figure 11-3. Alternative Mode Preferences

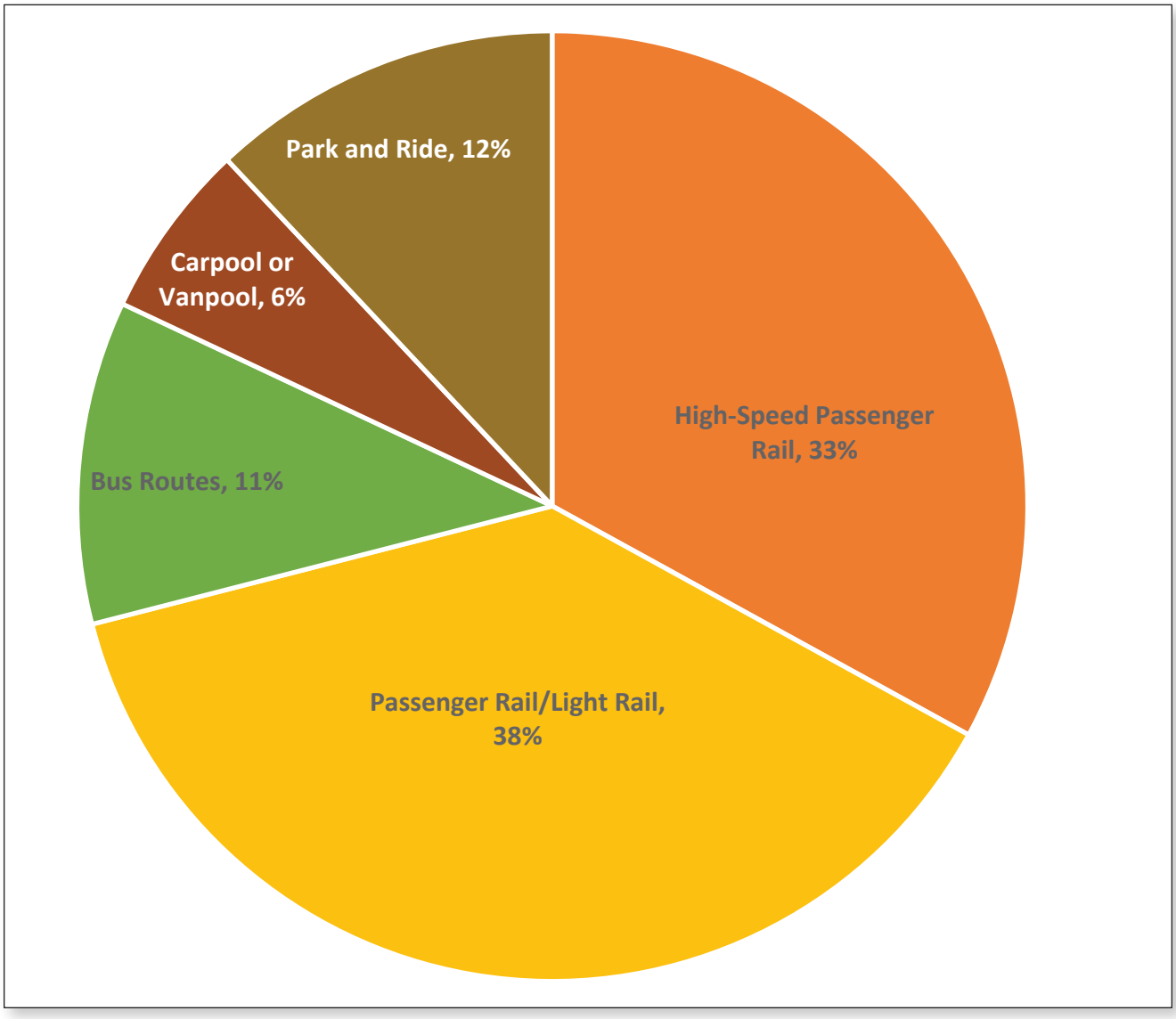
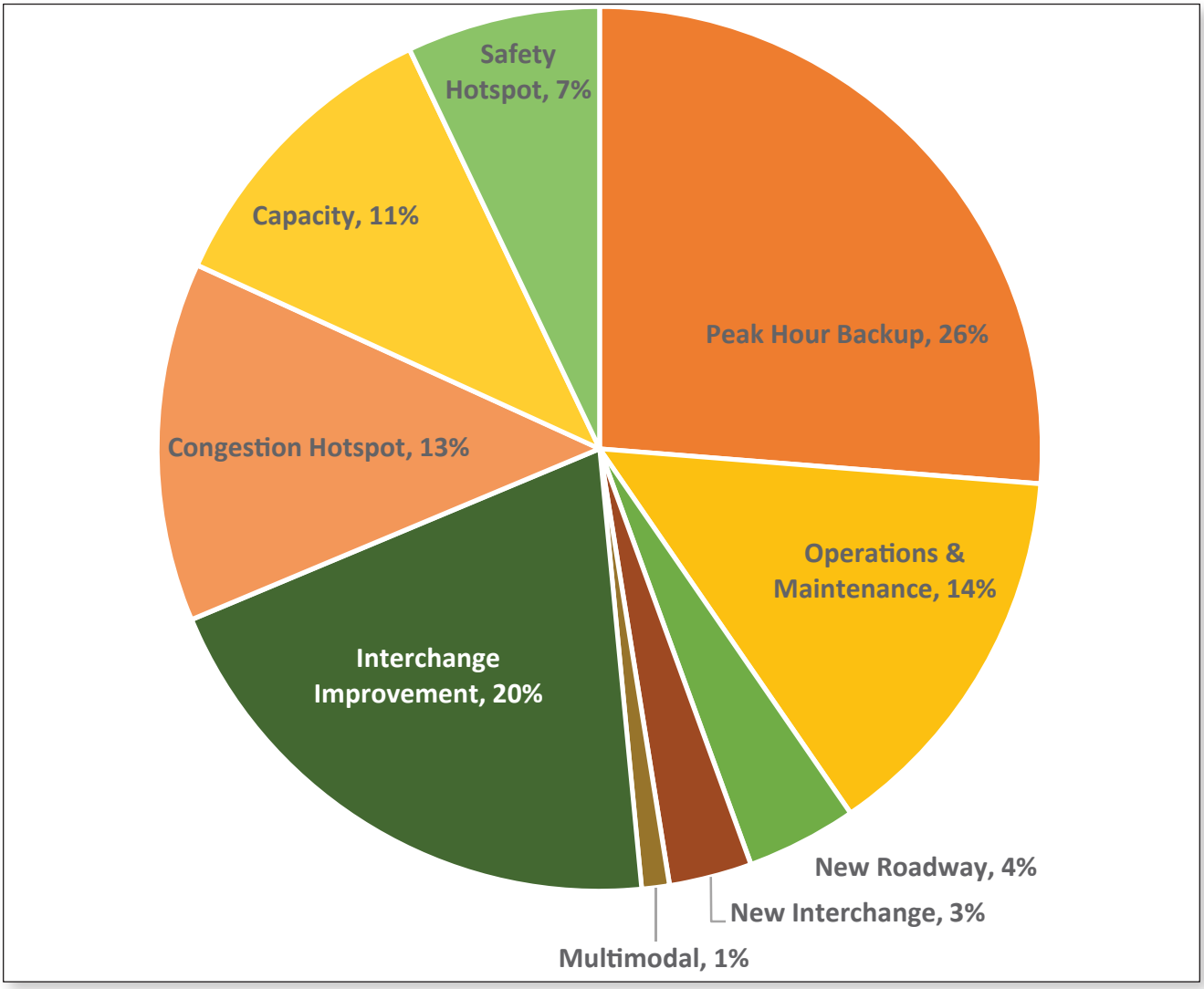


Figure 11-4. Wikimaps Comments – Breakdown by Category



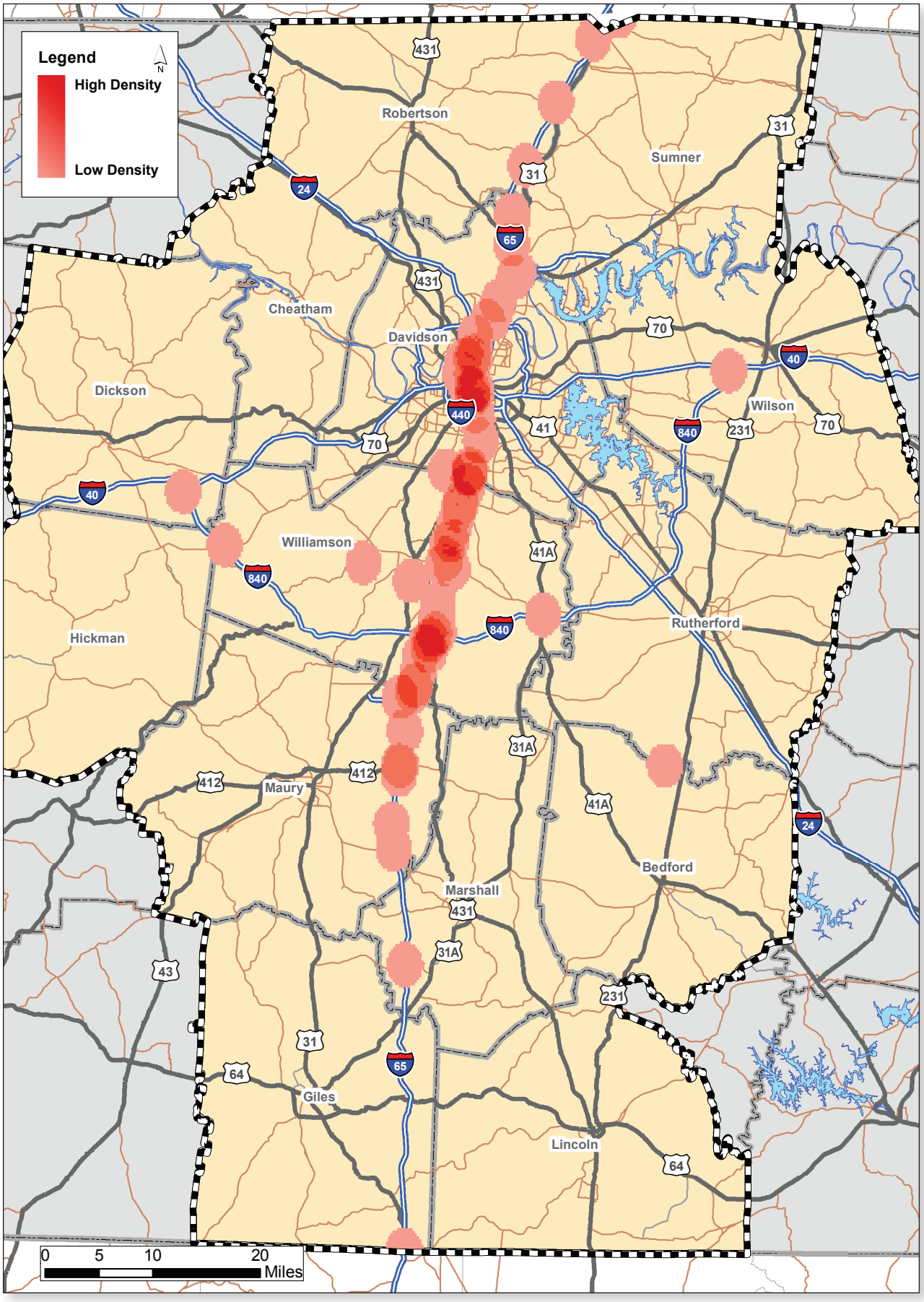
Comments on the interactive map focused primarily on peak hour congestion hotspots and operational problems at key interchanges. Given that people generally focus on problem areas they encounter daily, the feedback paints a clear picture of specific problem areas from a user's point of view. The areas that were the subject of the most comments, from north to south along the corridor, were:

- I-65/I-24 interchange north of downtown Nashville;
- I-65/I-40 interchange south of downtown Nashville;
- Old Hickory Boulevard interchange area in Brentwood;
- Cool Springs Boulevard interchange area in Franklin;
- I-65/I-840 interchange area; and
- I-65/SR 396 (Saturn Parkway) interchange area in Spring Hill.

11.3 Additional Public and Stakeholder Outreach

In addition to the outreach activities listed here, the TDOT Office of Community Transportation (OCT) coordinated small group presentations to key stakeholder, civic, and citizen groups on an as requested basis.

Figure 11-5. Geographic Distribution of Wikimaps Comments





SECTION C
Goals, Objectives, and Performance Measures

SECTION C : GOALS, OBJECTIVES, AND PERFORMANCE MEASURES

1. Introduction

Section B: Assessment of Existing Deficiencies and Future Needs discussed the current state of the corridor across a full spectrum of multimodal considerations. The analysis also identified likely deficiencies and needs in the corridor, given current growth trends, if current policies and strategies are left alone. The next phase of the study involves examining alternative policies, strategies, and investments that will improve conditions within the corridor going forward.

In order to evaluate whether alternative recommendations result in "improvement," a linked set of goals, objectives, and performance measures are needed to both define the region's priorities and aspirations for the corridor as well as measure whether or not proposed alternatives better pursue those priorities relative to the base case. To this end, this section lays out the goals, objectives, and performance measures that will ultimately guide the development and prioritization of feasible multimodal solutions for the corridor.

2. Study Goals and Objectives

In 2015, the Tennessee Department of Transportation (TDOT) completed the 25-Year Long-Range Transportation Policy Plan, which provides a foundation for prioritizing transportation investments across the state and helps accomplish TDOT's vision to serve the public by providing the best multimodal transportation system in the nation. A major component of the 25-Year Policy Plan included the advancement of a 10-Year Strategic Investments Plan (SIP). The SIP established three distinct strategic emphasis areas and associated program areas:

- Efficiency
  - Congestion Relief
  - Mobility Choices
- Effectiveness
  - Maintenance and Preservation
  - System Safety
- Economic Competitiveness
  - Strategic Corridors
  - Freight Movement

Building on the emphasis areas, technical analysis, and public input, goals and objectives were developed for the I-65 corridor. Goals describe desired results, while objectives identify steps that can be taken to achieve the goals. Table 2-1 summarizes the goals and objectives for the I-65 corridor.

Table 2-1. I-65 Corridor Goals and Objectives

No.	Goals	Objectives
1	Provide efficient and reliable travel within and through the I-65 corridor.	• Improve travel times among destinations in the region, with an emphasis on reducing peak period travel times. • Provide transportation options for people and freight. • Optimize freight movement in and through the region.
2	Improve safety conditions in the corridor, both on I-65 and on its parallel and connecting routes, for all transportation users.	• Reduce crash rates along the corridor, with a particular focus on crash "hot spots" for motorists and non-motorists. • Implement or upgrade technologies that promote safety and effective incident management.
3	Coordinate transportation investments with land use decision-making.	• Improve street networks and access management in interchange areas. • Encourage transit-oriented development along proposed high-capacity transit routes.
4	Invest in transportation improvements equitably throughout the corridor.	• Expand transportation options for traditionally underserved populations within the corridor.
5	Protect the natural environment, and historic and cultural resources within the corridor.	• Identify transportation improvements that are not likely to result in major impacts to environmental, social, and cultural resources. • Pursue investments and strategies that minimize greenhouse gas emissions.
6	Maintain and enhance partnerships with both regional and local partners.	

3. Performance Measures

Complementing the study's goals and objectives are a series of performance measures that will be used to evaluate the performance of alternative transportation investment strategies in the I-65 corridor. These performance measures provide a set of baseline statistics from which the proposed improvements can be compared and evaluated in a subsequent phase of the study. Table 3-1 shows the recommended performance measures, a description of each, and the goals/objectives which each will support.

Table 3-1. Proposed Performance Measure Methodology

Goal	Performance Measures	Description	Unit of Measurement	Tool or Methodology	Related Goals
 Moving People	Auto and Transit Travel Times	• Comparison of travel times for driving (auto) and riding transit for key origin-destination pairs	Minutes	• Congested highway and transit skims from the Nashville MPO travel demand model	1
	Person Throughput	• Total passenger capacity of the corridor, including private vehicles and transit for both peak and off-peak periods	Persons per Hour	• Measure potential using HCM and assumptions about transit service	1
	Auto Vehicle Miles Traveled (VMT)	• Daily VMT corridor-wide	Miles	• Derived from travel demand model	1
	Auto Vehicle Hours of Travel (VHT)	• Daily VHT corridor-wide	Hours	• Derived from travel demand model	1
	Auto Vehicle Hours of Delay (VHD)	• Daily VHD corridor-wide	Hours	• Derived from travel demand model	1
 Moving Freight	Truck Travel Times	• Peak and off-peak travel times for key freight origins and destinations	Minutes	• Congested and uncongested highway and transit skims from the Nashville MPO or Statewide travel demand model	1
	Truck Throughput	• Trucks per hour during peak and off-peak periods	Trucks per Hour	• Modeled volumes using the Nashville MPO or Statewide travel demand model	1
	Access to Intermodal Facilities	• Average travel time to intermodal facilities from key freight generators during peak and off-peak periods	Minutes	• Congested and uncongested highway and transit skims from the Nashville MPO or Statewide travel demand model	1
	Truck Vehicle Miles Traveled (VMT)	• Daily Truck VMT corridor-wide	Miles	• Derived from travel demand model	1
	Truck Vehicle Hours of Travel (VHT)	• Daily Truck VHT corridor-wide	Hours	• Derived from travel demand model	1
	Truck Vehicle Hours of Delay (VHD)	• Daily Truck VHD corridor-wide	Hours	• Derived from travel demand model	1

Goal	Performance Measures	Description	Unit of Measurement	Tool or Methodology	Related Goals
Safety	Presence of Countermeasures at Safety Hotspots	• Qualitative measure of actions to address safety issues	High, Medium, Low	---	2
Land Use Coordination	Presence of Transit-Oriented Development at Stations	• Qualitative and quantitative measures of the amount of development around stations that supports transit	• Average density and FAR within 1/4 mile radius • Low, Medium and High • Presence or absence of transit-supportive land use plans	• GIS buffer analysis using CommunityViz model output	3
	Street Network Density at Interchanges	• Measure of walk potential	Intersections per square mile within 1/4 mile of stations	• GIS analysis using street network layer	3
Equity and Accessibility	People Within a 10-Minute Walk, Bike and Transit Ride To a Station	• Quantitative measure of non-auto accessibility	Total People	• GIS buffer analysis using bike facility, transit and sidewalk layers	4
Air Quality/ Emissions	Carbon Intensity	• Measures the amount of carbon dioxide emitted from transportation per person	Tons per Day	• VMT divided by average fuel economy (miles per gallon) times carbon content of fuel (grams per gallon)	5

4. Next Steps

Given existing and future deficiencies, the goals, objectives, and performance measures will serve as the framework for evaluating proposed improvements in the I-65 corridor. Importantly, the identified deficiencies span all modes and services, and the performance measures underscore the need for multimodal solutions.



SECTION D

Development of Feasible Multimodal Solutions

SECTION D: DEVELOPMENT OF FEASIBLE MULTIMODAL SOLUTIONS

1. Introduction

As part of the analysis of existing and projected conditions in the Interstate 65 (I-65) corridor, a Trend scenario was developed. This scenario serves as a baseline against which project recommendations can be evaluated. The trend scenario consists of two key data inputs: 1) population and employment growth projections provided by TDOT and the Nashville Area Metropolitan Planning Organization (MPO); and 2) transportation projects currently programmed by TDOT and the Nashville Area MPO. These are projects currently under development with funding identified and programmed.

Based on the trend scenario, the prior task analyzed the existing deficiencies and future needs in the I-65 corridor through Tennessee. The Trend scenario, which assumed current practices, plans, and policies remain unchanged, was analyzed across the following transportation issues, modes, and services:

- Land use and economic development
- Highway capacity and travel demand
- Safety
- Operations and maintenance/Intelligent transportation systems (ITS)
- Freight
- Transit
- Transportation Demand Management (TDM)
- Walking and bicycling

To address the identified deficiencies and needs, a series of multimodal solutions have been developed, analyzed, and evaluated. This section reviews the proposed multimodal solutions, and, importantly, highlights both their potential impact on corridor-wide performance measures and public input on the proposed solutions. Before describing the proposed multimodal solutions, the following summarizes the primary deficiencies and needs in the I-65 corridor.

2. Overview of Existing Deficiencies and Future Needs

Growth in middle Tennessee continues to place pressure and new demands on the transportation system throughout the I-65 corridor. While the highway system has historically served as the primary transportation option in the corridor, increasingly other transportation modes and systems are assuming more importance as major employment, commercial, and residential centers multiply and expand. The deficiencies and needs, or in the case of land use and development, opportunities and challenges, have been grouped into four general categories and are summarized on the following page. The analysis underscores the wide range of transportation deficiencies and needs, particularly in the counties experiencing the largest absolute and relative rates of growth.

- Growth and Development:
  - As shown in Table 2-1, the central sub-area, consisting of Davidson, Rutherford, Williamson, and Wilson Counties, accounts for 68 percent and 78 percent of projected population and employment growth, respectively, in the corridor through 2040.
  - More than 60 percent of workers in surrounding counties commute to Davidson County every day and more than 30 percent of Davidson County workers commute daily to Williamson County (Figure 2-1).
- Highways and Freight:
  - By 2040, Levels of Service D, E, and F are forecast on most of I-65 between Kentucky and Spring Hill (Figures 2-2 and 2-3).
  - Parallel and intersecting arterials are projected to approach or exceed capacity, including:
    - ✓ US 431/Hillsboro Pike/Lewisburg Pike
    - ✓ US 31/Franklin Pike/Columbia Pike
    - ✓ US41A/Nolensville Pike
    - ✓ SR 254/Old Hickory Boulevard
    - ✓ SR 96/Murfreesboro Road
    - ✓ SR 386/Vietnam Veterans Boulevard
  - By 2040, travel times are projected to double on much of the corridor between Nashville and Spring Hill.
  - Truck volumes are projected to increase by more than 50 percent on most of the roadway network by 2040.
  - Between 2013 and 2015, crashes increased 23 percent along I-65.
- Transit, Bike/Ped, and TDM:
  - Existing regional transit services are largely peak period and peak direction, limiting access to employment centers.
  - Park-and-Ride lots in the I-65 corridor are underutilized compared to systemwide rates, in part due to their location.
  - Development densities around existing and planned regional transit stops are low, limiting the ridership potential of both existing and planned services.
  - Bicycle and pedestrian facilities are needed for all ages and abilities to/from major activity centers.
  - Violation rates on high occupancy vehicle (HOV) lanes range from 63 percent to 96 percent. Figures 2-2 and 2-3 show the freeway segments where HOV facilities are experiencing high violation rates.
- System Operations and Maintenance:
  - Numerous ITS devices are in place on I-65 as part of the Tennessee Department of Transportation (TDOT) Smartway system.
  - Expansion of the Smartway system is proposed for two miles north of Exit 108/SR 76 and one mile south of Exit 59/I-840.
  - There are numerous additional ITS application opportunities in the I-65 corridor – for freeways, arterials, and transit.

Table 2-1. County Growth Trends

		2010		2020				2030				2040			
		Population	Employment	Population		Employment		Population		Employment		Population		Employment	
Sub-Area	County	Total	Total	Total	Increase from 2010	Total	Increase from 2010	Total	Increase from 2010	Total	Increase from 2010	Total	Increase from 2010	Total	Increase from 2010
North	Cheatham	39,107	15,899	45,334	16%	19,351	22%	51,565	32%	22,813	43%	57,804	48%	26,281	65%
	Dickson	49,664	22,469	55,396	12%	25,839	15%	61,140	23%	29,129	30%	66,896	35%	32,608	45%
	Robertson	66,283	28,067	83,977	27%	33,591	20%	99,100	50%	39,857	42%	112,851	70%	47,190	68%
	Sumner	160,645	55,354	193,105	20%	66,686	20%	218,698	36%	80,227	45%	241,698	50%	95,970	73%
	Sub-Area Total	315,699	121,789	377,812	20%	145,467	19%	430,503	36%	172,026	41%	479,249	52%	202,049	66%
Central	Davidson	626,682	542,773	680,496	9%	635,738	17%	734,958	17%	745,177	37%	780,507	25%	869,137	60%
	Rutherford	262,604	133,803	384,504	46%	170,093	27%	497,364	89%	215,490	61%	602,977	130%	271,416	103%
	Williamson	183,182	120,266	309,328	69%	162,311	35%	426,801	133%	223,802	86%	537,377	193%	307,836	156%
	Wilson	113,993	51,640	157,139	38%	65,133	26%	196,478	72%	81,960	59%	233,085	104%	102,437	98%
	Sub-Area Total	1,186,461	848,481	1,531,467	29%	1,033,275	22%	1,855,601	56%	1,266,429	49%	2,153,946	82%	1,550,826	83%
South	Bedford	45,058	25,809	51,610	15%	29,345	14%	58,175	29%	32,892	27%	64,748	44%	36,448	41%
	Giles	29,485	14,153	31,048	5%	15,658	11%	32,620	11%	17,178	21%	34,199	16%	18,704	32%
	Hickman	24,690	6,543	26,773	8%	7,187	10%	28,866	17%	7,839	20%	30,967	25%	8,495	30%
	Lincoln	33,361	14,892	35,226	6%	16,287	9%	37,100	11%	17,690	19%	38,984	17%	19,104	28%
	Marshall	30,617	12,004	34,072	11%	12,836	7%	37,530	23%	13,672	14%	40,995	34%	14,520	21%
	Maury	80,956	39,996	94,861	17%	47,043	18%	106,276	31%	55,746	39%	116,514	44%	65,609	64%
	Sub-Area Total	244,167	113,397	273,590	12%	128,356	13%	300,567	23%	145,017	28%	326,407	34%	162,880	44%
STUDY AREA TOTAL		1,746,327	1,083,668	2,182,869	25%	1,307,098	21%	2,586,671	48%	1,583,472	46%	2,959,602	69%	1,915,755	77%

Source: Statewide Travel Demand Model, Version 2

Figure 2-1. Existing Year (2016) County-to-County Work Flow

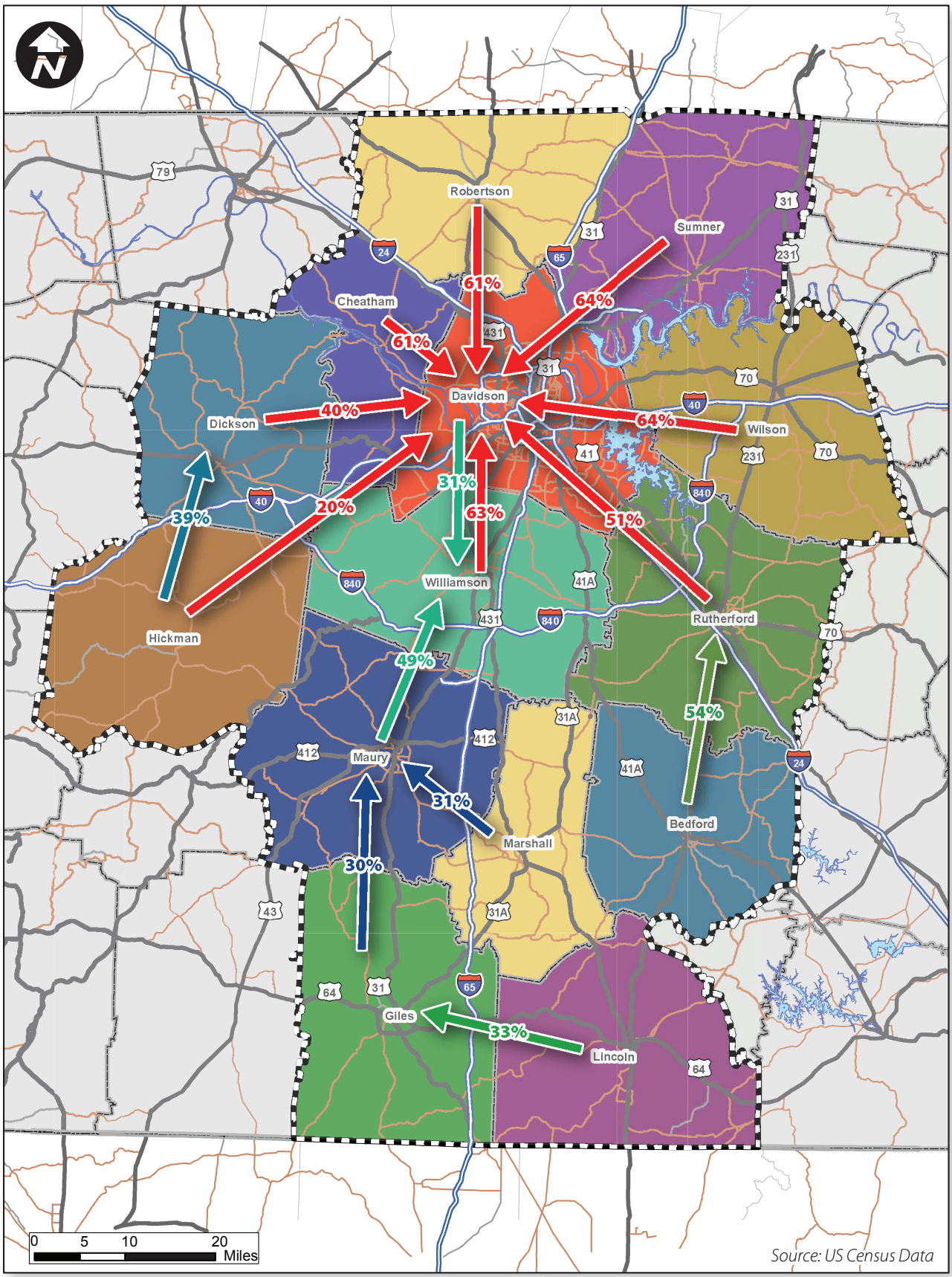


Figure 2-2. I-65 Deficiencies and Needs: North Sub-Area

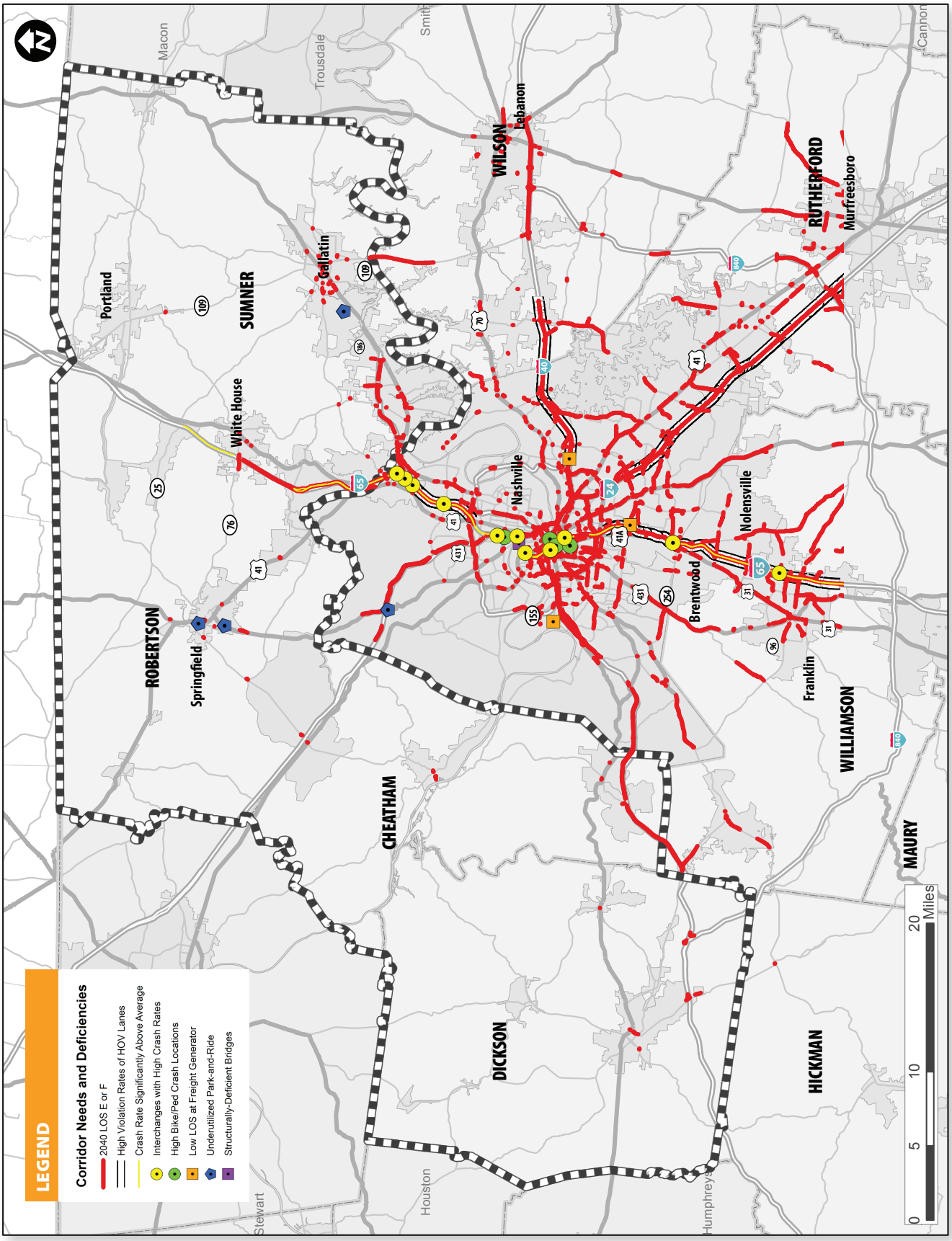


Figure 2-3. I-65 Deficiencies and Needs: Central Sub-Area

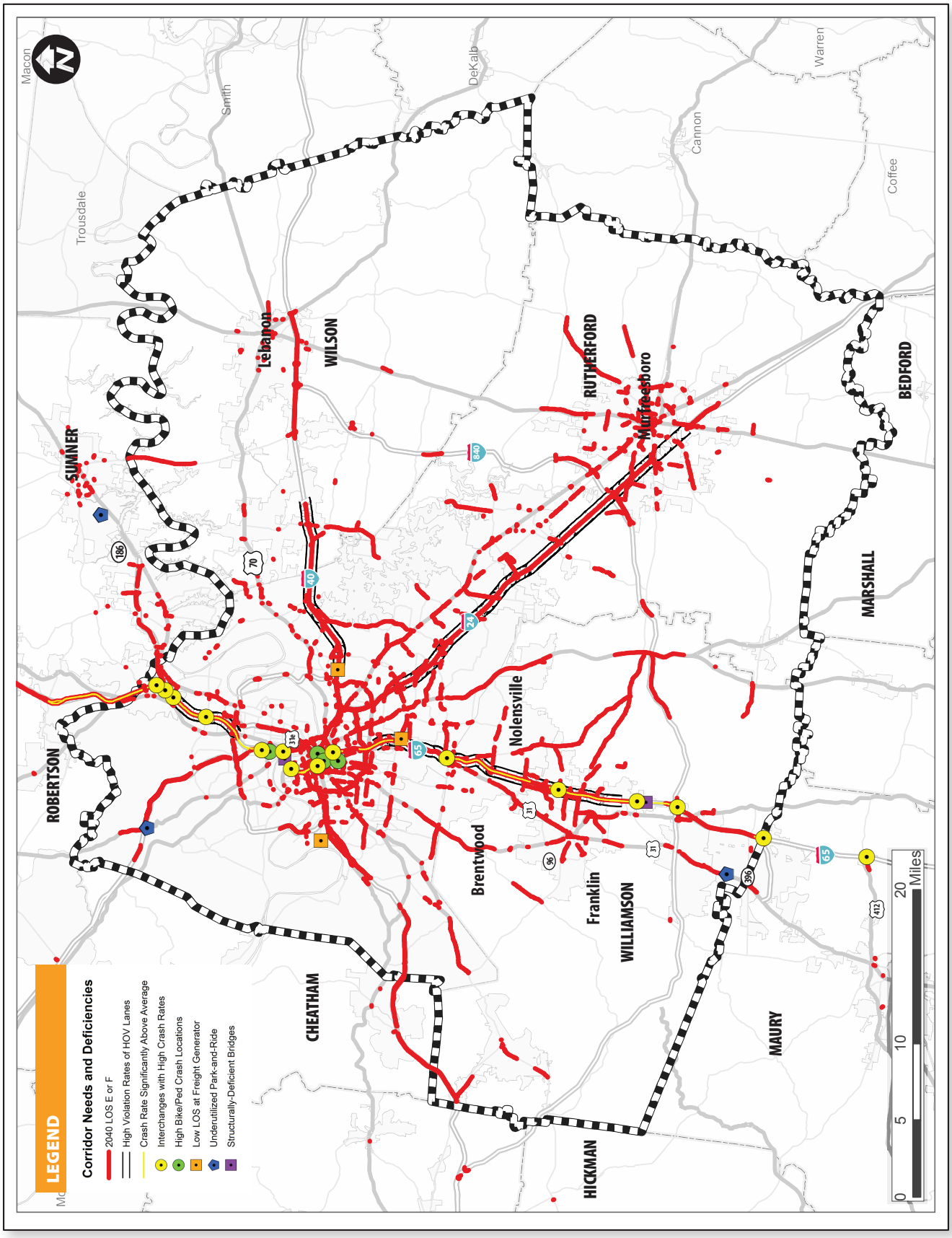
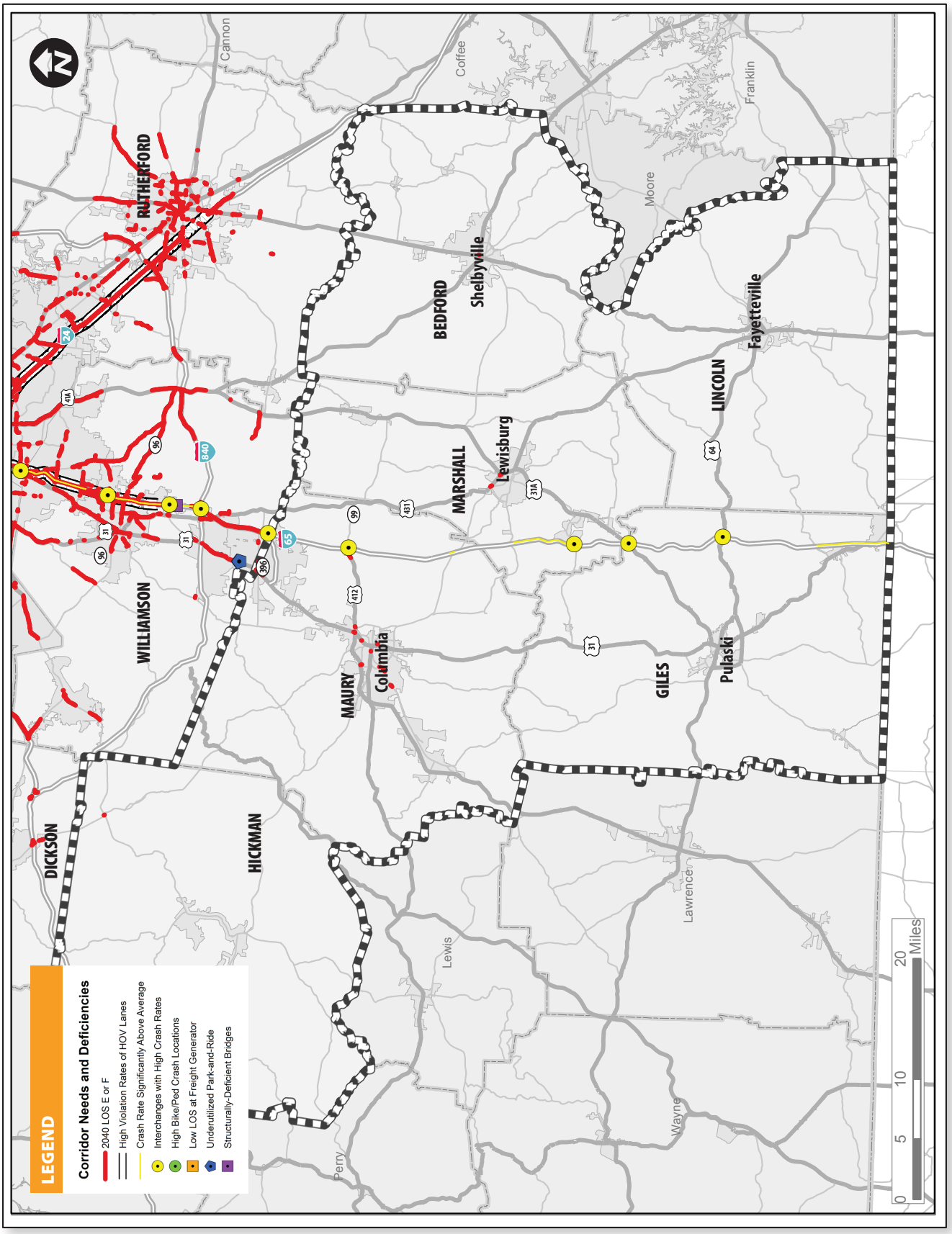


Figure 2-4. I-65 Deficiencies and Needs: South Sub-Area



3. Performance Measures

Underpinning the study's goals and objectives are a series of performance measures that serve as the basis for evaluating potential transportation solutions in the I-65 corridor. In conjunction with the Trend scenario, the performance measures establish a baseline against which future investments can be compared and evaluated. Table 3-1 reports the performance measures for the Base Year (2010) and Trend (2040) scenarios, which were obtained using the Tennessee Statewide Travel Demand Model, Version 2 (TSM).

The performance measures combine traditional transportation system performances, for example, Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT), with performance measures that incorporate transportation options and land use impacts. Measures for tracking transportation options include:

- **Person Throughput** – the total number of daily auto and truck occupants and transit riders passing two different points or screenlines in the I-65 corridor – the Sumner/Davidson county line on the north and the Davidson/Williamson county line on the south;
- **Presence of Transit Oriented Development (TOD) at Stations** – the total number of people and jobs within a ¼ mile radius of existing and planned transit stations (existing stations are current RTA Park-and-Ride locations; future stations are based on recommendations outlined in the nMotion Transit Plan); and
- **People within a 5-minute Walk or Bicycle Ride to a Station** – the total population within a five-minute walking or bicycling travel time to existing and planned transit stations.

At the north screenline, approximately two-thirds of the projected increase in person throughput under the Trend scenario is related to higher traffic volumes fueled by population and employment growth, and one-third of the projected increase in person throughput is tied to planned new transit services between Sumner County and Davidson County. With fewer transit services planned between Davidson County and Williamson County, changes in person throughput at the south screenline are predominantly driven by higher traffic volumes.

The expansion of transit services and transit stations will, nevertheless, expand the potential market for transit ridership substantially across the I-65 corridor. In particular, the total number of people within a

Table 3-1. Base Year and Trend Performance Measures

Goal	Performance Measure	Unit	Base (2010)	Trend (2040)	Percent Change Base v. Trend
Moving Autos and Trucks	Auto Travel Times	Minutes	See "Table 4-3"		
	Auto Vehicle Miles Traveled (VMT)	Miles (1,000s)	173,652	279,757	61%
	Auto Vehicle Hours of Travel (VHT)	Hours (1,000s)	3,836	6,456	68%
	Auto Vehicle Hours of Delay (VHD)	Hours	101,746	431,384	324%
	Truck Vehicles Miles Traveled (VMT)	Miles (1,000s)	6,524	12,030	84%
	Truck Vehicle Hours of Travel (VHT)	Hours	123,726	327,961	165%
	Truck Vehicle Hours of Delay (VHD)	Hours	16,204	27,147	68%
Moving People	Person Throughput	Persons per Day - North	177,569	252,815	42%
		Persons per Day - South	205,076	275,077	34%
Safety	Presence of Countermeasures at Safety Hotspots	High, Medium, or Low	See "Safety Recommendations"		n/a
Land Use Coordination	Presence of TOD at Stations	Total People and Jobs	24,968	38,456	54%
Equity and Accessibility	People within a 5-Minute Walk or Bike Ride to a Station	Total People - Walk	7,329	31,880	335%
		Total People - Bike	61,154	228,969	274%
Air Quality/Emissions	Carbon Intensity	Pounds per Day per Person	99.07	96.35	-3%

five-minute walking and bicycling trip is projected to increase nearly fourfold and threefold, respectively, in the Trend scenario.

4. Highway Capacity and Safety

4.1 Mainline Improvements

As part of the mainline capacity improvements, the future2040 TSM was updated to include proposed projects. The mainline improvements were broken into two phases. Phase 1 included the following projects:

- Future projects recommended by the Nashville Area MPO , as identified in the MPO's 2040 Regional Transportation Plan (RTP);
- Future projects recommended by the State of Tennessee IMPROVE Act (2017); ;and
- Additional recommendations based on model review and existing/future bottlenecks.

Phase 2 included a refined version of Phase 1 projects as well as additional mainline improvements identified through stakeholder and public involvement. This section provides the results of the traffic analysis for the Phase 2 refinements and additions of the 2040 Build scenario. The list of mainline improvement projects is shown in Tables 4-1 (Highway Capacity) and 4-2 (Safety). The tables include projects that are part of the 2017 IMPROVE Act. TDOT's goal is for all IMPROVE Act projects to be let to construction by 2030. Additionally, projects listed in TDOT's current 3-year Comprehensive Multimodal Program are noted as well. These projects are currently in some stage of development. Figures 4-1, 4-2, and 4-3 show the project recommendations in each of the study's three sub-areas: North, Central, and South.

Table 4-1. Mainline Improvements: Highway Capacity

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
H-1*	I-65	SR-25	Kentucky State Line	Widening, 4 to 6 lanes	8.8	Robertson	North
H-2	I-65/SR-109 Prop/SR-41	N/A	N/A	Relocation of SR-109, new interchange at I-65, and widening of I-65 from south of new interchange to Kentucky state line	0.6	Sumner	North
H-3*	SR-109 Portland Bypass	SR-109 south of SR-76	SR-109 near Kirby Drive	Construct new 4 lane divided roadway	6.8	Sumner	North
H-4*	I-65	Bethel Road (SR-257)	SR-25	Widening, 4 to 6 lanes	8.7	Robertson	North
H-5*	SR-76	Charles Drive	New Hall Road	Widening, 2 to 4 lanes	2.1	Robertson	North
H-6	I-65	New interchange at New Hall Road in White House		New Interchange	N/A	Robertson	North
H-7	I-65 (SB only)	Blue Star Road (US-31)	Bethel Road (SR-257)	Widening, 2 to 3 lanes	5.2	Robertson	North
H-8*	NET Corridor Section 2 - Vietnam Veterans Pkwy (SR-386)	US-31E/ Saundersville Road	SR-109 Bypass	Transit Capital Expansion - Widening, 4 to 6 lanes for freeway Bus Rapid Transit service from Nashville to Gallatin (Project currently under study by TDOT)	6.9	Sumner	North
H-9	SR-109	North of the Cumberland River Bridge	SR-109 Portland Bypass south of Gallatin	Widen from 2 lanes to 4/5 lanes	1.3	Sumner	North

Table 4-1. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
H-10[#]	I-65	Long Hollow Pike (SR-174)	Blue Star Road (US-31)	Widening, 4 to 6 lanes	1.8	Sumner	North
H-11[*]	Vietnam Veterans Pkwy (SR-386) at Forest Retreat Road	N/A	N/A	New Interchange (Project currently under study by TDOT.)	0.0	Sumner	North
H-12	I-65 at Springfield Highway (SR-11/US-41)	N/A	N/A	New Interchange	N/A	Davidson	Central
H-13[*#]	NET Corridor Section 1 - Vietnam Veterans Pkwy (SR-386)	I-65	US-31E/ Saundersville Road	Transit Capital Expansion - Widening, 4 to 6 lanes for freeway Bus Rapid Transit service from Nashville to Gallatin	8.9	Sumner	North
H-14	NET Corridor Transit - Ellington Pkwy (US 31E/ SR-6) and I-65	Ellington Pkwy (SR-6) southern terminus	SR-386	Construction of managed Lanes along Ellington Pkwy (SR-6) and I-65 for freeway Bus Rapid Transit service from Nashville to Gallatin	10.0	Davidson	Central
H-15[*]	I-24	I-65	Old Hickory Blvd (SR-45)	Widening, 4 to 6 lanes	4.3	Davidson	Central
H-16	I-65	Briley Parkway	Nashville Core	Extend HOV lanes	4.2	Davidson	Central
H-17	Dickerson Pike (US 41)	SR-155 (Briley Pkwy)	Spring St	Widening, 4 to 6 lanes	4.7	Davidson	Central
H-18[*]	Clarksville Hwy (US-41A/ SR-112)	SR-12 (Ashland City Hwy)	SR-155 (Briley Pkwy)	Widening, 2 to 5 lanes, with Multi-Use Trail	2.4	Davidson	Central
H-19[*]	Downtown Nashville Loop	N/A	N/A	Roadway/Junctions Reconstruction	12.2	Davidson	Central
H-20	I-65	I-40 (Exit 210)	I-40 (Exit 208)	Weaving Patterns	2.0	Davidson	Central
H-21	I-65	Armory Drive	Nashville Core	Extend HOV lanes	3.4	Davidson	Central
H-22[*]	I-24	I-40	I-840	Widening, I-40 to Haywood Lane - 8 to 10 lanes; Haywood Lane to I-840 - 6 to 8 lanes	23.2	Davidson and Rutherford	Central
H-23	Battery Lane/Harding Place at Franklin Rd/ Improvements	SR-6 (Franklin Rd.) at SR-255 (Harding Pl.) and Battery Lane		Capacity improvements for intersection approaches	0.7	Davidson	Central
H-24	Nolensville Pike	South of Old Hickory Blvd (SR-245)	South of Burkitt Road	Reconstruction and widening, 2 to 5 lanes	4.5	Davidson and Williamson	Central
H-25	I-65	Old Hickory Blvd (SR-254)	Concord Road (SR-253)	New Interchange	0.0	Williamson	Central
H-26	Franklin Road (US-31/SR-6)	Concord Road (SR-253)	Moores Lane (SR-441)	Widening, 2 to 5 lanes	2.3	Williamson	Central
H-27	Franklin Road (US-31/SR-6)	SR-441 (Moore's Lane)	Harpeth River Bridge	Widening, 2 to 5 lanes	3.7	Williamson	Central
H-28	Nolensville Road (SR-11)	Burkitt Road	I-840	Widening with realignment from south of Clovercroft Road to north of Sunset Road in Nolensville	10.6	Williamson	Central

Table 4-1. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
H-29*#	Mack Hatcher Pkwy (SR-397)	South of SR-96	US-431 (SR-106)	New construction, 4 lanes	3.3	Williamson	Central
H-30	East McEwen Drive	Near Cool Springs Blvd	Wilson Pike (SR-252)	Widening, 2 to 4 lanes	1.6	Williamson	Central
H-31	Smyrna/Williamson County Connector	I-24 at Rocky Fork Road	McEwen Drive Extension	New Roadway	12.0	Williamson and Rutherford	Central
H-32*	Mack Hatcher Pkwy (SR-397)	SR-96 east of Franklin	Columbia Pike (US-31/SR-6) south of Franklin	Widening, 2 to 4 lanes	3.2	Williamson	Central
H-33*	Columbia Pike (US-31/SR-6)	Fowlkes Street	Mack Hatcher Pkwy (SR-397)	Widening, 2 to 4 lanes	1.9	Williamson	Central
H-34*#	Murfreesboro Road (SR-96)	East of Arno Road	Wilson Pike (SR-252)	Widening, 2 to 5 lanes	5.8	Williamson	Central
H-35	Lewisburg Pike (SR-106/ US-431)	Mack Hatcher Pkwy (SR-397)	Donelson Creek Pkwy	Widening, 2 to 4 lanes	0.8	Williamson	Central
H-36	Peytonsville Road/Goose Creek Bypass (SR-248)	SR-106 (Lewisburg Pike)	West of I-65	Widen existing 2 lane road to 4/5 lane	0.8	Williamson	Central
H-37*#	Murfreesboro Road (SR-96)	East of Wilson Pike (SR-252)	I-840	Widening, 2 to 5 lanes	5.5	Williamson	Central
H-38*	Columbia Pike (US-31/SR-6)	I-840	Mack Hatcher Pkwy (SR-397)	Widening, 2 to 4 lanes	5.0	Williamson	Central
H-39*	Murfreesboro Road (SR-96)	I-840	Veterans Pkwy	Widening, 2 to 5 lanes	6.9	Williamson and Rutherford	Central
H-40	I-65	I-840	SR-396 (Saturn Parkway)	Widening, 4 to 6 lanes	5.8	Williamson	Central
H-41	Buckner Road Widening	Columbia Pike (SR-6/US-31)	Buckner Lane	Widening	1.9	Williamson	Central
H-42	Buckner Road Extension	Buckner Road	Lewisburg Pike (SR-106/US-431)	New Roadway with New Interchange at I-65	2.1	Williamson	Central
H-43	Saturn Pkwy (SR-396) Extension	US-31	Carters Creek Pike (SR-246) at I-840	New Roadway	6.0	Maury and Williamson	Central
H-44	Duplex Road (SR-247)	SR-6/US-31	0.1 mile west of I-65	Widen Duplex Rd. from 2 to 3 lanes with add'l improvements	3.1	Maury and Williamson	Central
H-45	I-65	Saturn Parkway (SR-396)	Bear Creek Pike (SR-99/US-412)	Widening, 4 to 6 lanes	6.9	Maury	South
H-46	Bear Creek Pike (SR-99/ US-412)	Nashville Highway (US-31)	US-431	Widening, 2 to 4 lanes	11.1	Maury	South

** Project included on IMPROVE Act project list*
Project included in 2018-2020 Comprehensive Multimodal Program

Table 4-2. Mainline Improvements: Safety

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
S-1	I-65 at SR-257 (Exit 104)	I-65 at SR-257 (Exit 104)		NB/Off Ramp Queuing	0.0	Robertson	North
S-2	I-65 at Bethel Road (SR-257) Interchange Lighting Improvements	I-65 at SR-257 (Exit 104)		Install interchange lightning	0.0	Sumner	North
S-3	Bethel Road (SR-257)	Lake Road	I-65	Widen shoulders and correct substandard horizontal geometries	2.3	Robertson	North
S-4	I-65 at US 31W Louisville Hwy (Exit 98)	I-65 at US 31W Louisville Hwy (Exit 98)		NB/Off Turn Lanes, SB/On Auxiliary Lane, NB/SB Signal Timing	0.0	Sumner	North
S-5	I-65 at US-31W (Exit 98)	I-65 at US-31W (Exit 98)		NB to WB Flyover	0.0	Sumner	North
S-6	I-65 Interchange Lighting at Rivergate Pkwy, Long Hollow Pk, US-31W	N/A	N/A	Interchange Lighting	N/A	Davidson	Central
S-7	I-65 at SR 174 Long Hollow Pike (Exit 97)	I-65 at SR 174 Long Hollow Pike (Exit 97)		SB/Off Turn Lanes, NB/SB Signal Timing	0.0	Davidson	North
S-8	I-65 at Trinity Lane (Exit 87)	I-65 at Trinity Lane (Exit 87)		NB/Off Ramp Auxiliary Lane Length	0.0	Davidson	Central
S-9	I-65 at Rosa L Parks Blvd (Exit 85)	I-65 at Rosa L Parks Blvd (Exit 85)		NB/Off Turn Lanes, SB/Off Turn Lanes, SB/On Turn Lanes	0.0	Davidson	Central
S-10	I-65 at Wedgewood Ave (Exit 81)"	I-65 at Wedgewood Ave (Exit 81)		SB/On Auxiliary Lane, NB/SB Signal Timing	0.0	Davidson	Central
S-11	I-65 at SR 254 Old Hickory Blvd (Exit 74)	I-65 at SR 254 Old Hickory Blvd (Exit 74)		Convert to to Diverging Diamond Interchange	0.0	Davidson	Central
S-12	I-65 at SR 253 Concord Rd (Exit 71)	I-65 at SR 253 Concord Rd (Exit 71)		NB/On Auxiliary Lane, SB/On Auxiliary Lane, NB/SB Signal Timing	0.0	Williamson	Central
S-13*	I-65 at Moores Lane	I-65 at Moores Lane		Interchange Modification	0.0	Williamson	Central
S-14	I-65 at SR 96 Murfreesboro Rd (Exit 65)	I-65 at SR 96 Murfreesboro Rd (Exit 65)		NB/Off Turn Lanes, SB/Off Turn Lanes, NB/SB Signal Timing	0.0	Williamson	Central
S-15	SR-96	Intersection with US-41A		Intersection Improvements	0.0	Williamson	Central
S-16	I-65 at SR 396 Saturn Parkway (Exit 53)	I-65 at SR 396 Saturn Parkway (Exit 53)		NB to WB Flyover	0.0	Maury	South
S-17	I-65 at US 412/SR 99 (Exit 46)	I-65 at US 412/SR 99 (Exit 46)		NB/SB Signalized Intersection	0.0	Maury	South
S-18	I-65 at SR 129 Lynnville Highway (Exit 27)	I-65 at SR 129 Lynnville Highway (Exit 27)		NB/On Turn Lane, SB/On Turn Lane	0.0	Marshall	South
S-19*	SR-99 (US-412) Interchange Modification	I-65 at SR 99 (US-412)		Interchange Modification	0.0	Maury	South
S-20	I-65 at SR 11/US 31A (Exit 22)	I-65 at SR 11/US 31A (Exit 22)		NB/SB Signalized Intersection	0.0	Giles	South
S-21	I-65 at SR 15/US 64 (Exit 14)	I-65 at SR 15/US 64 (Exit 14)		NB/SB Signalized Intersection	0.0	Giles	South
S-22*	Main Street (SR-7)	Union Hill Road (Ardmore)	Morrow Road (Ardmore)	Safety Improvements	0.9	Giles	South

** Project included on IMPROVE Act project list*

Figure 4-1. Mainline Improvements Map: North Sub-Area

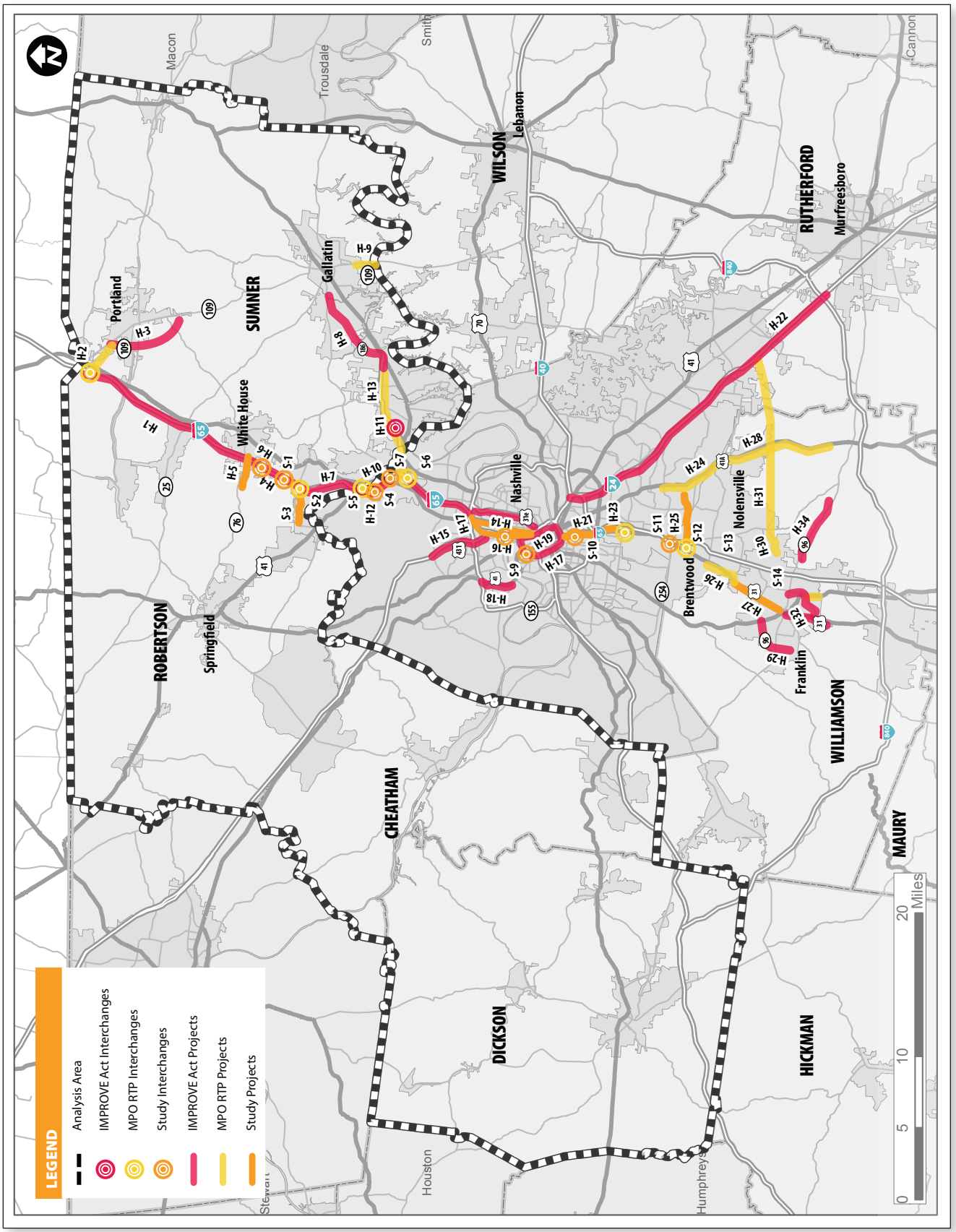


Figure 4-2. Mainline Improvements Map: Central Sub-Area

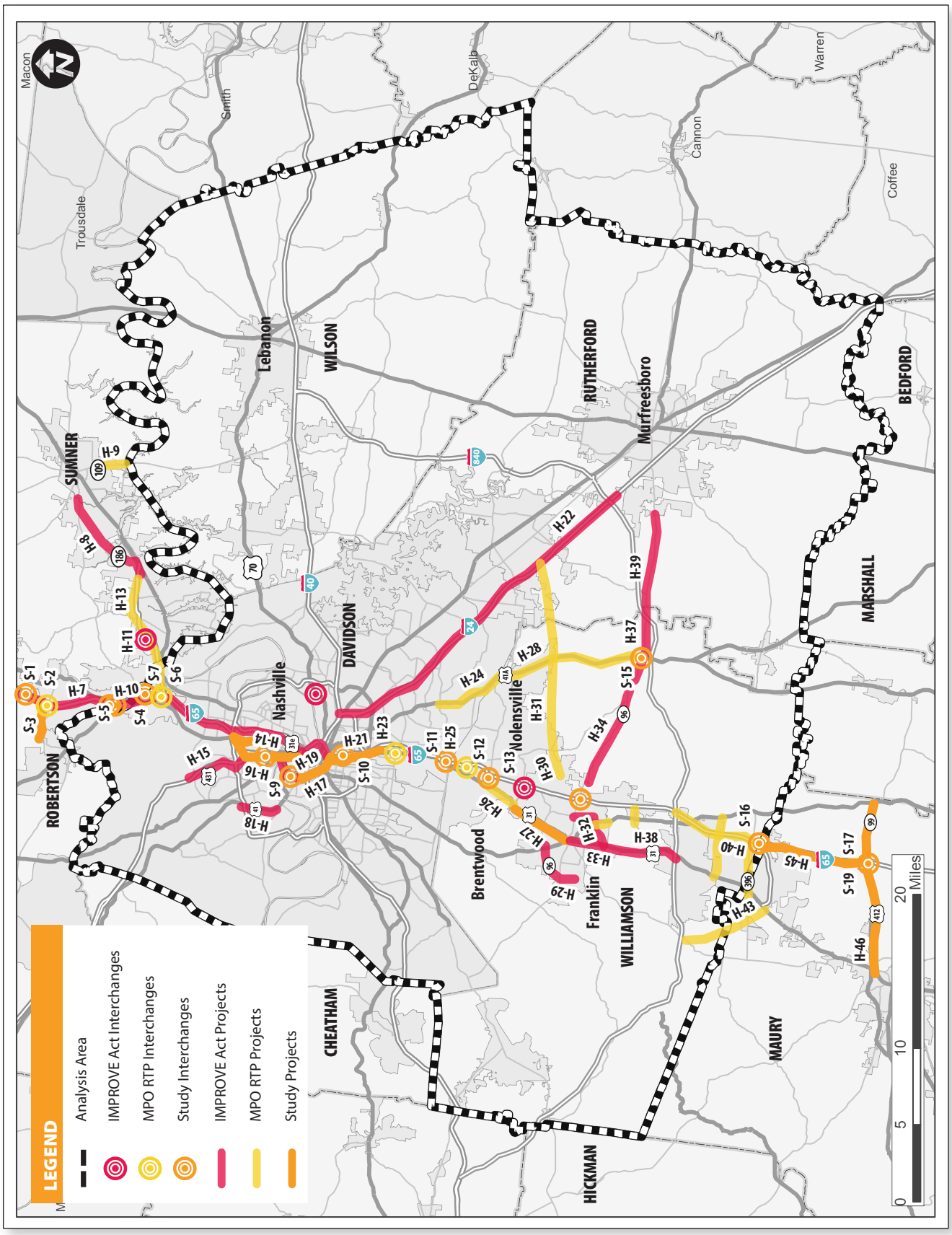
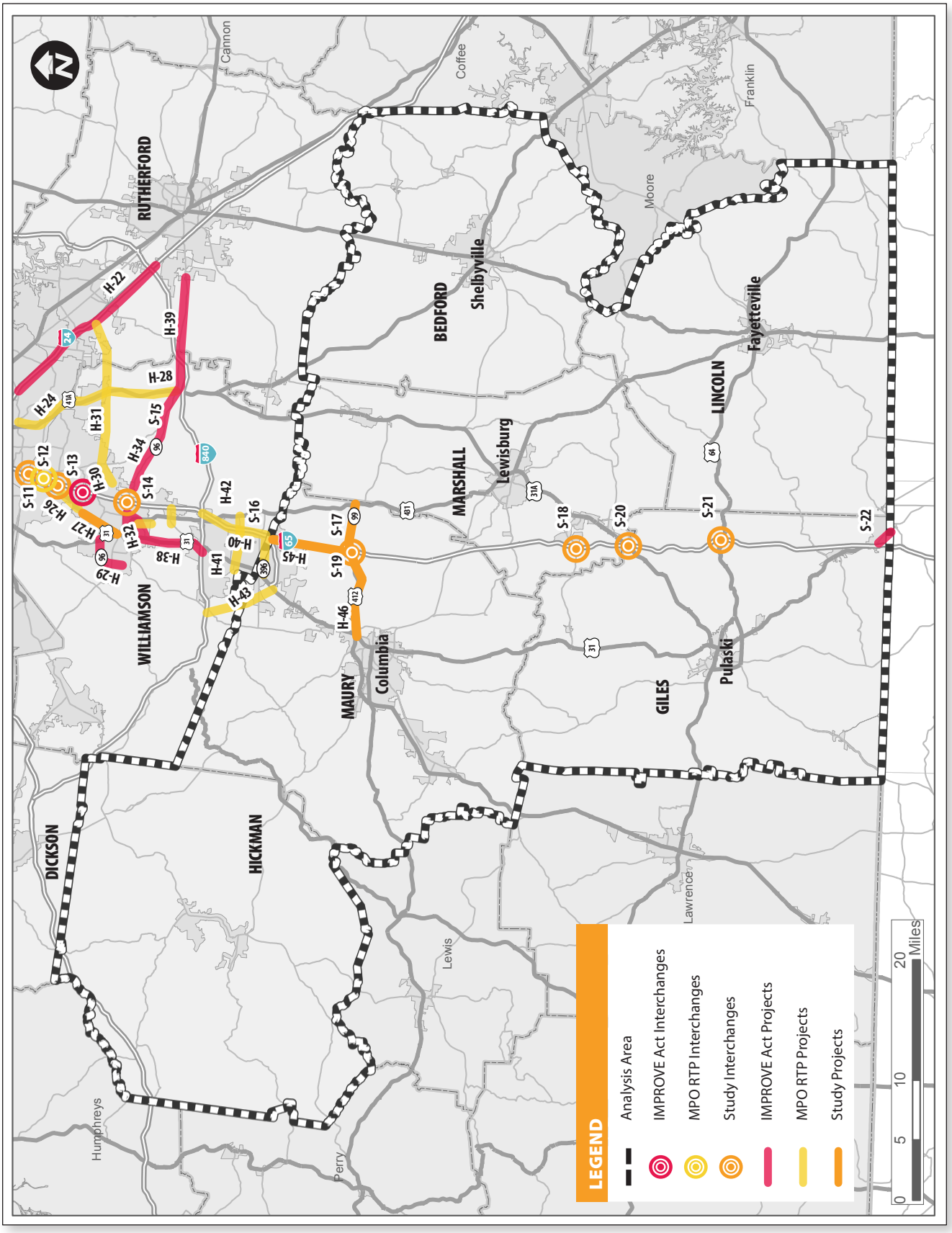


Figure 4-3. Mainline Improvements Map: South Sub-Area



Volume to Capacity Ratios

A volume to capacity (V/C) ratio analysis is one tool to quantitatively assess the effectiveness of a corridor to handle vehicular traffic. The ratio compares the demand in a corridor with the corridor's designed capacity. Level of service (LOS) is a qualitative measure of the operating conditions of a roadway. The LOS of a facility is measured by a letter between A and F, with LOS A (V/C ratio less than 0.6) referring to a facility in good operational condition and LOS F (V/C ratio greater than 1.0) referring to a facility in failing operational condition. Figure 4-4 shows the V/C ratios of interstates in the study area under the 2040 Build scenario. To better understand the effects of the proposed mainline improvement projects on I-65, the V/C ratios for both the 2040 Trend and 2040 Build scenarios are compared in Figure 4-5. As Figure 4-5 illustrates, although the proposed mainline improvements represent a significant investment and improvement in areas, they will not solve congestion on I-65 between Franklin, Nashville, and Hendersonville.

Travel Time for Key Travel Markets

Ten origin-destination (O-D) pairs were identified as key travel markets for travel time analysis in the statewide travel demand model. Table 4-3 displays the travel times in the 2010, 2040 Trend, and 2040 Build scenarios based on the link-level travel time results of the statewide travel demand model. The average daily travel time increases from 27 minutes in 2010 to 42 minutes in the 2040 Trend scenario. Under the 2040 Build scenario, however, the average daily travel time will be reduced to 38 minutes, a decrease of eight percent, and average speeds will increase by nine percent. The largest travel time savings will be in the Spring Hill-Franklin travel market, a distance of 18.5 miles that realizes a 22 percent time reduction, and the Franklin-Brentwood travel market, a distance of 8.5 miles that will experience a 20 percent travel time savings.

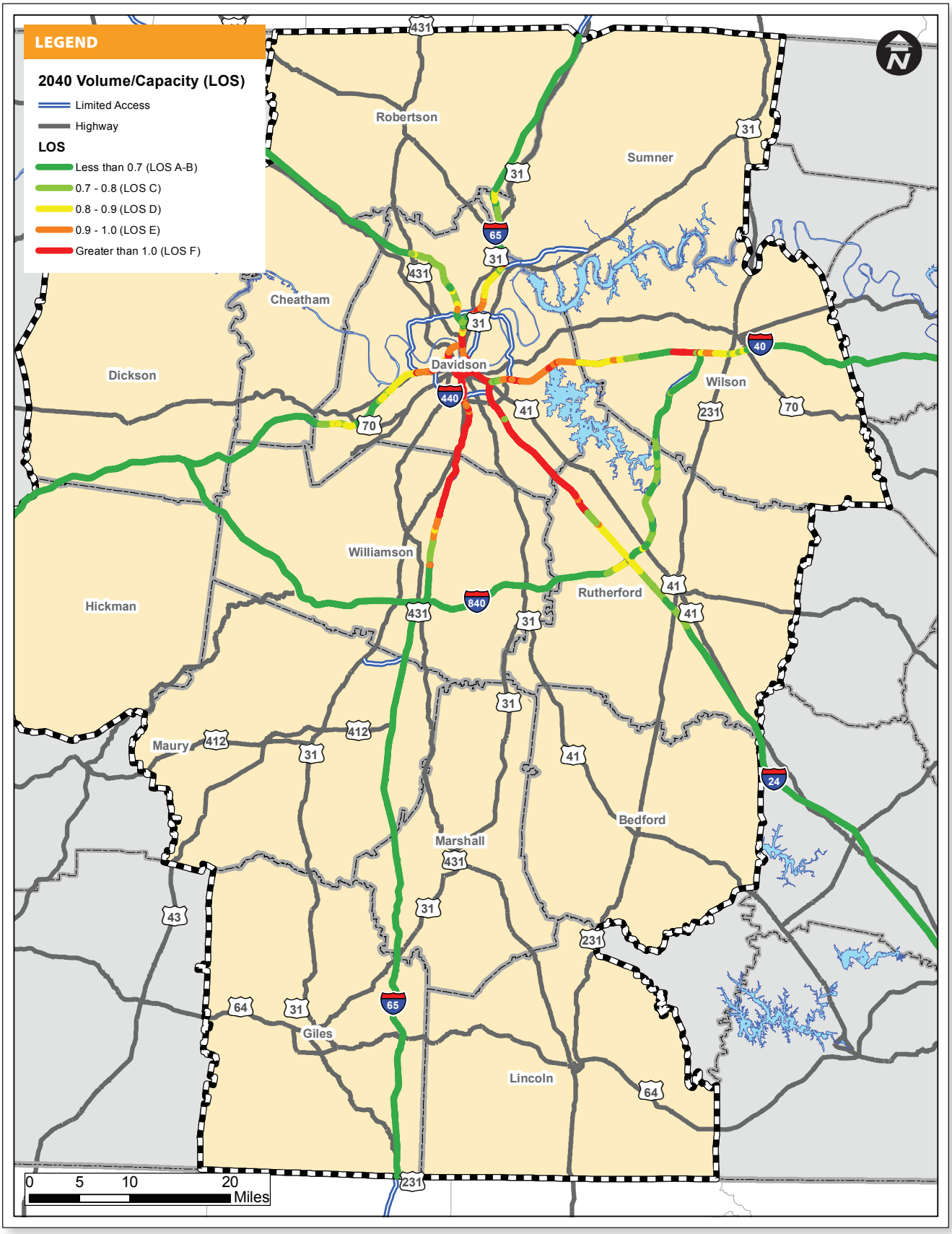
Network Performance

To better understand the impacts of the mainline improvements on a corridor wide scale, network traffic

Table 4-3. 2010 and 2040 Travel Time for Key Travel Markets

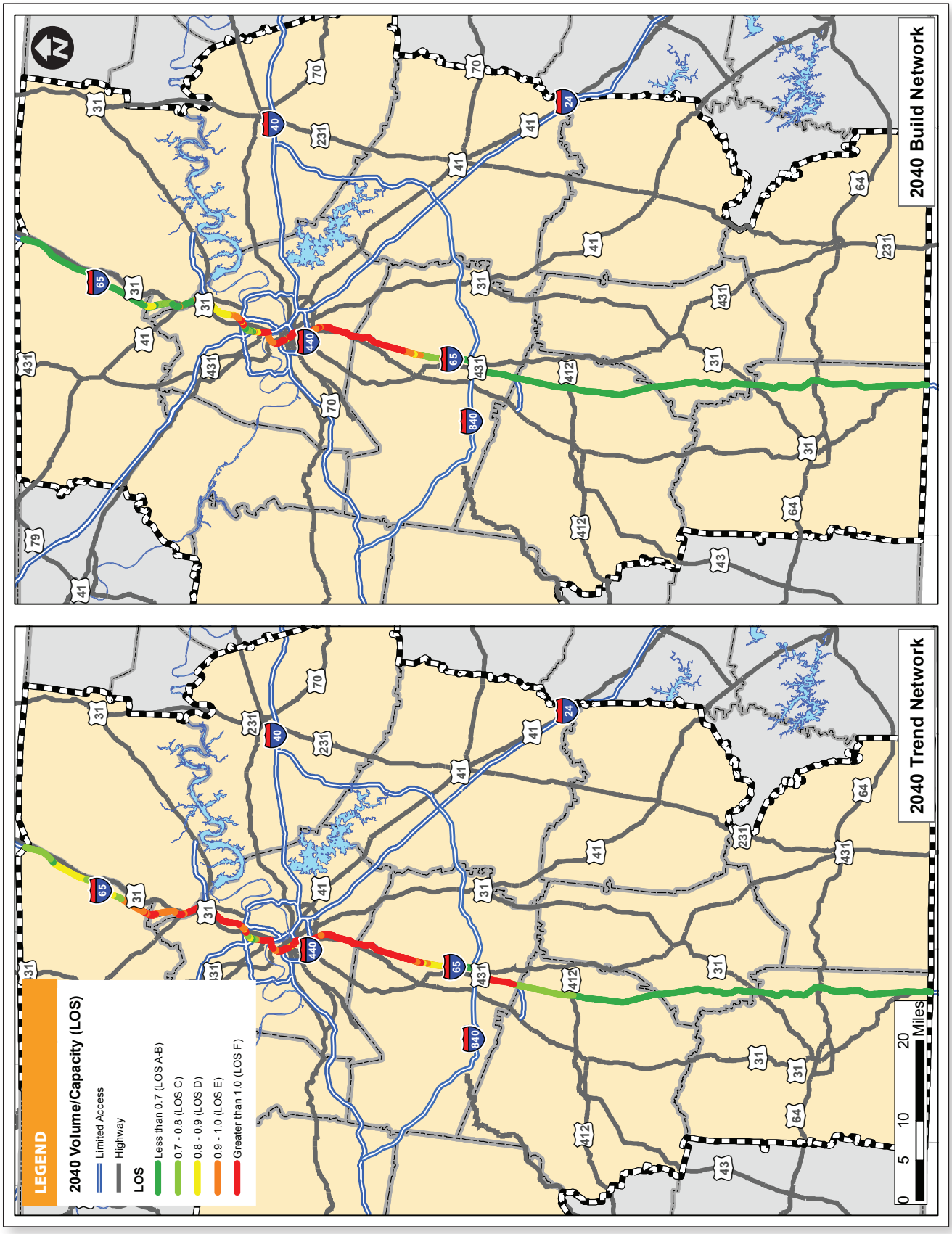
	Travel Time (minutes)			% Change 2040		Speed (mph)			% Change 2040
Market From-To	Base (2010)	Trend (2040)	Build (2040)	Trend v. Build	Approximate Distance (mi)	Base (2010)	Trend (2040)	Build (2040)	Trend v. Build
Franklin to Brentwood	10	21	17	-20%	8.5	51	24	30	25%
Brentwood to Franklin	11	22	20	-8%	8.5	46	23	25	9%
South Nashville to Franklin	22	37	36	-1%	16.5	45	27	27	1%
South Nashville to Nashville Core	16	30	29	-3%	8.5	32	17	18	3%
Franklin to Nashville Core	29	59	53	-10%	21.5	44	22	24	11%
Portland to Nashville Core	41	47	46	-2%	39.0	57	50	51	2%
Hendersonville to Nashville Core	25	32	31	-2%	18.5	44	35	35	2%
Spring Hill to Nashville Core	36	64	60	-6%	35.5	59	33	35	6%
Spring Hill to Franklin	20	36	28	-22%	18.5	56	31	40	29%
Giles County to Franklin	56	69	63	-9%	31.0	33	27	30	10%
Average	27	42	38	-8%	20.6	47	29	32	9%

Figure 4-4. Interstate LOS Map (2040 Build)



Source: Statewide Travel Demand Model, Version 2

Figure 4-5. 2040 Trend and 2040 Build LOS Comparison



Source: Statewide Travel Demand Model, Version 2

performance for Vehicle Miles Traveled (VMT), Vehicle Hours Traveled (VHT), average speed, and Vehicle Hours of Delay (VHD) are compared in Table 4-4. According to Table 4-4, the network VMT increases approximately 178,000 miles under the 2040 Build scenario compared to the 2040 Trend, an increase of one-tenth-of-one percent. This increase of VMT is expected given the capacity projects. However, due to the capacity improvements, VHT will decrease by around 35,000 hours, a one percent decrease, under the 2040 Build scenario compared to the 2040 Trend. Finally, the VHD will be reduced by around 41,000 hours, a 10 percent reduction. Urban interstates and urban principal arterial drive the decrease in VHD, with 10 and 12 percent decreases, respectively. The results indicate that the capacity projects will significantly improve the performance of the roadways and reduce overall network delay.

Another key, high-level performance measure is the change in person throughput. Table 4-5 compares the person throughput at six different screenlines along

Table 4-4. 2010, 2040 Trend, and 2040 Build Network Performance Measures

		VMT				
	Parameter	2010	2040 Trend	% Change (from 2010)	2040 Build	% Change (from Trend)
Functional Class	**R. Interstate (1)**	26,259,283	39,563,179	50.7%	39,882,986	0.8%
	R. Prin. Arterial (2)	14,985,509	29,109,831	94.3%	29,239,396	0.4%
	R. Minor Arterial (6)	13,544,516	24,686,616	82.3%	24,663,658	0.1%
	R. Major Collector (7)	8,878,405	16,641,207	87.4%	16,384,300	-1.5%
	R. Minor Collector (8)	8,112,124	15,723,364	93.8%	15,756,041	0.2%
	R. Local Road (9)	236,733	337,615	42.6%	326,775	-3.2%
	U. Interstate (11)	34,499,701	45,694,349	32.4%	45,189,277	-1.1%
	U. Other Freeway (12)	5,696,550	8,951,797	57.1%	9,113,479	1.8%
	U. Prin. Arterial (14)	29,817,822	44,352,312	48.7%	44,904,202	1.2%
	U. Minor Arterial (16)	22,877,501	37,172,455	62.5%	37,074,464	0.3%
	U. Collector (17)	8,396,876	16,804,683	100.1%	16,662,162	0.8%
	U. Local Road (19)	347,330	719,937	107.3%	739,097	0.1%
	All	**173,652,351**	**279,757,343**	**61.1%**	**279,935,836**	**0%**

		VHT				
	Parameter	2010	2040 Trend	% Change (from 2010)	2040 Build	% Change (from Trend)
Functional Class	**R. Interstate (1)**	348,467	526,663	51.1%	530,519	0.7%
	R. Prin. Arterial (2)	263,555	504,742	91.5%	507,067	0.5%
	R. Minor Arterial (6)	267,321	489,159	83.0%	487,620	0.3%
	R. Major Collector (7)	185,537	348,385	87.8%	343,022	1.5%
	R. Minor Collector (8)	186,119	361,407	94.2%	363,684	0.6%
	R. Local Road (9)	5,387	7,670	42.4%	7,435	3.1%
	U. Interstate (11)	585,403	861,215	47.1%	832,610	3.3%
	U. Other Freeway (12)	93,878	152,196	62.1%	155,400	2.1%
	U. Prin. Arterial (14)	895,827	1,422,171	58.8%	1,422,836	0.0%
	U. Minor Arterial (16)	729,791	1,215,310	66.5%	1,210,715	-0.4%
	U. Collector (17)	263,868	541,346	105.2%	534,099	-1.3%
	U. Local Road (19)	11,270	25,270	124.2%	25,379	0.4%
	All	**3,836,424**	**6,455,533**	**68.3%**	**6,420,387**	**-0.5%**

Table 4-4. Continued

		Average Speed (mph)					VHD				
	Parameter	2010	2040 Trend	% Change (from 2010)	2040 Build	% Change (from Trend)	2010	2040 Trend	% Change (from 2010)	2040 Build	% Change (from Trend)
Functional Class	**R. Interstate (1)**	75	75	-0.3%	75	-0.2%	467	3,357	618.4%	3,104	-7.6%
	R. Prin. Arterial (2)	57	58	1.4%	58	1.4%	83	1,243	1,389.5%	1,238	-0.4%
	R. Minor Arterial (6)	51	50	-0.4%	51	-0.2%	168	5,158	2,971.9%	4,239	-17.8%
	R. Major Collector (7)	48	48	-0.2%	48	-0.2%	25	894	3,534.3%	805	-10.0%
	R. Minor Collector (8)	44	44	-0.2%	43	-0.6%	80	1,349	1,585.9%	1,230	-8.8%
	R. Local Road (9)	44	44	0.2%	44	0.0%	0	22	4,887.9%	8	-65.6%
	U. Interstate (11)	59	53	-10.0%	54	-7.9%	73,021	189,118	159.0%	167,129	-11.6%
	U. Other Freeway (12)	61	59	-3.1%	59	-3.4%	2,957	11,700	295.6%	11,556	-1.2%
	U. Prin. Arterial (14)	33	31	-6.3%	32	-5.2%	16,246	127,210	683.0%	114,189	-10.2%
	U. Minor Arterial (16)	31	31	-2.4%	31	-2.3%	7,772	62,975	710.3%	61,679	-2.1%
	U. Collector (17)	32	31	-2.5%	31	-2.0%	874	25,951	2,870.0%	23,049	-11.2%
	U. Local Road (19)	31	28	-7.6%	29	-5.5%	52	2,406	4,512.8%	2,152	-10.5%
	All	**45**	**43**	**-4.3%**	**44**	**-3.7%**	**101,746**	**431,384**	**324.0%**	**390,377**	**-9.5%**

Table 4-5. Auto and Truck Person Throughput at Screenlines

Screenlines: I-65 Only						
		Daily Person Throughput				
Screenline	Location	2010	2040 Trend	% Change (from 2010)	2040 Build	% Change (from Trend)
1	Kentucky State Line	33,708	43,072	27.8%	47,406	10.1%
2	White House	44,802	54,698	22.1%	63,835	16.7%
3	Millersville	43,554	52,152	19.7%	59,597	14.3%
4	Brentwood	114,538	152,283	33.0%	160,192	5.2%
5	Spring Hill	42,931	60,816	41.7%	66,960	2.7%
6	Alabama State Line	11,669	19,729	69.1%	20,265	9.3%
	Average	**48,534**	**63,792**	**31.4%**	**69,709**	**43.6%**

I-65 for the 2010, 2040 Trend and 2040 Build scenarios. The person throughput along I-65 will increase at all six screenlines for autos and trucks. The corridor-wide increase in person throughput under the 2040 Build scenario is approximately 5,900 additional people, a nine percent increase, compared to 2040 Trend.

4.2 Interchange Improvements

Micro Level Operational, Capacity, and Safety Improvements

In Task 2, seven interchange locations were identified for operational, capacity, and safety improvements. Turning Movement Counts (TMC) were acquired for these locations for further microsimulation analysis. Also, five additional interchange locations were evaluated for targeted safety improvements based on crash hotspot data. The morning and afternoon peak hour operations were modeled in Synchro where possible and recommendations were made to increase the LOS for the intersections. Where applicable, Crash Modification Factors (CMF) were also used to quantify the safety benefits of each proposed improvement. A CMF is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site. (For more information on Crash Modification Factors (CMF), refer to http://www.cmfclearinghouse.org) The results of the analysis are summarized in Table 4-6. The recommendations derived from this analysis are included in the safety project recommendations in Table 4-2.

As Table 4-6 indicates, the frequency of crashes will be reduced by approximately 20 and 30 percent in most of the locations, which can be interpreted as

Table 4-6. Interchange Improvement Results

Interchange			Existing Intersection Level of Service (Delay in sec)		Build Intersection Level of Service (Delay in sec)			
No.	Road	Ramp Location	AM	PM	AM	PM	Interchange Daily Delay Savings (hr)	CMF
1	Exit 98: US 31 W	I-65 NB	B (12.7)	B (15.6)	B (12.1)	B (14.8)	7.4	0.705
		I-65 SB	D (36.3)	A (6.8)	C (34.4)	A (3.4)		n/a
2	Exit 97: SR-174 Long Hollow Pike	I-65 NB	B (15.8)	D (38.3)	B (15.6)	D (35.5)	60.1	n/a
		I-65 SB	D (41.6)	C (30)	B (19.0)	B (17.6)		0.705
3	Exit 85: Rosa L Parks Blvd	I-65 NB	E (55.7)	F (80.7)	D (50.4)	C (26.8)	265.1	0.803
		I-65 SB	E (73.2)	E (70.7)	D (37.3)	D (39.2)		0.803
4	Exit 81: Wedgewood Ave	I-65 NB	D (44.8)	C (25)	C (25.0)	B (17.9)	112.8	n/a
		I-65 SB	D (40.2)	D (53)	C (20.1)	C (27.6)		n/a
5	Exit 74: SR-254 Old Hickory Blvd	I-65 NB	D (49.4)	E (73.6)	D (42.1)	E (62.5)	286.9	n/a
		I-65 SB	F (170.0)	F (176.5)	F (134.5)	F (150.1)		n/a
6	Exit 71: SR-253 Concord Rd	I-65 NB	F (119.0)	D (43.6)	E (67.50	C (24.2)	183.3	n/a
		I-65 SB	C (28.2)	F (115.6)	C (27.3)	F (91.6)		n/a
7	Exit 65: SR-96 Murfreesboro Rd	I-65 NB	F (109.9)	C (29.2)	D (41.4)	C (24.1)	219.2	n/a
		I-65 SB	C (28.2)	E (56.9)	C (28.1)	D (44.0)		0.803
F	Exit 53: SR-396/Saturn Pkwy Interchange	I-65 NB	-	-	-	-	-	0.700
		I-65 SB	-	-	-	-		n/a
G	Exit 46: US-412/SR-99 Interchange I-24 West	I-65 NB	-	-	-	-	-	0.656
		I-65 SB	-	-	-	-		0.656
H	Exit 27: SR-129/Lynnville Highway Interchange I-24 West	I-65 NB	-	-	-	-	-	n/a
		I-65 SB	-	-	-	-		n/a
I	Exit 22: SR-11/US-31A Interchange I-24 West	I-65 NB	-	-	-	-	-	0.656
		I-65 SB	-	-	-	-		0.656
J	Exit 14: US-64/SR-15 Interchange I-24 West	I-65 NB	-	-	-	-	-	0.656
		I-65 SB	-	-	-	-		0.656

a reduction of fatal, injury, and property damage crashes. Additionally, for most of the projects, the planning level cost estimate is relatively low, meaning that most of these improvements could be implemented in the short-term and at a relatively low cost. Comprehensive data collection and analysis is recommended before making the decision to move forward with the projects shown in this table.

Macro Level Operational Improvements

A recurring comment at public workshops was the issue of improving the weaving areas around downtown Nashville along I-65. Currently, I-65 northbound merges from the left with I-40 northbound south of downtown Nashville. After several off-ramps and on-ramps serving the downtown area, I-65 exits to the right of I-65/I-40 and I-40 exits to the left. The geometry generates a large-scale weaving area during the afternoon peak hour. One potential solution for this weaving area is to redesign the western interchange at the end of the weave, making the I-40 exit to the right and I-65 exit to the left. Figure 4-6 shows the new traffic configuration for the interchange, with I-40 westbound traffic accessing the ramp from the center and right lanes, and I-65 northbound traffic accessing the ramp from the center and left lanes.

The peak hour counts along I-65, I-40, and the downtown ramps were evaluated for further macro level analysis of a potential solution. VISSIM was used to model the entire network as the tool is able to measure complex and large scale weaving patterns such as those that occur between multiple interchanges. Synchro lacks these analytical capabilities. The modeling was done for existing year 2017 data, and the results are shown in Table 4-7.

According to Table 4-7, the proposed improvement will have a negligible effect on the area during the morning peak hour as the weaving is not an issue during this time. However, the improvement would improve afternoon total delay by three percent and increase the average speed by two percent, which suggests potential merits for further analysis. A detailed analysis with origin-destination data is recommended for future analysis should TDOT decided to investigate the benefits of this proposed project.

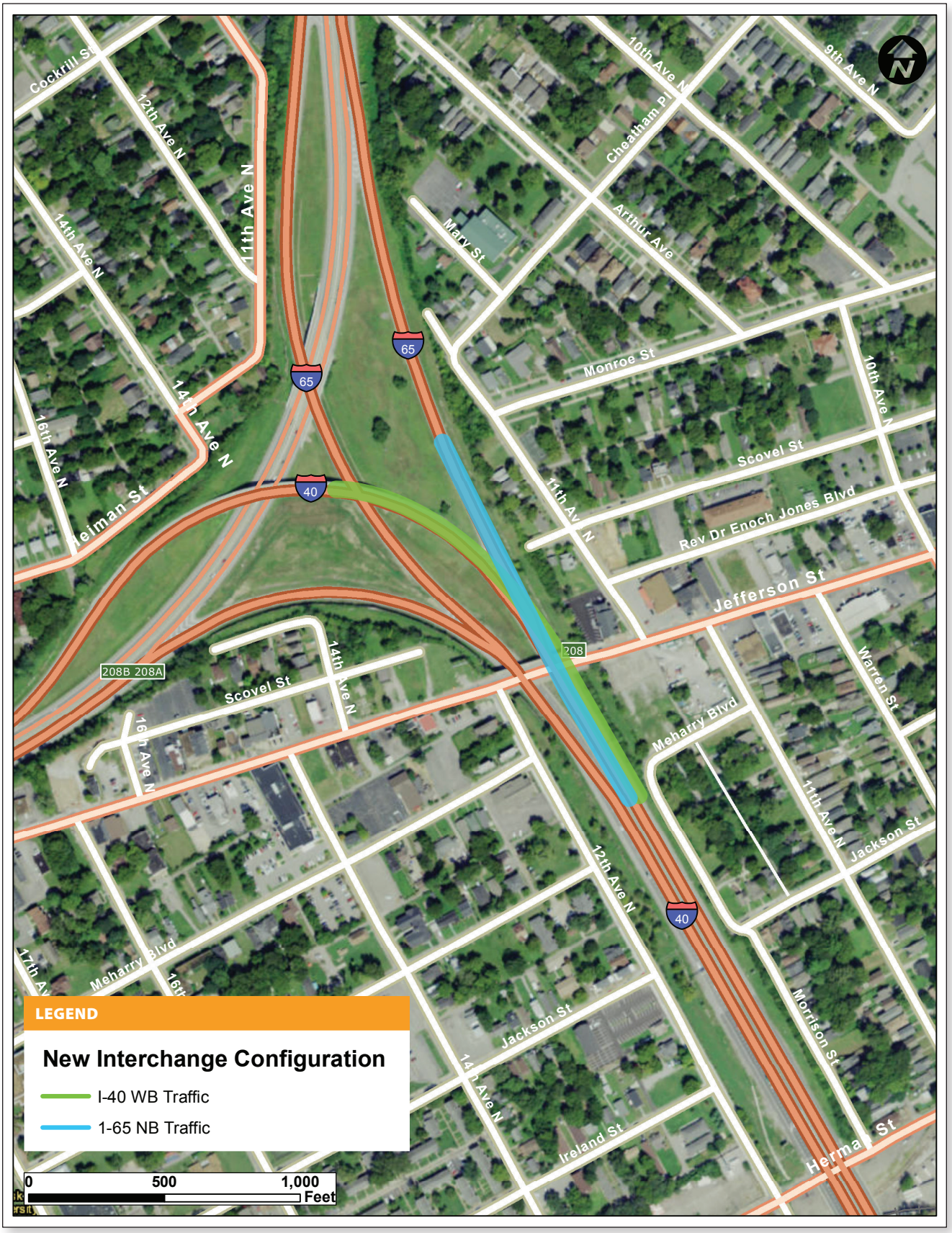
Table 4-7. Weaving Analysis: Downtown Nashville

	AM			PM		
Peak Hour Performance	No-Build	Build	Improvement	No-Build	Build	Improvement
Average Delay Per Vehicle (sec)	77.40	77.40	0%	145.40	140.50	-3%
Average Speed (mph)	29.80	29.90	-0%	23.80	24.30	2%
VMT (mi)	10,827.00	10,847.00	-0%	14,152.00	14,163.00	0%
VHT (hr)	362.73	363.10	-0%	593.95	583.46	-2%
Total Delay (hr)	**158.61**	**158.58**	**0%**	**327.18**	**316.49**	**-3%**

Table 4-8. Crash Type and Frequency

Year	Number of Crashes	Angle	Rear-End	Fatalities	Injuries
2002	4	2	2	0	1
2003	3	1	2	0	4
2004	2	2	0	0	0
2005	3	3	0	0	5
2006	1	1	0	0	0
2007	1	0	1	0	0
2008	1	0	1	0	0
2009	7	5	2	0	1
2010	5	3	2	0	3
2011	5	3	2	0	1
2012	3	1	2	0	0
2013	4	2	2	0	1
2014	6	5	1	0	2
2015	3	2	1	0	0
2016	2	1	1	0	0
2017	1	1	0	0	4
Total	**51**	**32**	**19**	**0**	**22**
Average per year	**3.2**	**2**	**1.2**	**0**	**1.4**

Figure 4-6. New I-40/I-65 Interchange Configuration



Other Safety Improvements Projects

Based on public comments, the intersection of State Route (SR) 96 and SR 11 was also analyzed for safety improvements. The intersection is currently operating as an all-way stop-controlled intersection with relatively high crash rates. The crash history from 2002 to 2017 was provided by TDOT, with a total of 51 crashes occurring during the fifteen-year period. No fatal crashes were reported; however, 22 injuries were reported. Of the 51 reported crashes, 32 crashes (63 percent) were angle and 19 (37 percent) were read-end crashes. Table 4-8 shows the crash types and frequency of crashes at this location.

The majority of the crashes shown on Table 4-8, specifically the angle crashes, could be avoided by changing the control type from stop sign controlled to signalized. The CMF for this improvement is 0.656 for all crash types, meaning that the frequencies of both angle and rear-end crashes are estimated to be reduced by approximately 35 percent. Using the current dollar values for property damage crashes and injuries, the estimated saving would be around $470,000 per year. This value is well above the cost of installation and maintenance of a signalized intersection.

4.3 High Occupancy Vehicle (HOV) Enforcement Analysis

Due to the high violation rates on I-65, the existing HOV lanes are operating as additional General Purpose (GP) lanes, and consequently, the V/C ratios on the HOV lanes are similar to the GP lanes. Previous studies show that the violation rate along I-65 is between 60 and 90 percent. The high violation rates eliminate the intended benefit for HOV-eligible vehicles since there are very little travel time saving benefits.

Two possible improvements to the operation of the HOV lanes is to increase fines and increase enforcement. To estimate the effect of these potential improvements, the number of multiple occupant (HOV-eligible) vehicles was estimated on each link. In the absence of data on I-65, the existing count on I-24 in the vicinity of Nashville between Exits 56 and 57 collected in March 2016 was used. No mode shift assumptions were included in the analysis. A brief summary of the counts is shown in Table 4-9.

Per Table 4-9, approximately 16 percent of vehicles on I-24 have two or more occupants (HOV eligible).

Table 4-9. HOV Eligible Vehicles

Time of Day	Single Occupant Vehicles	Multiple Occupant Vehicles	Total Vehicles	% Multiple Occupant Vehicles
7AM - 9AM	2,702	749	3,451	22%
4PM - 6PM	3,027	320	3,347	10%
Total	5,729	1,069	6,798	16%
Split	84%	16%		

For this study, it is assumed that I-65 has the same distribution. Applying the 16 percent factor to the daily volume of each link from the 2040 statewide model results in the number of HOV-eligible vehicles on each link along I-65 where an HOV lane exists. If the HOV lanes are enforced, it is further assumed that 100 percent of the HOV eligible vehicles will use HOV lanes. Given that assumption, the following alternatives were tested:

- **Zero violation:** 100 percent of HOV-eligible vehicles use HOV lanes;
- **20 percent violation:** 100 percent of HOV-eligible vehicles plus an additional 20 percent of vehicles use HOV lanes; and
- **50 percent violation:** 100 percent of HOV-eligible vehicles plus an additional 50 percent of vehicles use HOV lanes.

Zero Violation

In this alternative, the law is effectively enforced, and the number of violations is negligible. Figure 4-7 shows the results of this analysis. Without enforcement, the HOV lanes have the same 2040 V/C ratio as the GP lanes, and they fail in most segments. However, the zero violation V/C ratios are at LOS D or better. Of course, the GP lanes are also affected under this scenario. Since the V/C ratios on the GP lanes will be higher in the zero percent violation scenario, LOS will deteriorate by approximately 11 percent (Table 4-10).

20 Percent Violation

In this alternative, the law is moderately enforced, and the number of violations does not exceed 20 percent of the HOV eligible vehicles. Per Figure 4-8, the 2040 HOV lanes with 20 percent violation largely operate at LOS E or better as compared to mostly failing under a no enforcement alternative. As with the zero violation

scenario, V/C ratios are higher on the GP lanes, resulting in a six percent increase (Table 4-10).

50 Percent Violation

In this alternative, the law is poorly enforced, and the number of violations is significantly high at 50 percent of the HOV eligible vehicles. In Figure 4-9, the 2040 HOV lanes with 50 percent violation are operating slightly better or similarly to the HOV lanes operating without enforcement. The trend of LOS deterioration shows that at around 50 percent violation, HOV-eligible vehicles would not see the HOV lanes as attractive and start using the GP lanes, since the time savings will not be different. The V/C ratios and LOS values are similar between no enforcement and 50 percent violation, illustrating that at an approximately 50 percent violation rate HOV lanes lose their effectiveness. By adopting best practices in violation laws and policies (see Section 9, Transportation Demand Management), HOV violation rates can be more effectively managed and can generate mode shifts from single occupant vehicles to multiple occupant vehicles.

Table 4-10. HOV Eligible Vehicles and General Purpose Lane LOS

HOV Enforcement Level	General Purpose Lane Average V/C	General Purpose Lane Percent Change in V/C
No Enforcement	0.990	n/a
Zero Violation	1.096	11%
20% Violation	1.054	6%
50% Violation	0.992	0%

Source: Statewide Travel Demand Model

4.4 Parallel Arterials

Eight routes were also identified as potential parallel routes that can operate as bypass or alternative incident management corridors. Four of these eight routes are on the north side of Nashville. The routes are:

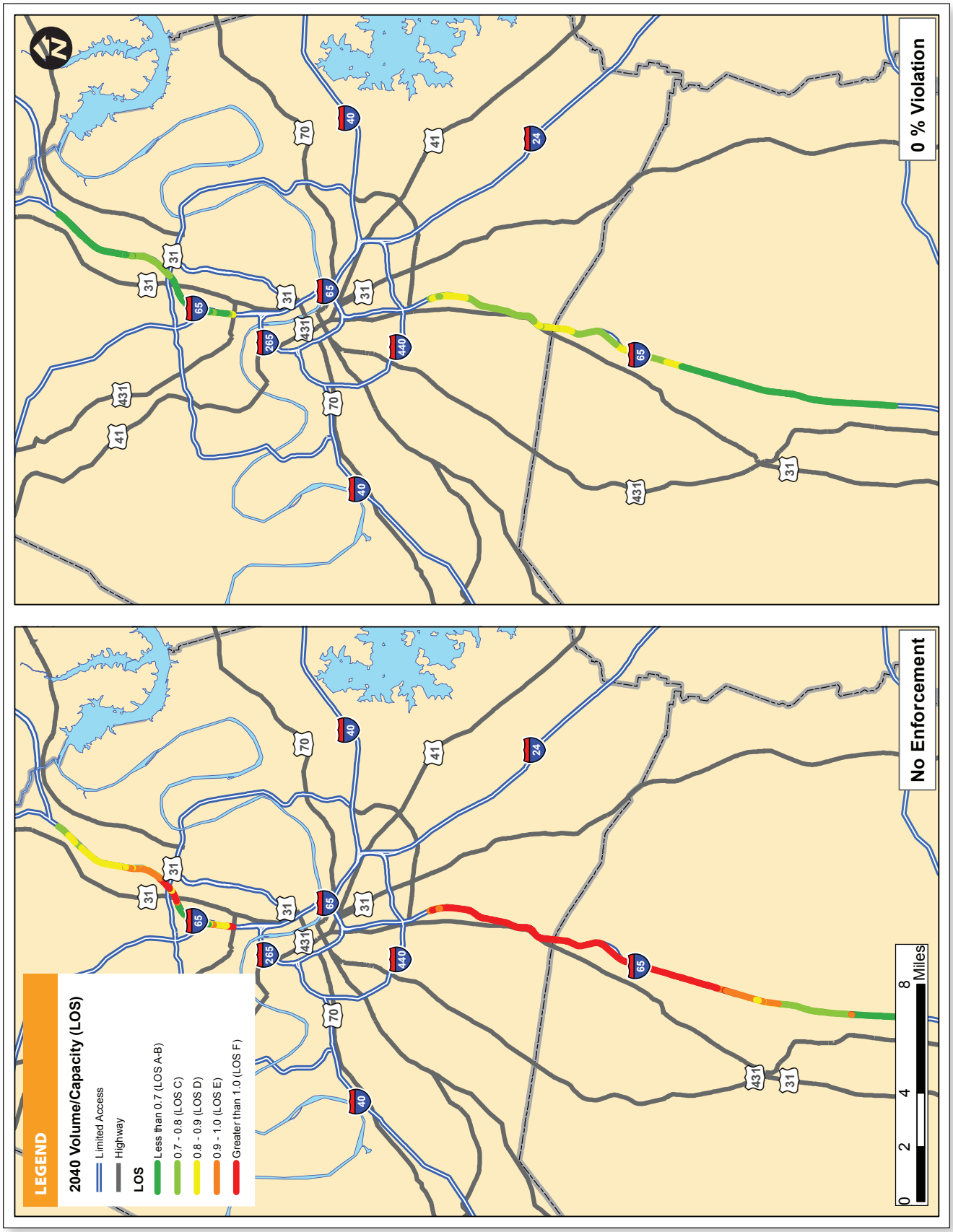
- Brick Church Pike;
- US-41;
- US-31E; and
- Gallatin Pike.

The remaining four routes serve south of Nashville. These routes are:

- Granny White Pike;
- US-31;
- Powell Avenue; and
- US-41A.

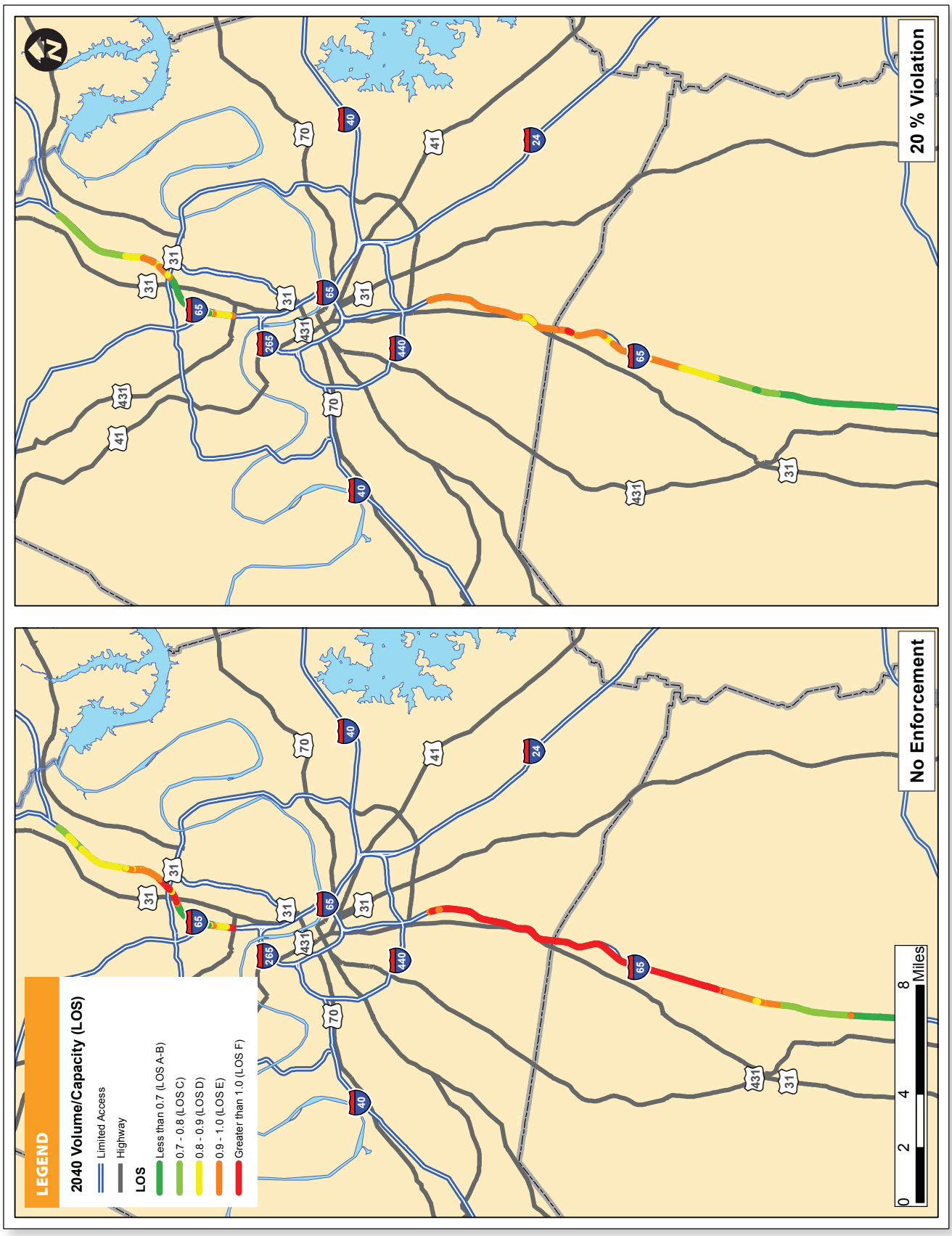
Most of these routes do not have the capacity to accommodate the entire I-65 volume. However, in case of emergency a single route or a combination of routes could be used as alternatives to I-65. To understand the conditions of these routes the LOS of these corridors are mapped with I-65 in Figure 4-9. According to the 2040 V/C ratios from the TSM model, these parallel routes operate at a much better LOS than I-65. Therefore, these routes generally have available capacity and could be considered as acceptable alternatives for I-65 should a need exist. More detailed analysis including LOS analysis during the morning and afternoon peak hours is highly recommended to understand the reliability of these routes as the statewide model is limited to daily V/C ratios. Active arterial management, discussed in Section 5 (Intelligent Transportation Systems) will play an important role in maximizing the combined operational performance of I-65 and parallel arterials.

Figure 4-7. HOV Lane Level of Service: Zero Percent Violation



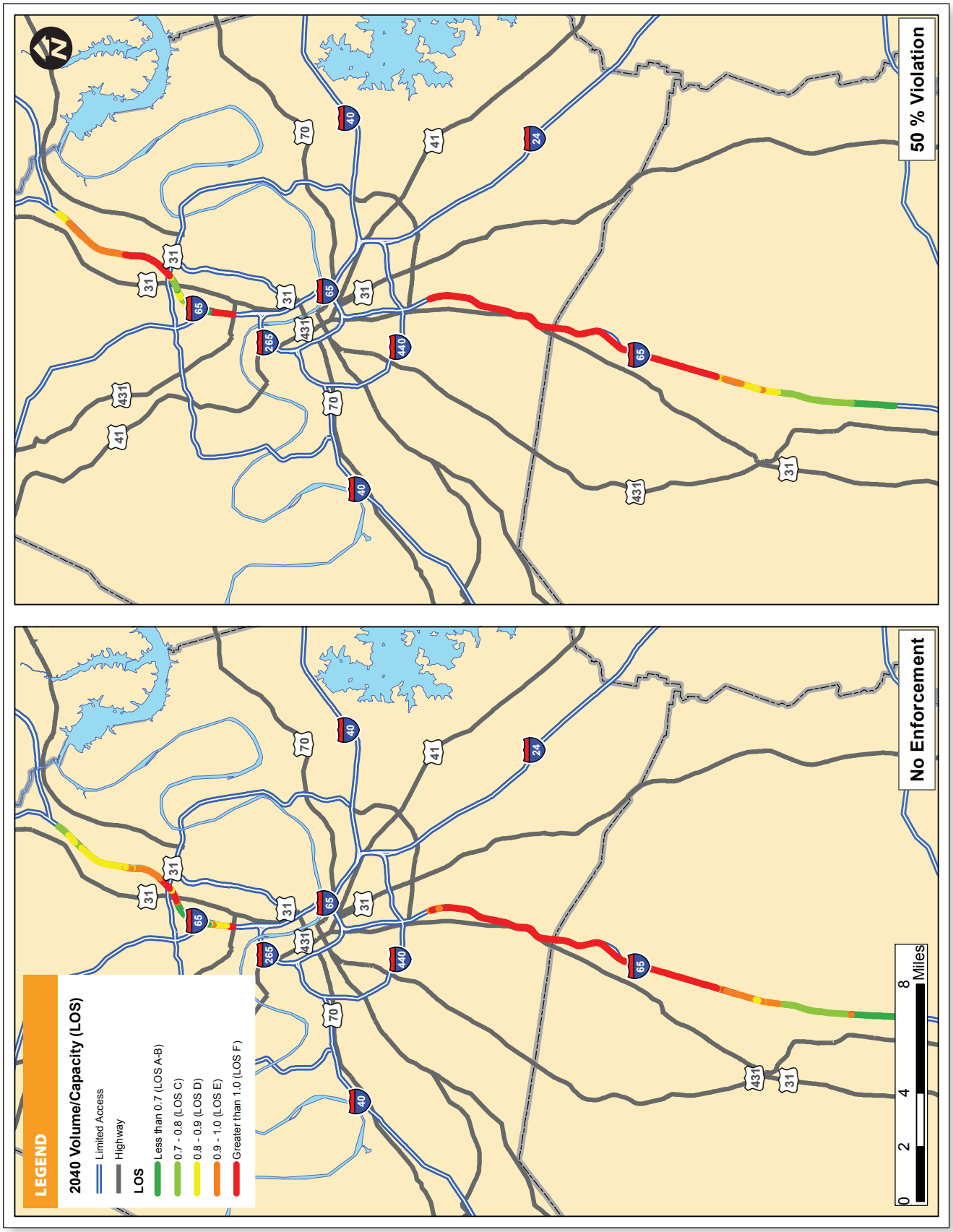
Source: Statewide Travel Demand Model, Version 2

Figure 4-8. HOV Lane Level of Service: 20 Percent Violation



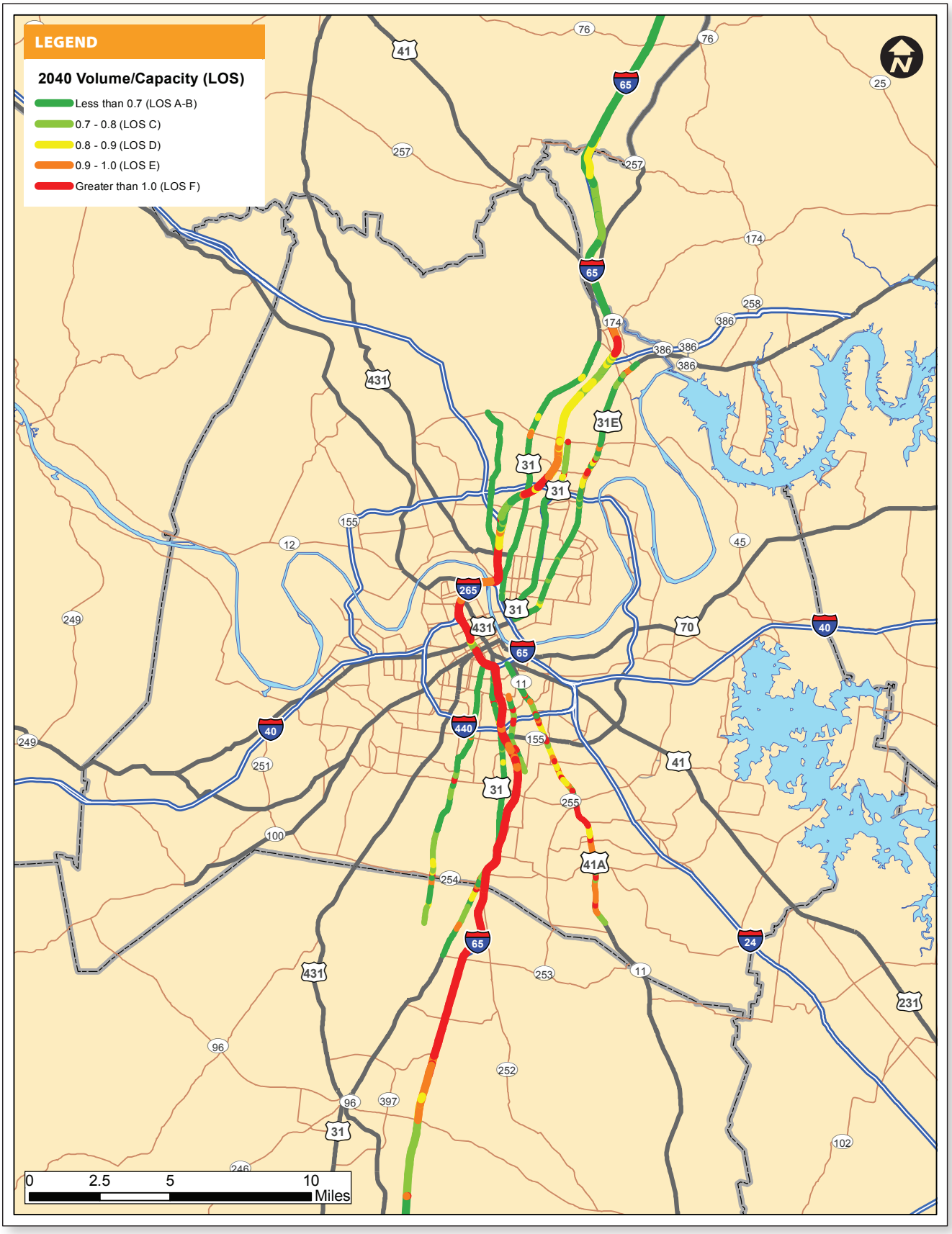
Source: Statewide Travel Demand Model, Version 2

Figure 4-9. HOV Lane Level of Service: 50 Percent Violation



Source: Statewide Travel Demand Model, Version 2

Figure 4-10. Parallel Routes Level of Service (2040 Build)



Source: Statewide Travel Demand Model, Version 2

5. Intelligent Transportation Systems

After examining the Intelligent Transportation Systems (ITS) needs in the I-65 corridor, potential solutions were identified for the corridor overall as well as each subarea. ITS solutions include both physical device deployments and operational strategies. Table 5-1 and Figures 5-1, 5-2, and 5-3 illustrate the proposed ITS improvements.

5.1 Corridor Wide Solutions

Safety

A significant number of crashes, both rear-end and sideswipe, have been identified throughout the I-65 corridor. Areas with higher numbers of incidents include:

- **North Sub-Area:** South of Goodlettsville from north of the I-24 interchange to the SR 386 merge area;
- **Central Sub-Area:** South Downtown Nashville Loop (the area between the I-40/I-65 interchanges); and
- **South Sub-Area:** Cool Springs interchange.

To address rear-end incidents along I-65, additional dynamic message signs (DMS) are recommended at strategic locations to provide drivers with information on downstream conditions. Possible messages include "Incident – Slow Traffic Ahead,""Congestion - Reduce Speed Ahead," and "Accident Right Lane Closed Move Left." By informing drivers of the need to reduce speeds well ahead of the incident, the potential for rear-end collisions can be reduced providing safer roadways for all motorists. Additionally, if messages about major incidents can be provided on a DMS well ahead of the incident and before major decision points, truck drivers and other motorists can adjust their routes accordingly. Several studies have shown that drivers with travel time information can better "manage their expectations," reducing driver frustration and enhancing driver safety.

Connected Vehicles/Dedicated Short Range Communications (DSRC)

It is recommended that all new ITS device deployments have DSRC reader equipment installed to capitalize on connected vehicle technology benefits. DSRC is a two-way short/medium range wireless communication that allows for very high data transmission between vehicles (vehicle-to-vehicle or V2V) and with infrastructure (vehicle-to-infrastructure or V2I). By installing DSRC technology in conjunction with other field devices, TDOT will able to harness data generated from vehicles that utilize the state highway system. The data will allow TDOT to provide more detailed information directly to drivers as well as give the department a better understanding of existing conditions including road weather, emissions, and safety conditions. By outfitting TDOT HELP trucks and other TDOT vehicles with on-board DSRC units, TDOT will be able to gather data for their roadways without waiting for the public to fully adopt the technology.

Freight/Truck

By identifying the needs of the freight community, ITS solutions can enhance the experience of truck drivers. Potential freight-related ITS opportunities include virtual weigh stations and smart truck parking. Currently there is only one weigh station on the I-65 corridor near the Kentucky border, which could be converted to a virtual station. By pre-screening for certain operating characteristics, such as speed and height, virtual weigh stations can improve the enforcement of commercial motor vehicles over traditional random selection and monitor conditions continuously. Additional stations could be added between the existing station and the Alabama border to allow for better regulation of overweight vehicles and in turn extend the life of the existing pavement along I-65. Smart truck parking locations along the corridor would provide dedicated areas for trucks and aid in eliminating trucks parking on ramps. Potential locations for this deployment include the existing rest areas near Exit 22/US 31A, Exit 46/US 412, and at the Kentucky state line.

Traffic Incident Management Strategies

A dedicated Traffic Incident Management (TIM) team is another operation solution that could be deployed along I-65. TIM programs are used to reduce incident-related travel delays. While regional TIM teams exist in Tennessee, the proposed team would be a group

Table 5-1. ITS Improvements

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
0-1	Rapid Incident Scene Clearance (RISC)	Kentucky	Alabama	Contractual incentive-based program and operational policy to support open roads initiative related to truck crashes; North and South options	122.0	All	North, Central, and South
0-2	Conversion to Virtual Weigh Stations	Kentucky	Alabama	Portland weigh station	122.0	All	North, Central, and South
0-3	Smart Truck Parking	Kentucky	Alabama	Location TBD; Potential sites include the existing rest areas near Exit 22, Exit 46, and the Kentucky state line	122.0	All	North, Central, and South
0-4	I-65 Traffic Incident Management (TIM) Team	Kentucky	Alabama	North and South options	122.0	All	North, Central, and South
0-5	I-65 North ITS	Exit 108	Kentucky border	Install CCTV, DMS, and detection devices including fiber optic connections on I-65; Suggested DMS locations: SR-25/Main St (Exit 112) NB and SB, and SR-52 (Exit 117) SB.	13.0	Sumner	North
0-6	Connected Vehicle Technology Deployment	I-840	SR-76 (Exit 108)	Install DSRC radios	49.0	Davidson, Robertson, Sumner, and Williamson	North and Central
0-7	Adaptive Ramp Metering (ARM)	Exit 108 (SR-76)	Exit 90 (SR-155)	Install adaptive ramp metering devices and additional detection at 6 ramp locations in each direction	18.0	Davidson, Robertson, and Sumner Counties	North and Central
0-8	Adaptive Ramp Metering (ARM)	Exit 88 (I-24)	Exit 80 (US-440)	Install adaptive ramp metering devices and additional detection at 6 ramp locations in each direction	8.0	Davidson	Central
0-9	Dynamic on-ramp assignment - Southbound	Charlotte Ave	I-40/I-65 Split	Add arterial DMS along 14th Ave, add interstate shields or use gantries for junction pre-positioning on on-ramps and interstate facilities	1.0	Davidson	Central
0-10	Dynamic on-ramp assignment - Northbound	Broadway (US-70A)	I-40/I-65 Split	Add arterial DMS along 14th Ave, add interstate shields and deploy lane control gantries for junction pre-positioning on on-ramps and interstate facilities	1.0	Davidson	Central
0-11	Adaptive Ramp Metering (ARM)	Exit 80 (US-440)	Exit 53 (SR-396)	Install adaptive ramp metering devices and additional detection at 9 ramp locations in each direction	27.0	Davidson and Williamson	Central and South
0-12	Active Arterial Management US 31 E/Gallatin Pike	Rivergate Pkwy	Spring Street	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	10.0	Davidson	North and Central
0-13	Active Arterial Management (AAM) Dickerson Pike	US-31 W/ Louisville Hwy	US-431/ Trinity Ln	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	10.0	Davidson and Sumner	North and Central
0-14	Active Arterial Management (AAM) Franklin Rd	Demonbreun	Mack Hatcher	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	18.0	Davidson and Williamson	Central
0-15	Active Arterial Management (AAM) Nolesville Pike (US-41)	Korean Veterans Blvd	Old Hickory Blvd	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	9.0	Davidson	Central

Table 5-1. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
0-16	Active Arterial Management (AAM) Old Hickory Blvd	Hillsboro Rd (US-431)	US-41	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	15.0	Davidson	Central
0-17	Active Arterial Management (AAM) Hillsboro Rd (US-431)	Broadway (US-70A)	Mack Hatcher	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	16.0	Davidson and Williamson	Central
0-18	Active Arterial Management (AAM) Nolensville Pike (US-41)	I-840	US-231/ Colloredo Blvd/Lane Pkwy	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	28.0	Williamson, Rutherford, and Bedford	South
0-19	I-65 South ITS	MM 57.6	Alabama border	Install CCTV, DMS, and detection devices including fiber optic connections on I-65; Suggested DMS locations: SR-396/Saturn Pkwy (Exit 53) NB and SB, SR-50/New Lewisburg Hwy (Exit 37) NB and SB, and SR-11/Alt US-31/Sam Davis Hwy (Exit 22) NB.	67.0	Maury and Giles	South

that was solely focused on the I-65 corridor. Since needs differ across the corridor, a team for the north component and the south component would be appropriate.

Additionally, a Rapid Incident Scene Clearance (RISC) strategy could be deployed along the corridor to aid in the removal of trucks that are involved in incidents. This strategy is a contractual, incentive-based program that utilizes heavy duty wreckers when there are incidents that involve a rollover blocking one or more lanes, an incident with multiple trucks, lost loads that impact travel along the corridor, and incidents that involve impacts with or on top of barrier walls, guardrails, or bridge supports. The strategy includes operational policy as well that supports the open roads initiatives with incentives provided for meeting clearance performance measures. Similar to the TIM teams, a north and south option could be deployed to address the different needs of the corridor.

Interstate System Management and Operations Strategies

Additional closed-circuit television (CCTV), detection, and DMS installed from Exit 108/SR 78 to the Kentucky border and from I-840 to the Alabama border would provide the department with additional information on these sections of the corridor and preposition them for future operational strategies that may need to be deployed. Currently real-time information about these two areas is limited to third party data and driver calls. By deploying additional devices, the department would be able to monitor traffic congestion and deploy mitigating strategies. Deployments to the state lines will also allow the for coordinated operations with the adjoining states.

5.2 North Sub-Area Solutions

The northern section of I-65 experiences directional congestion in the AM and PM peak periods as drivers travel to and from the Nashville area. By 2040, LOS for this area is estimated to be at LOS D and E for much of the corridor. To address these deficiencies and needs, two operational strategies are proposed: adaptive ramp metering and active arterial management.

Although adaptive ramp metering (ARM) should be considered primarily for the central section of I-65, some ARM deployment will be required in the northern section for a successful operational strategy in the central section. ARM can be deployed via two different algorithms: corridor adaptive ramp metering (CARMA) and system-wide adaptive ramp metering (SWARM). CARMA meters ramps based

Figure 5-1. ITS Improvements Map: North Sub-Area

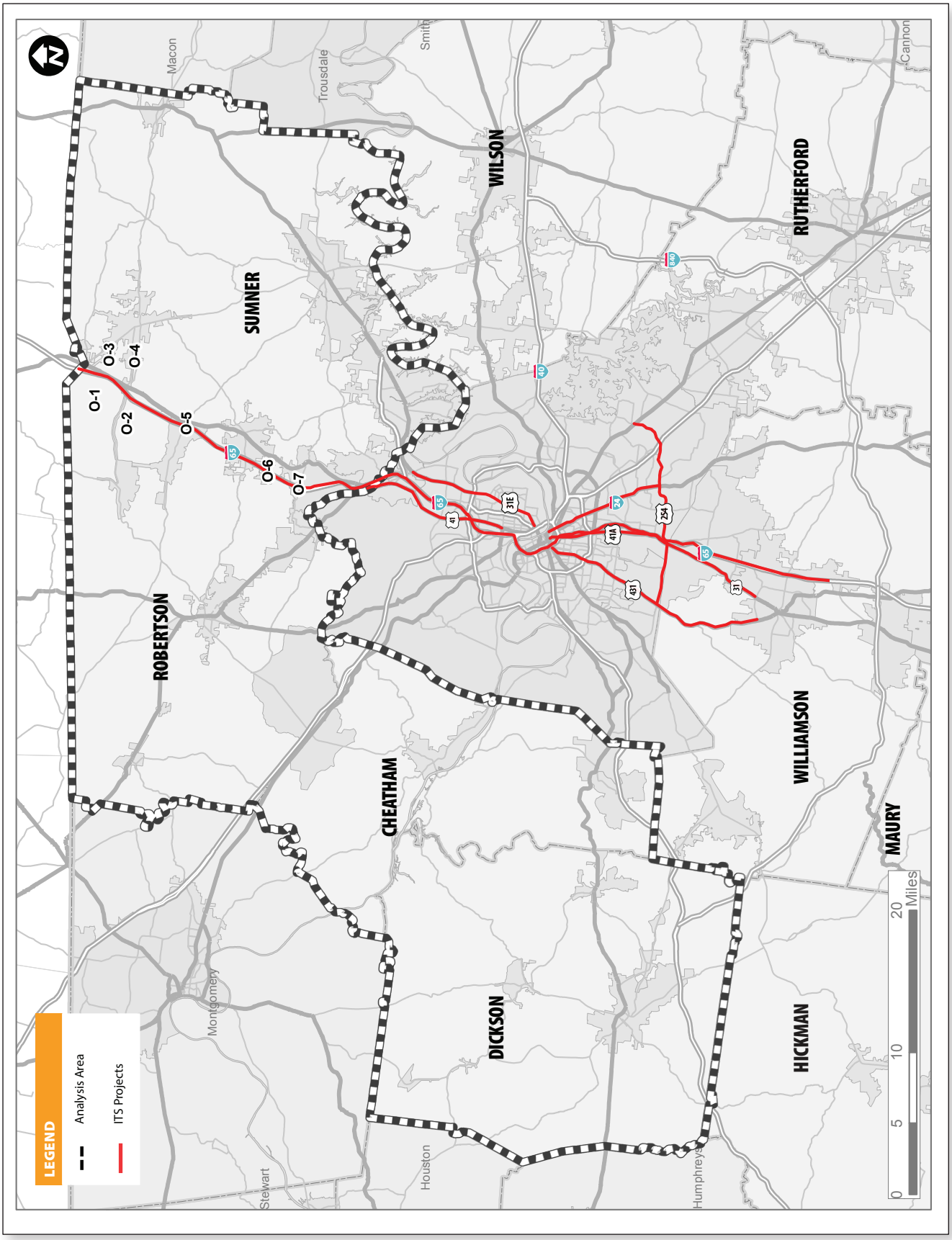


Figure 5-2. ITS Improvements Map: Central Sub-Area

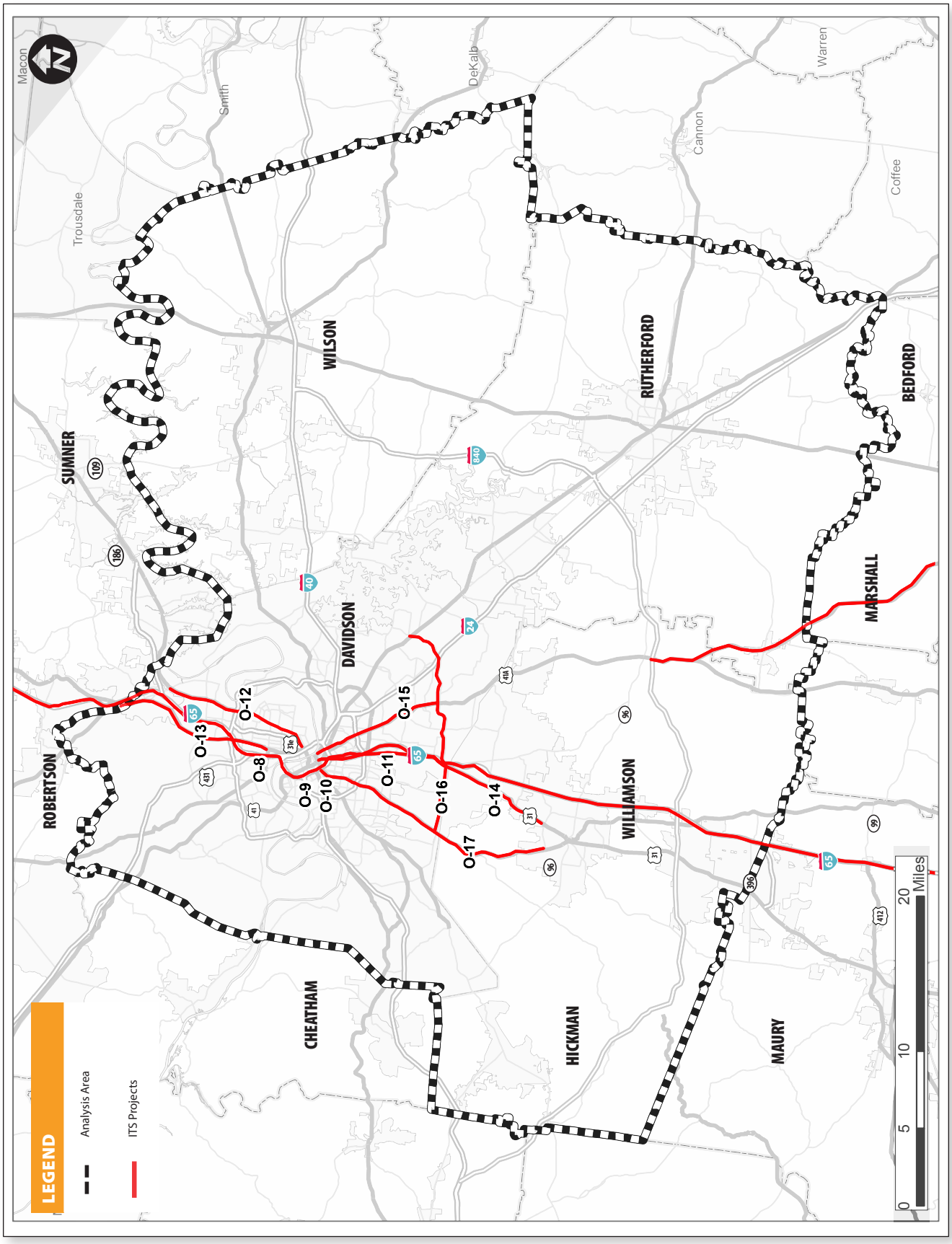
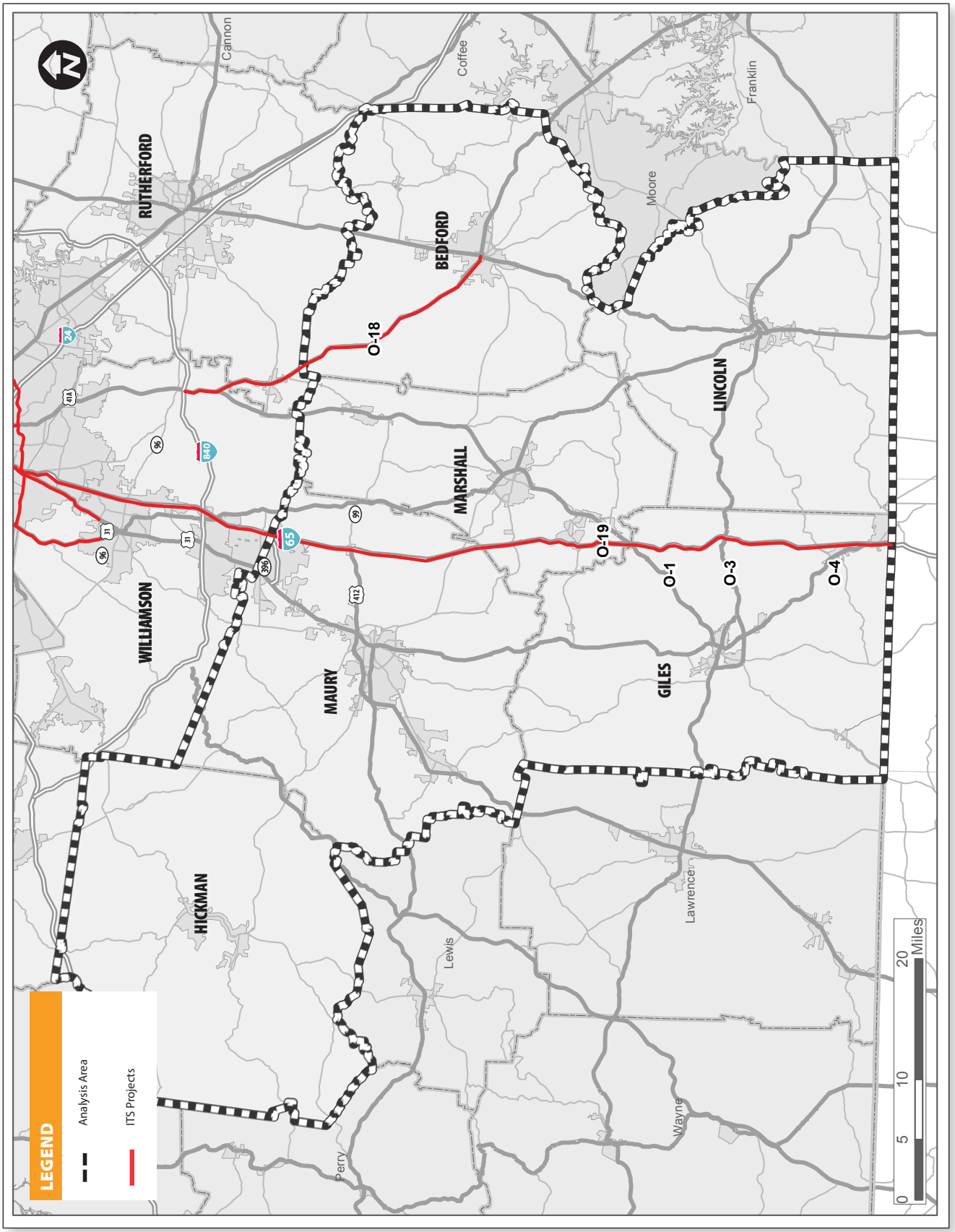


Figure 5-3. ITS Improvements Map: South Sub-Area



on mainline speeds and local controller conditions to optimize metering and allow for the maximum vehicles to enter the facility when speeds are high on the mainline and allow no vehicles when speeds are near optimal. SWARM meters based on current density, required density, and the number of vehicles that should be added or removed from the facility between ramps. For this strategy, upstream ramps are called to action when a single ramp has exceeded its capacity. This option allows for locally, manually, and varied algorithms to be utilized along a corridor, which makes it a good candidate for I-65. Recommended locations for this operational deployment would include the interchanges of SR 386/Vietnam Veterans Boulevard (Exit 95) and US 31W/Louisville Highway (Exit 98). As population grows north of Nashville, additional interchanges may need to be added to the ramp metering strategy including SR 257/Bethel Road (Exit 104) and SR 76 (Exit 108). Deployments would require mainline and ramp detection, metering devices, and coordination with signalized intersections on the arterials that feed the entrance ramps.

To aid in alleviating the congestion on I-65 in the northern section, active arterial management (AAM) is also proposed on Dickerson Pike from US 31W/ Louisville Highway to US 431/Trinity Lane. The goal of AAM is to increase throughput on corridors by minimizing congestion and reducing delays. AAM optimizes signal timings and addresses the real-time conditions of the corridor. By optimizing travel along Dickerson Pike, drivers will have an alternative route to I-65 for travel to and from Nashville. To maximize the benefit of utilizing an alternative route, drivers would need to know that travel times along the alternative would meet or outperform the travel times of I-65. Another potential AAM parallel corridor in the north section is US 31W/ Gallatin Pike from Rivergate Parkway to Spring Street. Both alternative route options would require memoranda of understanding (MOUs) with the signal maintaining agencies, operational support to optimize the signal timings and detect incidents along the corridor, and last mile connectivity.

5.3 Central Sub-Area Solutions

Within the central section, there are several on- and off-ramps that are closely spaced together, particularly in the downtown Nashville area. This spacing creates a significant number of weaves and bottleneck conditions as noted in Section 4. To address these conditions as well as the congestion along this section of I-65, ARM is a potential solution due to its ability to reduce overall freeway congestion by limiting the number of vehicles entering the facility and minimizing platoons that can create difficult merge conditions. One caveat for ARM's success is the need to coordinate signal timing within adjacent intersections. Deployments would require mainline and ramp detection, metering devices, and coordination with signalized intersections on adjacent arterials. Similar to the need for the northern section's ARM, deployments to the south of the central section will be needed to support this strategy. For the central section of I-65, ramp metering strategies would be potential solutions at the following locations:

- **North of Downtown:** SR-386/Vietnam Veterans Boulevard (Exit 95), SR-45/Old Hickory Boulevard (Exit 92), US-41/Dickerson Pike (Exit 90A), and US-431/Trinity Lane (Exit 87);
- **Downtown:** US-41A/Rosa L. Parks Boulevard (Exit 85), Charlotte Avenue/US-70, Church Street, Broadway, and Demonbreun Street; and
- **South of Downtown:** Wedgewood Avenue (Exit 81), Armory Drive (Exit 79), SR-255/Harding Place (Exit 78), and SR-254/Old Hickory Boulevard (Exit 74A and 74B).

The south loop area between the I-40 and I-65 junctions has been identified as an area of particular focus for potential ITS strategies. In addition to ARM, the deployment of dynamic ramp assignments/ closures to the southbound on-ramps between Charlotte Avenue and the south I-40/I-65 interchange and to the northbound on-ramps between US 70A/ Broadway and the north I-40/I-65 interchange could be introduced. The intent of this strategy is to allow drivers time to negotiate the merging conditions and then enter the marked lane for either I-40 or I-65. This recommendation would limit the need for drivers to cross multiple lanes of traffic after entering the interstate in order to get into the correct lane for their destination. Arterial DMS along 14th Avenue and George L. Davis Boulevard, and possibly along Broadway, Church Street, and Charlotte Avenue, would need to be deployed to inform drivers of the change in operations for the on-ramps. Additionally, gantries (overhead structures) and/or painted interstate shields would need to be deployed on the on-ramps and interstate to inform drivers of the correct on-ramp to use during managed times as well as what lanes should be utilized for each interstate. For the northbound direction, the strategy would likely only

need to be deployed in the PM peak periods; however, for the southbound direction, the strategy could be deployed in the AM and PM peak periods.

AAM strategies could provide congestion relief for I-65's central section, including the following corridors:

- US-31/Franklin Road;
- US-41/Nolensville Pike;
- SR-254/Old Hickory Boulevard; and
- US-431/Hillsboro Road.

To the west of I-65, the options include Franklin Road from Demonbreun Street to US 431/Mack Hatcher Memorial Parkway and US 431/Hillsboro Road from US 70A/Broadway to Mack Hatcher Memorial Parkway. Both options would require coordination with Metro Nashville-Davidson County, the City of Brentwood, and the City of Franklin in order to have an effective operational strategy. To the east of I-65, US 41/Nolensville Pike from Korean Veterans Boulevard to SR 254/Old Hickory Boulevard would require coordination with Metro Nashville and the City of Brentwood for operation. SR 254/Old Hickory Boulevard from US 431/Hillsboro Road to US 41/ Nolensville Pike could also provide congestion relief as a connector between the two AAM corridors. For each of the AAM corridors, MOUs, last mile connectivity between intersections, and signal timing optimization and incident detection would be needed.

Within the Cool Springs area, ARM has been identified as a potential solution. Additional opportunities include the use of hard shoulder running and transit signal priority (TSP). Potential ARM deployments include the following locations:

- SR-253/Concord Road (Exit 71);
- SR-441/Moores Lane (Exit 69);
- Cool Springs Boulevard (Exit 68);
- McEwen Drive (Exit 67); and
- SR-96/Murfreesboro Road (Exit 65).

As Williamson County's population continues to grow, ARM strategies may also be appropriate for deployment at the interchanges from SR 248/Goose Creek Bypass/Peytonsville Road (Exit 61) to SR 396/ Saturn Parkway (Exit 53). US 41 is also an opportunity for AAM between US 231/Colloredo Boulevard in the south sub-area and I-840 due to the growth anticipated in the Shelbyville area. By coordinating with the municipalities along the corridor and surrounding areas, drivers will have additional options when traveling to and from the Franklin and Nashville business districts.

Hard shoulder running applications in the locations surrounding the Cool Springs area would be an appropriate effective strategy. The area is expected to see significant increases in trips in the future and hard shoulder running would expand the capacity of I-65. It is recommended that this strategy only be for light vehicles due to the existing pavement and geometric constraints of the roadway. Finally, the implementation of TSP to support future express bus routes along Mallory Lane and Carothers Parkway within the Cool Springs Area would enhance the service and minimize impacts on normal traffic operations.

6. Freight

This section identifies freight-related mobility constraints in the study area and develops a set of potential solutions that can improve freight mobility and enhance efficient and safe freight movement. These improvements will ultimately promote access to economic areas and generators. The recommendations are based on projected freight demand from various sources. In addition to mainline and interchange improvements, there are number of system management and operation strategies than can expand freight options, including:

- Managed lanes;
- Parallel corridors;
- Freight arterial bottlenecks;
- Dedicated freight corridors;
- Speed modifications;
- Freight diversion strategies; and
- Traffic management strategies.

6.1 Mainline Improvements

Figure 6-1 illustrates interstate highway sections within the study area that may require capacity expansion to address volume-to-capacity (V/C) ratios greater or equal to 0.8 (LOS D) and truck percentages (TP) greater than 20 percent. Highway capacity improvements identified in Section 4 will address the primary area of concern on I-65 north of SR 386/ Vietnam Veterans Boulevard. Complementing the capacity projects, Table 6-1 and Figure 6-2 highlight a series of recommended improvements to mitigate freight bottlenecks in Davidson County.

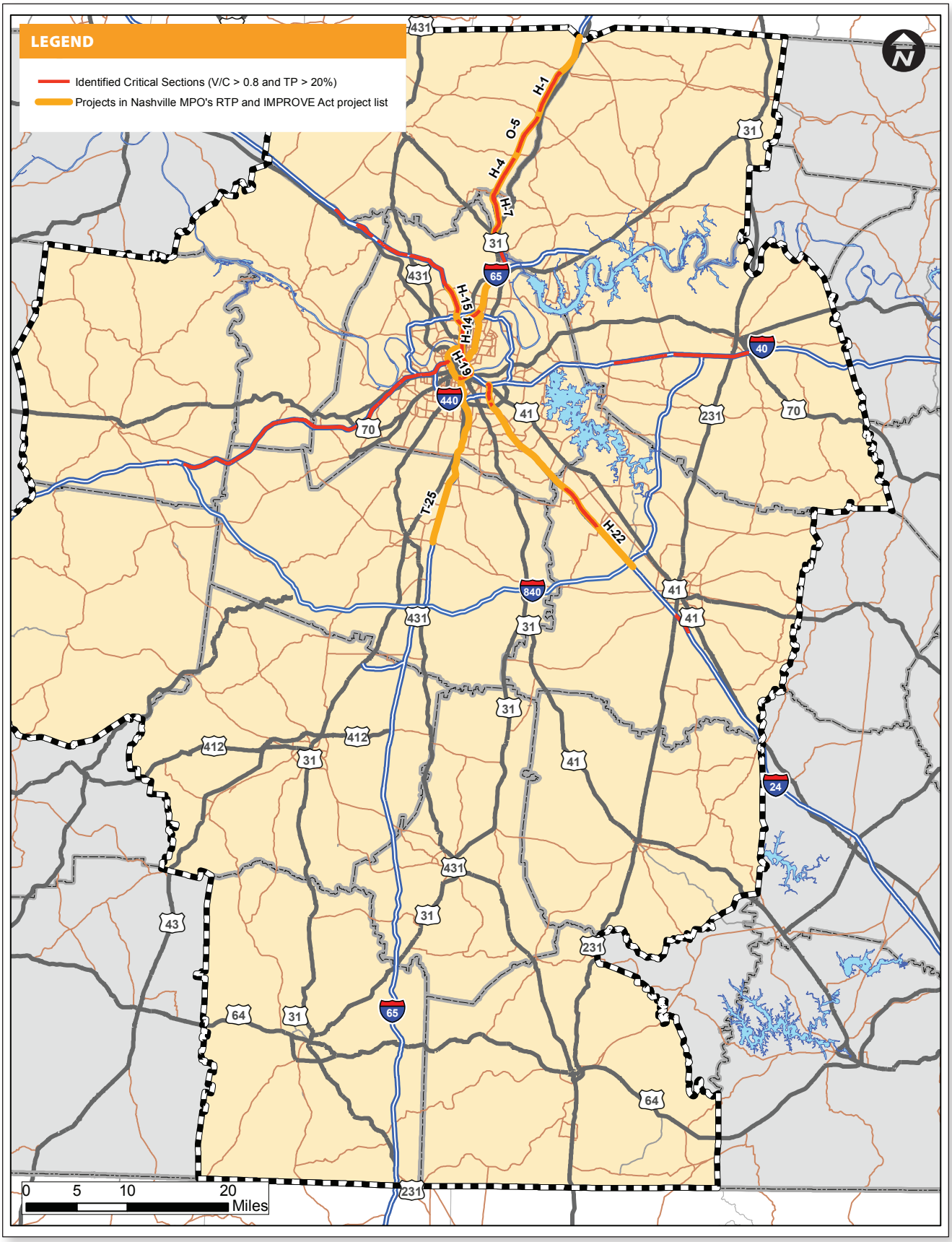
6.2 Interchange Improvements

As part of the interchange analysis (see also Section 4.2), freight operations were evaluated to determine if they are contributing to congestion problems in each of the identified interchanges. Ten interchanges were studied for additional improvements such as ramp

Table 6-1. Freight Improvements

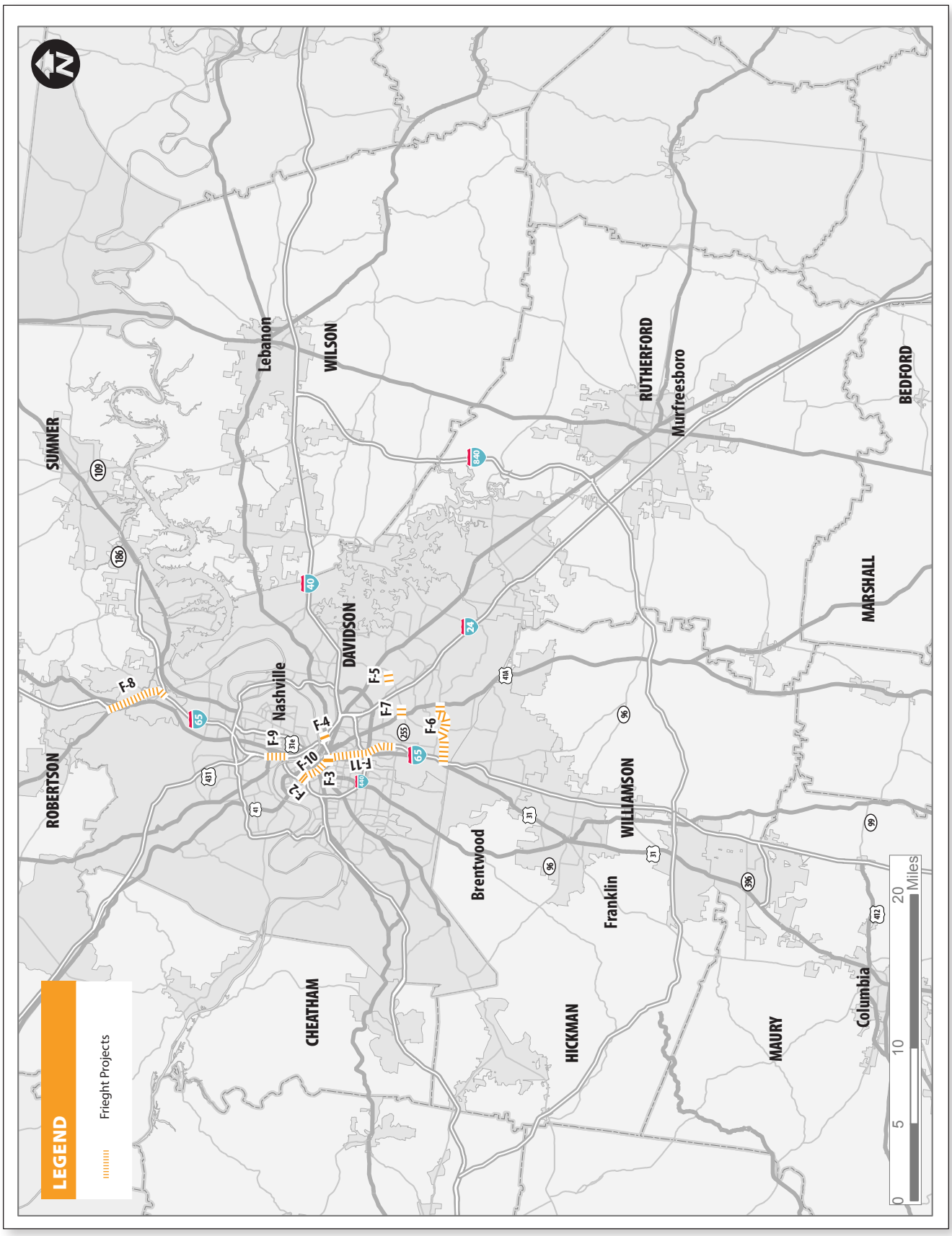
ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
F-1	I-65 Weight Station near TN/KY State Line	N/A	N/A	Roadway Reconstruction and New Weigh Station	0.0	Sumner	North
F-2	I-65	Northbound direction - Diverging area of I-40 and I-65 (West of Nashville Loop)		Diverging area geometry correction - Adding lane(s)	0.2	Davidson	Central
F-3	I-65	Nortbound direction - Merging area of I-40 and I-65 (South of Nashville Loop)		Merge area geometry correction - Adding lane (s)	0.3	Davidson	Central
F-4	Ramp Improvement	Northbound ramp from I-24 to Hermitage Ave		Diverging area geometry correction - Adding lane(s)	0.2	Davidson	Central
F-5	Harding Place (SR-255)	McGavock Pike	Donelson Pike	Widening	0.4	Davidson	Central
F-6	Old Hickory Blvd (SR-254)	I-65	Nolensville Road (US-41A/SR-11)	Widening	4.1	Davidson	Central
F-7	Harding Place (SR-255)	Nolensville Road (US-41A/SR-11)	Jonquil Drive	Widening	0.5	Davidson	Central
F-8	I-65 (NB only)	Rivergate Parkway	US-31W/SR-41	Widen from 4/6 to 8 lanes	5.7	Davidson and Sumner	Central
F-9	I-65/I-24	I-24 junction, south of Fern Avenue	Trinity Lane (US-431)	Replace underpass to accommodate 6 lanes in each direction	1.7	Davidson	Central
F-10	I-65/I-40	I-65 junction (east of Demonbreun Street)	I-40 junction (west of Charlotte Avenue)	Widen to 8 lanes	4.3	Davidson	Central
F-11	I-65	Harding Place (SR-255)	I-40	Widen from 6 to 8 lanes	9.7	Davidson	Central

Figure 6-1. Projected 2040 Interstate Truck Percentages



Source: Statewide Travel Demand Model, Version 2

Figure 6-2. Freight Improvements



widening, revising merging/diverging areas, widening shoulders, and adding dedicated turning lanes.

Similar to the mainline improvements, for an interchange to be considered as a bottleneck for freight operations, V/C ratios and truck percentages should be greater than or equal to 0.8 and 20 percent, respectively. The ten interchanges were separately analyzed for the 2010 through 2040 time periods. Based on the analysis, congestion at four interchanges is considerably impacted by truck movements:

- Exit 104/Bethel Road;
- Exit 98/US 31W;
- Exit 96/Rivergate Parkway; and
- Exit 95/Vietnam Veterans Boulevard.

6.3 Managed Lanes

Under the broader umbrella of managed lanes, truck only toll (TOT) lanes are one potential strategy for mitigating truck traffic especially in the peak direction. While not currently used in the United States, TOT lanes are closely related to the larger issue of whether road pricing should be an important tool for consideration in the I-65 corridor. For this study, the impacts of TOT lanes are categorized into two groups: effects on logistics systems and effects on traffic conditions.

Logistics Systems Effects

Impacts of toll lanes on logistics systems are mainly obtained by movement of trucks to less congested roadways which can lead to a reduction in operating costs for the freight operator and in higher driver retention. The effectiveness of toll lanes on logistics decisions are primarily affected by the capability of the carrier to offset the added cost of the tolls (e.g., reduced transport cost and transferability of toll cost to clients), and the extent to which the structure of the logistics system allows implementation of such strategies. Studies have shown that TOT lanes are expected to affect truck utilization, logistics system design, and freight modal choice. In Germany, for example, the tolling scheme increased the cost of moving general cargo by road between five and seven percent. With other conditions remaining the same, it can be expected that a truck tolling scheme will change logistical cost trade-offs made between transport cost and storage, inventory, and administration.

Traffic Condition Effects

The impact of TOT lanes on traffic conditions include changes in truck routing and delivery schedules. In cases where the additional cost cannot be offset, tolling is expected to incentivize utilization of toll free alternative routes which have comparable distance and travel time. The literature, however, offers contradicting findings. In Switzerland, tolling had virtually no impact on vehicle routing which is not surprising considering the fact that all roads are tolled equally. In Germany, only five percent of trucks switched to secondary roads to avoid tolling. In Australia, on the other hand, tolling increased truck traffic volume on secondary roads by about 60 percent.

In addition to truck routing, tolling may affect delivery schedules, especially in cases where tolls vary by time of day. The UK tolling system is the only tolling scheme in Europe in which truck tolls vary by time of day – day and night toll levels. It has been observed that nighttime deliveries in the UK increased from eight-and-a-half percent in 1985 to 20 percent in 2002. However, this change may not be solely attributable to the tolling scheme as day time traffic conditions worsened and warehouses and factories extended their operating hours as well.

In the United States, one study evaluated the impacts of toll level on freight demand diversion on the I-81 corridor in Virginia. The study found that low levels of tolling would not change routing for most commodity types. Coal, however, was sensitive even to low toll levels. The study suggested toll exemption for local freight movement, empty trucks, and special commodity classes. Another study examined the feasibility of implementing truck-only toll lanes (TOT) in Atlanta. TOT lanes are of interest in the Atlanta region because trucks are expected to account for 93 percent of freight movement in the area in 2030. It was found that a TOT facility would reduce total vehicle hours traveled while have little impact on total vehicle miles traveled. Finally, a third study analyzed feasibility of tolling parallel corridors of I-90 and SR 520 in the State of Washington. Results showed that that the introduction of tolling one or both corridors will change truck percentages insignificantly.

TOT lanes may also be introduced to facilities having managed lanes. Currently, there are four managed lane facilities in the US that allow trucks to operate at any time of day: Fort Lauderdale, Florida; Minneapolis–St. Paul, Minnesota; Houston, Texas; and Dallas–Fort Worth, Texas. In the first three examples, truck percentages

in the managed lanes are currently less than two percent. Whether or not trucks started to shift to other routes as a result of tolling was confirmed as traffic conditions in regular lanes were also improved. In Fort Lauderdale, evidence indicated that some auto travelers shifted to the managed lane, freeing up capacity for freight operators and incentivizing them to remain in general purpose lanes.

In closing, if the TOT concept is pursued in the I-65 corridor, its potential impacts on logistical decisions and truck routes and schedules hinges upon the preferences of freight operators and the tolling scheme. Toll lanes that focus on commuters may not serve the routes and schedules of freight operators, and consequently, may not meet truck traffic objectives. An in-depth investigation of different aspects of tolling would help clarify potential freight behavior more accurately in the presence of tolls or other demand management pricing mechanisms.

6.4 Parallel Corridors

Identifying parallel routes for freight is another strategy for accommodating increases in truck traffic through and within the I-65 study area. These corridors, all of which bypass downtown Nashville, are shown in Figures 6-3 and 6-4. Truck travel times and average and maximum V/C ratios for each route were also calculated and are shown in Tables 6-2 and 6-3. The results show only minor monthly variability in route travel times. Travel times (Table 6-2) for all routes, except route E and G, are less than three hours in the AM and PM peaks. Average and maximum V/C ratios (Table 6-3) for all routes are also less than those for I-65. Consequently, routes A, B, C, D, F, and H can be considered as acceptable alternatives for I-65. Among these acceptable alternatives, route F, comprised of SR 109 and I-840, is of particular interest with a travel time less than 30 percent greater than the I-65 travel time. Maximum V/C along this route is only 0.82 in 2010 and 1.56 in 2040. Importantly, route F can be considered as a dependable alternative for I-65 not only at the present time but also in the future.

Figure 6-3. Potential Alternative Freight Routes (A-D)

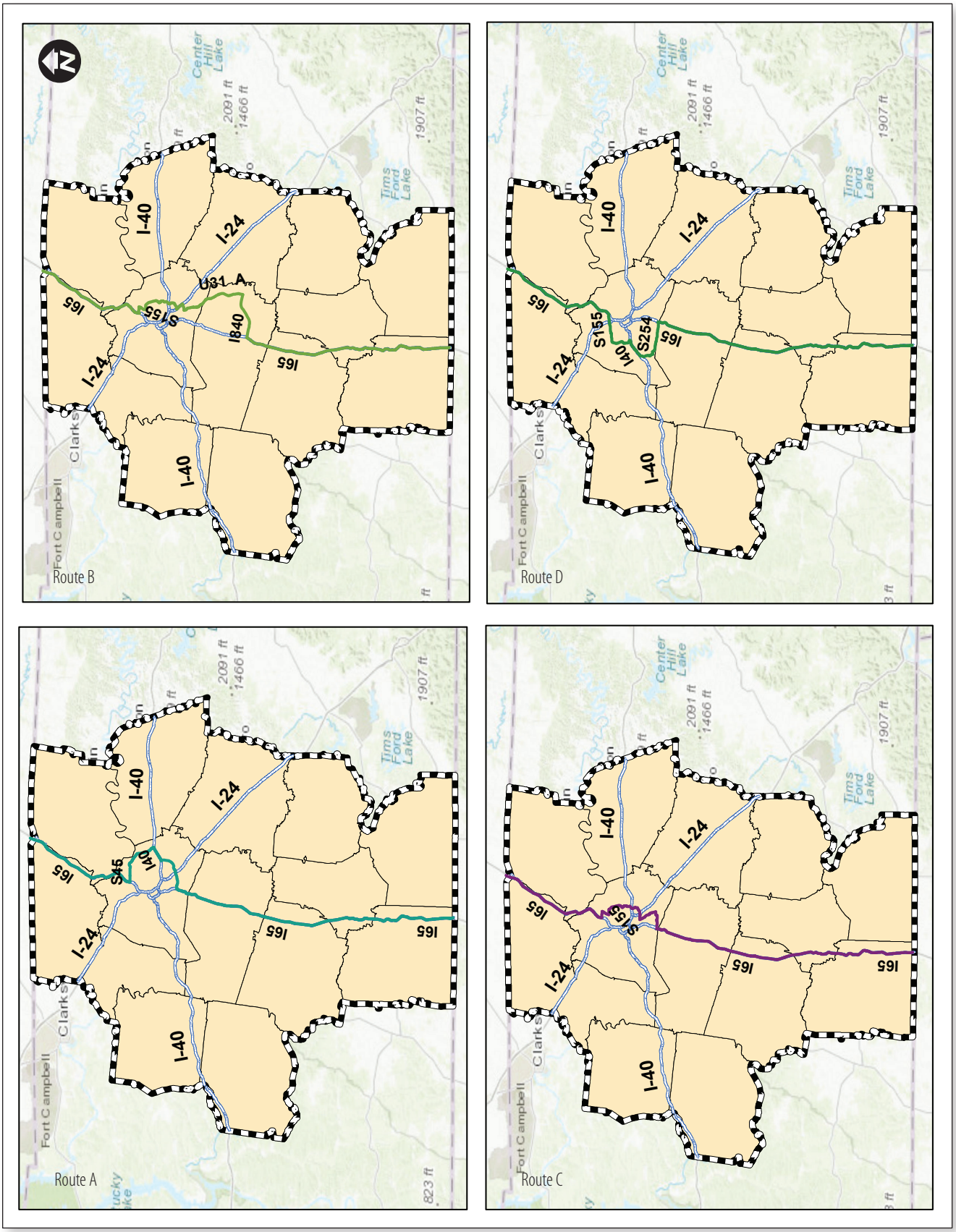


Figure 6-4. Potential Alternative Freight Routes (E-H)

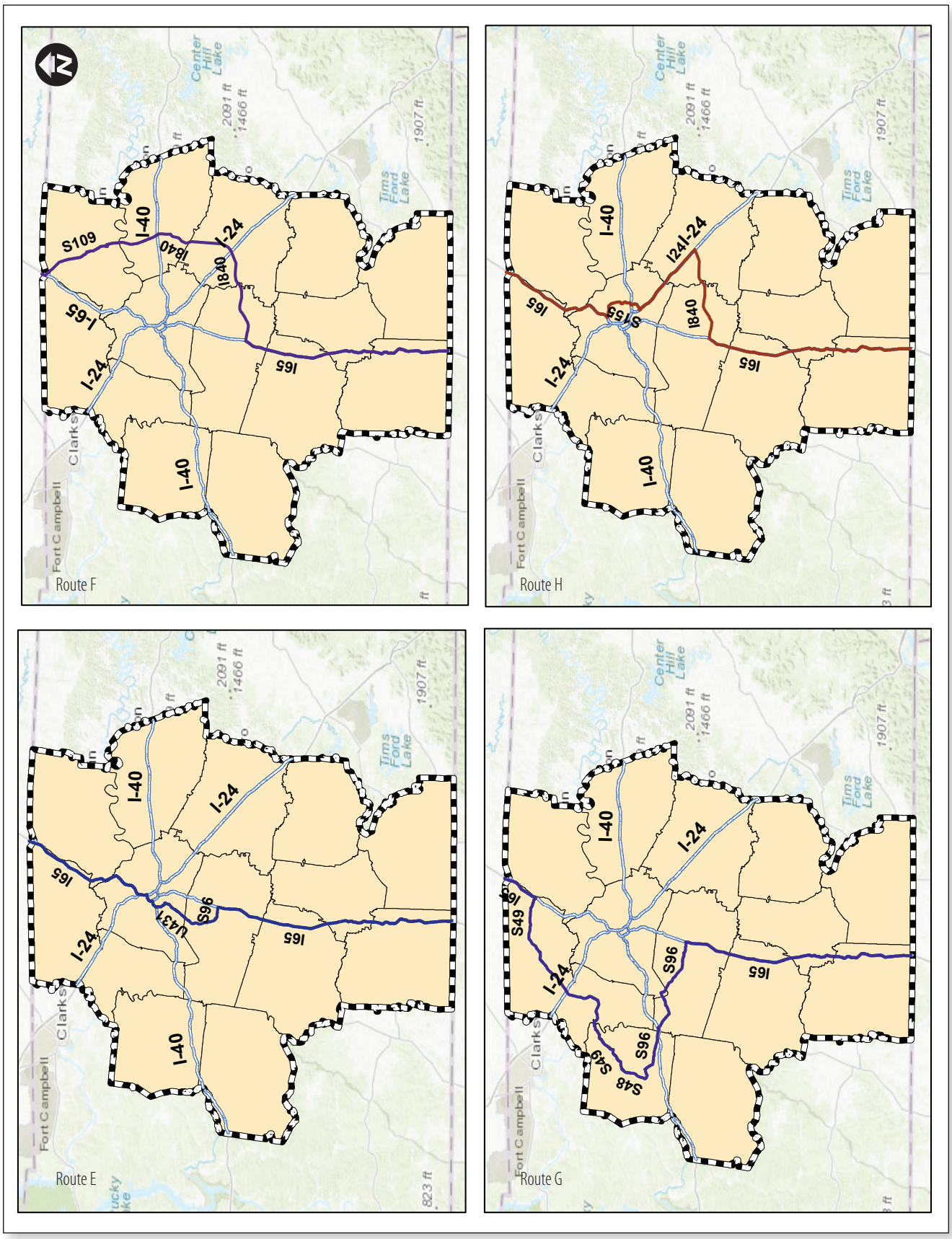


Table 6-2. Potential Alternative Freight Routes: Travel Times

	2010		2020		2030		2040	
Route	AVG V/C	MAX V/C	AVG V/C	MAX V/C	AVG V/C	MAX V/C	AVG V/C	MAX V/C
I-65	0.67	1.65	0.74	1.80	0.81	1.93	0.88	2.05
A	0.51	1.19	0.59	1.36	0.66	1.33	0.73	1.52
B	0.47	1.09	0.57	1.30	0.65	1.50	0.73	1.69
C	0.52	1.38	0.60	1.57	0.68	1.75	0.75	1.91
D	0.54	1.31	0.61	1.55	0.69	1.75	0.76	1.89
E	0.59	1.37	0.66	1.58	0.73	1.71	0.81	1.93
F	0.30	0.82	0.42	1.29	0.51	1.42	0.59	1.56
G	0.29	1.08	0.37	1.39	0.45	1.65	0.53	1.85
H	0.53	1.09	0.63	1.30	0.72	1.50	0.80	1.69

Table 6-3. Potential Alternative Freight Routes: Volume to Capacity

	AM		MD		OP		PM	
Route	TT-NB	TT-SB	TT-NB	TT-SB	TT-NB	TT-SB	TT-NB	TT-SB
I-65	2.26	2.23	2.24	2.22	2.22	2.20	2.25	2.21
A	3.08	3.14	3.05	3.14	3.03	3.13	3.04	3.14
B	2.98	2.98	2.96	2.96	2.95	2.96	2.96	2.96
C	2.82	2.83	2.80	2.82	2.79	2.82	2.79	2.83
D	2.81	2.76	2.80	2.78	2.79	2.77	2.80	2.78
E	3.03	2.99	3.05	2.99	3.06	2.98	3.09	2.99
F	2.92	2.82	2.91	2.80	2.92	2.82	2.92	2.82
G	5.53	5.47	5.47	5.47	5.52	5.57	5.50	5.56
H	2.58	2.61	2.58	2.61	2.57	2.59	2.58	2.59

Evaluating the impact on overall traffic performance measures of rerouting peak period truck traffic to the proposed alternative routes requires detailed route choice information from the travel demand model which is not currently available. In the absence of model data, however, there are steps that can be taken to identify elements needed to implement dynamic truck rerouting (DTR) strategies and understand state of the practice factors affecting DTR effectiveness. In general, DTR will be implemented more efficiently if ITS and connectors to traffic management centers exist, and effectiveness will be increased if DTR is implemented with variable speed limits.

Additionally, DTR can be implemented when:

- LOS during peak period is E or F;
- There are incidents related to severe traffic congestion;
- There exists an alternative route(s) to accommodate rerouted traffic no further than a few miles away;
- There is available capacity on the parallel routes; and
- There is available right-of-way for installation of overhead sign gantries at critical locations.

Some states and cities have already established rerouting plans. The State of Connecticut, for example, developed emergency diversion plans for major expressways in the Department of Emergency Management and Homeland Security (DEMHS) Region 5, a 1,400-square mile area with a population of nearly 600,000. The project's goal was to equip local and state emergency responders with tools to direct vehicles to alternative routes during and after emergency situations and ultimately reduce response time to incidents and improve speed, safety, and efficiency. Alternative routes were developed based on:

- Availability of capacity;
- Appropriateness of geometry (e.g., curve radius and grade standards) for trucks and cars;
- Bridge clearance to accommodate trucks;
- Direction and turn prohibitions; and
- Weight restrictions on bridges.

A set of guidelines was also developed to allow emergency responders to effectively perform rerouting during an incident. Such guidelines should be precise and clear, and should promote interagency cooperation and coordination.

In 2011, the South Alabama Regional Planning Commission studied incidents along Interstates 10, 65, and 165 in Mobile County to identify potential routes for diverging traffic during incidents. Traffic simulation was conducted using Synchro to evaluate the effect of traffic diversion. Routes were chosen based on the following criteria:

- Road type;
- Roadway infrastructure (number of lanes, traffic signals, turn lanes at intersections, etc.);
- Operational constraints (bridge weight restrictions, vertical clearance, traffic geometry, etc.);
- Current traffic demands; and
- Land use served by roadway

Routes were also checked to assure that they "make sense" to typical users. The study acknowledged that rerouting mixed traffic could be challenging because weight, clearance, and geometric restrictions may not allow trucks to follow automobiles. Furthermore, trucks carrying hazardous materials may not be allowed to use some routes. Finally, Seattle, Washington, developed a freight mobility improvement plan in which online information about bridges with weight restrictions and alternative truck routes are provided to users. The rerouting process is expected to diminish recurring congestion. Alternative routes, however, are not responsive to closures caused by incidents.

Although the state of practice is mostly focused on traffic rerouting during incidents or other non-recurring events, there are takeaways for truck rerouting in peak periods. First, availability to hazmat carriers, capacity, road geometry, and weight and clearance restrictions should be meticulously investigated when studying rerouting truck traffic. Second, implementing truck traffic rerouting strategies not only requires appropriate infrastructure, ITS, and traffic management systems but also a clear plan to facilitate interagency communication. Evaluation of alternative routes requires a traffic assignment model to extract route choice information, and a comprehensive study to develop and evaluate truck rerouting strategies for the I-65 corridor should be considered. An ex-post study is also recommended.

6.5 Freight Arterial Bottlenecks

To identify arterial bottlenecks from a freight operations perspective, four special freight generators were analyzed within the study area: Cherokee Marine Terminal, Tennessee Commercial Warehouse, Nashville International Airport, and CSX Radnor Yard. Consistent with previous analysis, sections in which V/C and TP are greater than 0.8 and 20 percent respectively are identified as sections potentially requiring improvement. Results for the 2040 model highlight several bottlenecks, many related to arterials with constrained right-of-way as well as I-24 in the downtown Nashville loop.

- Cherokee Marine Terminal: Jefferson Street between Rosa Park Boulevard and I-65;
- Tennessee Commercial Warehouse: Northbound ramp from I-24 to Hermitage Avenue;
- Nashville International Airport: Harding Place (SR-255) between McGavock Pike and Donelson Pike; and
- CSX Radnor Yard: Old Hickory Blvd (between I-65 and US 41A) and Harding Place (between US-41A and Jonquil Drive).

6.6 Dedicated Freight Corridors

By and large, dedicated truck lanes improve freight movement and promote economic productivity. The latter is expected as truck lanes lower delay cost

imposed to freight shipments and reduce wasted fuel cost. Dedicated truck lanes are of particular interest in areas with steep grades. From a design perspective, the rightmost lane is usually dedicated to trucks. There are also some instances in which truck-only lanes are physically separated from the main roadway (e.g., I-5 north of Los Angeles). Truck lanes may also be tolled in order to incentivize carriers to increase efficiency and move more freight payload per unit of fuel and driver cost. Increased efficiency also reduces the adverse environmental effects of diesel engines. Truck safety can be improved too in truck-only lanes as slow, less maneuverable trucks are separated from passenger cars.

Truck-only lanes, however, can be budget intensive due to the high cost of pavement and special geometry requirements. In general, truck volumes rarely justify implementation of truck-only facilities. Conditions justifying implementation of truck-only lanes include:

- Truck volume percentage greater than 30 percent;
- One-way, peak traffic volumes greater than 1,800 vehicles per lane-hour; and
- Off peak volumes in each direction greater than 1,200 vehicles per lane-hour.

Additionally, the National Highway Freight Program (NHFP) calls for states, in consultation with MPOs, to designate Critical Urban Freight Corridors (CUFC) within urbanized areas. Outside urbanized areas, a public road may meet criteria to be designated as a Critical Rural Freight Corridor (CRFC). In the event that routes which parallel I-65 are designated as a CUFC or CRFC, these routes may become competitive for federal funding to improve the efficiency of freight movement along the corridor.

6.7 Speed Modifications

To address growing safety concerns, states have introduced speed limit policies that can be broadly classified into two categories: uniform speed limits (USL) and differential speed limits (DSL). A uniform speed policy involves setting the same maximum speed limit for all vehicles, while a differential speed limit policy sets a lower limit for heavy trucks and buses.

Differential speed limits were introduced as a result of the 1987 Surface Transportation and Uniform Relocation Assistance Act, which allowed individual states to raise the speed limits from the previous mandated national speed limit of 55 mph to 65 mph. Since 2001, differential speed limits have received mixed reviews from a safety perspective. One study examined safety implications of three speed control strategies: uniform speed limits (USL), differential speed limits (DSL), and differential speed controls with truck speed limiters (MSL). The model was applied to a 3.7 mile stretch of a two-lane highway. The authors concluded that differential speed strategies increased the number and rate of car-truck overtakes which in turn resulted in negative effects on safety. On the other hand, DSL and MSL strategies reduced the number of car-car overtakes at different volumes, and increased safety. A second study evaluated impacts of differential speed limits on rural interstate highways in Idaho by reducing truck speed limit from 75 to 65 mph. The study reported that truck mean speeds reduced to 65.6 mph. Reduction in speed variance and violation rate was also observed and crashes decreased by more than eight percent, but the results were not significant at 95-percent confidence level.

A third study investigated safety impacts of uniform and differential speed limits on urban and rural interstates using nationwide fatal crash data from 1999 through 2011. It was found that total rural interstate fatalities were not significantly different among states with uniform and differential speed limits, but truck- and bus-involved rural interstate crashes were observed to be 25 percent higher in states with uniform speed limits than those with differential speed limits. Over the last decade, US states have modified their speed limit policies. The maximum speed limits have significantly increased for rural interstates and specified segments of roads in the western states. As of April 2017, however, differential speed limit use has declined to seven states.

6.8 Freight Traffic Diversion Strategies

Ongoing improvements in developing a truck route network that can be used in future freight planning projects and analysis will be critical in determining how well the developed network is integrated with freight facilities within the study area. To develop the truck route network, five roadway functional classes in the study area were selected:

- Rural Principal Arterial – Interstate;
- Rural Principal Arterial – Other;
- Urban Principal Arterial – Interstate;
- Urban Principal Arterial – Other Freeways and Expressways; and

- Urban Principal Arterial –Other.

The network was then visually inspected and manually adjusted to ensure that it is well connected with urban areas encompassing major freight generators. The proposed network allows for long haul freight movements with a trip end in the study area as well as truck trips passing through the area. The developed network provides very good access to the regions generating the highest volumes of truck traffic (Figure 6-5). In the most freight intensive areas, the network is also dense which indicates that alternative routes will be available to/from freight generators. For example, the intersection area of I-840 and Horton Highway (US-41A, south of I-840) is an area that will experience significant growth in truck trip generation. The area has access to I-65 via both I-840 and Murfreesboro Rd (SR-96).

Given truck trip concentrations, determining the feasibility of freight villages in the Nashville area would be beneficial. A freight village is defined as an area of land that is devoted to a number of transport and logistics facilities, activities, and services that are not just co-located but also coordinated to encourage maximum synergy and efficiency. Freight villages can especially improve freight productivity in areas where the number of warehouse and distribution facilities are likely to increase. Freight village integration in freight intensive areas can be beneficial by providing sufficient infrastructure to facilitate efficient movement of freight, promoting economic development and reducing total traveled truck miles.

6.9 Traffic Management Strategies

Managing freight movement in metropolitan regions has become increasingly important as central cities and surrounding counties continue to grow. New technologies and logistic networks are also remaking how freight and goods flow in and out of urban areas.

Urban Freight Solutions

Last mile delivery and first mile pickup have become critical parts of the supply chain, as the cost of moving goods from transportation hubs to final destinations in urban areas has reached upwards to 30 percent of the total cost of moving goods. As urban freight planning has gained increased attention, different strategies and programs have been proposed to address the last mile challenge including off-hour delivery, time slotting of pickups, and new innovations.

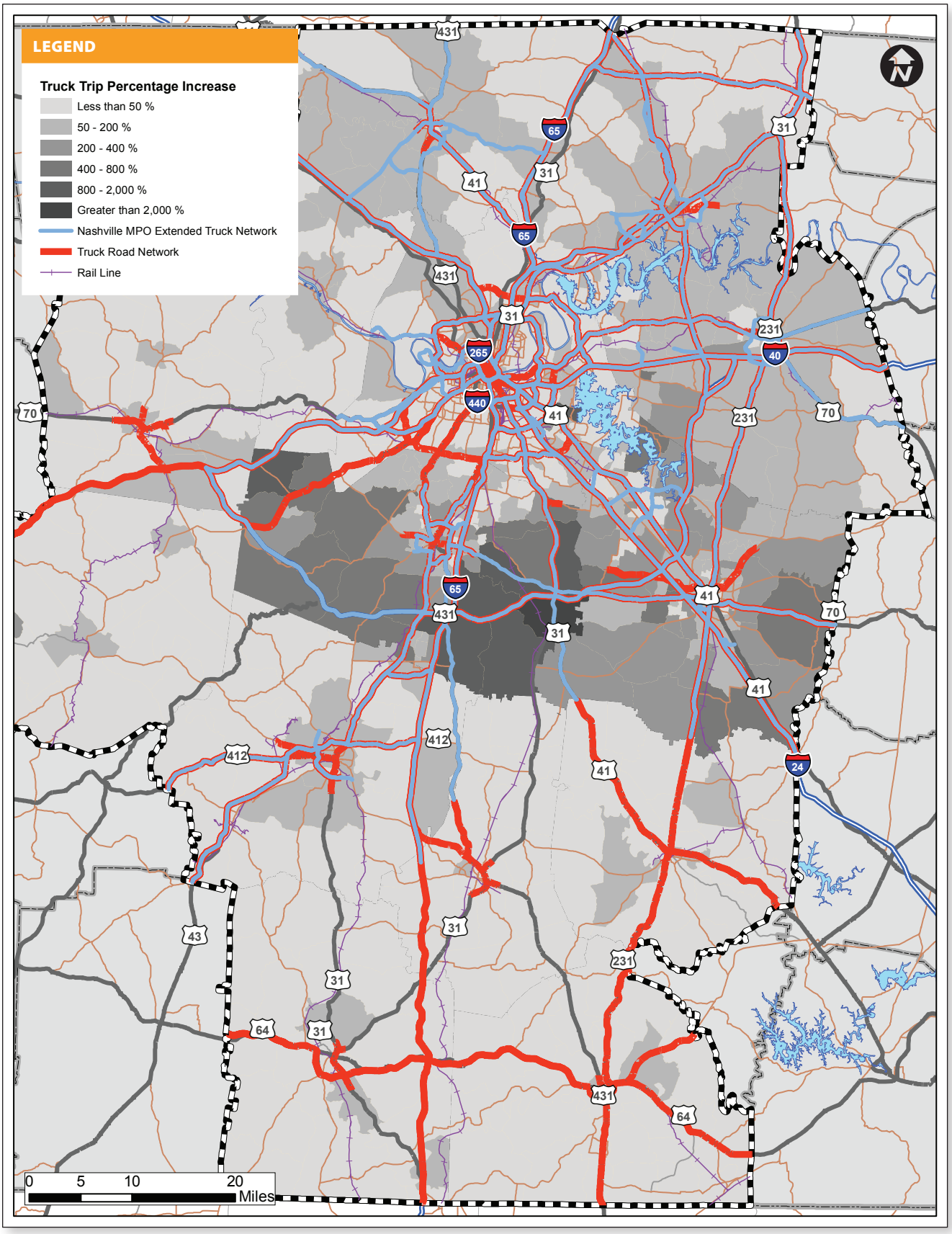
Off-peak hour deliveries (OHD): OHD programs, if implemented correctly, can promote sustainability, quality of life, economic efficiency, and environmental justice. A successful implementation of an OHD program requires a comprehensive knowledge of market and public policies as well as close collaboration with stakeholders. Freight services benefit from OHD programs as the number of routes needed to deliver all shipments can be reduced. In the New York City metropolitan area, receivers were asked about their interest in a Vendor Certification Program where they would accept unassisted off-hour deliveries. Survey results indicated that large establishments and headquarters are not good candidates for this program while the food and beverage sector seems the most likely sector to adopt this program.

Time-slotting: Time-slotting of pick-ups and deliveries is another last-mile delivery solution which can reduce the negative impacts of pick-ups and deliveries to large traffic generators such as government offices, colleges, hospitals, and large commercial establishments.

Driver training: Driver training programs reduce the cost of last mile delivery by changing driver behaviors and enhancing driver competencies to improve delivery efficiency, energy consumption, environmental impacts, and the safety of all road users. Drivers can be trained to drive in eco-friendly ways that save fuel and reduce emissions. Drivers may also be trained to handle deliveries in a quieter manner so that night deliveries do not disturb neighbors. The literature suggests that driver training programs are a cost-effective approach to improve delivery efficiency. Training programs, however, require close collaboration between the public and private sectors which can be challenging.

Loading and unloading management: Loading and unloading can be difficult in dense urban areas and truck operators may resort to shifting operations to traffic lanes and sidewalks. Such operations can be hazardous, but can also be avoided by implementing dedicated loading/unloading spaces, known as delivery bays. Such areas should be designed properly to incentivize operators to use them. Off-street loading/unloading zones can have similar impact.

Figure 6-5. I-65 Study Area Truck Trip Percentage Increase between 2010 and 2040



Source: Statewide Travel Demand Model, Version 2

Urban logistics spaces: Small terminals located in dense urban areas can provide service to local businesses and residents. While these terminals are budget-intensive, require land of 5,000 to 20,000 square feet, they can substantially improve freight operations. Underground parking lots at city centers can be used to provide such services. Local consolidation centers (e.g., FedEx offices) can also play a similar role.

Data analytics: Technological advancements have helped overcome the extraction and analysis of data in real time. Advanced analytic methods (e.g., optimization) can now be implemented for large-scale problems to effectively reduce the cost of last-mile deliveries by rerouting transport vehicles and resequencing stops based on real-time congestion information, pickup requests as they come in, and pickup requests that are anticipated. Another application of data analytics could be in right-sizing delivery vehicles, where mathematical modeling can help determine the appropriate size of vehicles depending on demand and the type of streets to which the deliveries will be made.

Innovative solutions: A number of innovative solutions can address last mile issues and are discussed below:

- **Trunk delivery:** The ability to access the trunk of one's car is a new innovation. Delivering to the trunk of a customer's car leads to a fundamentally different variant of the vehicle routing problem. Similarly, deliveries can be made to lockers versus to residents. Amazon Locker service is a prominent example of the latter solution which has been already implemented in many cities throughout the United States. In Washington D.C., Giant, a supermarket chain, delivers groceries to locker boxes at Metrorail stations. Customers can order online and pick up their items on their commute.
- **Consolidated deliveries and pickups:** Receivers can use technology to coordinate with multiple shippers to consolidate deliveries. On the other end, multiple pickups can also be consolidated.
- **Unmanned aerial vehicles:** Unmanned aerial vehicles will also significantly enhance supply chains and logistic operations by delivering smaller items within the last mile of transportation system.
- **Non-motorized delivery:** Utilizing non-motorized options for the last leg of delivery and first leg of pick up not only reduces vehicle congestion on streets but also lowers the negative environmental impacts of urban freight activities. Using an online bidding system, pedestrians and cyclists will be able to coordinate with a truck carrier and take care of local delivery and pickup activities. In this system, trucks and crowdsource form a hub and spoke, and the system can operate in a very efficient manner. Mathematical modeling shows that a truck carrier is never worse off by implementing such systems due to the reduction of maintenance, insurance, and fuel costs. Non-motorized freight services have been tested in New York City and Portland, Oregon.

Estimating the practicability, ease of implementation, and the level of effectiveness of these solutions in the I-65 corridor will require significant additional analysis and collaboration between local governmental agencies and private stakeholders.

Truck-Friendly Transportation System

Designing and redesigning the transportation system in a way that meets the preferences of truck drivers ultimately results in lower delays to trucks and greater economic productivity. Truck friendly transportation system strategies are grouped into two categories: infrastructure-related strategies and management solutions. Focusing on infrastructure design, first, the following infrastructure related strategies all have potential application in the I-65 corridor:

- Increasing truck parking capacity, allowing truck operators to make deliveries optimally in urban areas;
- Increasing the lengths of acceleration/ deceleration lane;
- Establishing a number of terminals on the urban fringe in order to facilitate transferring shipments to delivery vehicles;
- Expanding bridge anti-icing systems;
- Constructing overnight parking facilities in the core of the urban area to reduce the number of inbound truck trips in the morning peak hours; and
- Integrating the urban, suburban, and county traffic signal control systems to enhance inter-jurisdictional traffic management.

Dedicating one or multiple lanes to trucks, reconfiguring truck lanes, and expanding traffic management are relatively inexpensive solutions that can make the transportation system more truck friendly. Merging and diverging areas can be

particularly frustrating to truck drivers. A survey of 500 truck drivers in the Knoxville area revealed that most truck drivers support moving truck lanes to the inside travel lanes to avoid lane changing cars. The survey also showed that truck drivers are willing to pay about two dollars to avoid ten minutes of congestion.

Currently, there are six public parking facilities with a total capacity of 54 trucks, and 36 private parking facilities with a total capacity of 1,110 trucks. Disaggregate parking demand data is required to understand truck parking needs. In lieu of detailed data, this study proposes a surrogate truck parking supply performance measure: the ratio of the average truck volume on interstate highway sections to the total parking capacity. Data on truck volumes for the years 2010, 2020, 2030, and 2040 was obtained from the statewide travel demand model and the results are presented in Table 6-4. On average, there is one public parking spot for every 125 trucks moving in the study area in 2010. This number almost doubles by 2040 raising concerns about public truck parking capacity in the area. Due to the greater number of private parking spots, however, there is one private spot available for every 3.6 trucks in 2010 and every 10.5 trucks in 2040, an 83 percent increase. Developing truck parking expansion factors to be used with truck GPS probe data to accurately estimate parking demand will be an important consideration over time, as will an automated monitoring system using truck GPS probe data of parking utilization.

Table 6-4. Truck Volume to Parking Capacity Ratio in 2010-2014

	2010	2020	2030	2040
Public	124.6	154.9	188.6	227.4
Private	6.1	7.5	9.2	11.1
Total	**5.8**	**7.2**	**8.8**	**10.5**

7. Transit

While automobile travel will likely remain the predominant mode of travel in the region, it is important to ensure that residents and visitors in the region have meaningful transportation choices as the region continues to grow and develop. Both existing and emerging activity centers will benefit from a comprehensive multimodal transportation system. This section discusses the transit recommendations from the study, as well as how local jurisdictions can aide in the implementation of these recommendations through local plans and policies, such as zoning ordinances and land development regulations.

7.1 Transit

In December of 2016, the Nashville Metropolitan Transit Authority and the Regional Transportation Authority of Middle Tennessee (MTA/RTA) released nMotion, a plan to improve regional transit. The I-65 Multimodal Corridor Study was coordinated with the nMotion plan, and the recommendations from nMotion have been carried forward in this study. The plan lays out seven primary recommendations to improve and expand the region's transit system and, ultimately, improve mobility in Middle Tennessee.

1. Make Service Easier to Use
    - Evaluate existing routes to determine areas where service can be simplified or improved.
    - Rebrand under a single system to consolidate passenger information, provide a unified fare system, and better connect local and regional services.
    - Provide more and better passenger information on a variety of platforms.
    - Simplify fare payment.
    - Develop a Smart Technology Platform to provide a single point of information for public transit, parking, ride-sharing services, and new or improved mobility options.
2. Improve Existing Services
    - Increase service frequency on both local and regional routes.
    - Improve AccessRide services by partnering with ride-sharing services and local charitable organizations.
    - Improve mobility in downtown Nashville by constructing a second transit center, identifying transit emphasis corridors, and incorporating transit priority measures in key locations.
    - Develop crosstown and through-city routes to complement the current hub-and-spoke network.
3. Improve Access to Transit
    - Improve access to the transit network by improving bicycle and pedestrian connections, establishing private and/or community shuttles, work with local service providers to streamline transfers and fare payments, and provide more conveniently located park-and-ride lots.
4. Make Service More Comfortable
    - Upgrade stations and stops and provide service with more comfortable vehicles.
5. Develop a Network of Regional Transit Centers
    - Develop numerous transit centers throughout the region designed to act as regional and local mobility hubs that provide connections between local services and between local and regional services.
6. Expand Service to New Areas
    - Within Davidson County, expand service to fill gaps in service coverage and extend service to new areas as demand develops.
    - Within the larger Middle Tennessee region, assist local service providers in expansion of their respective services, and extend or improve service to key growth areas, including Springfield, Sumner County, Lebanon, Smyrna and LaVergne, Spring Hill, and Dickson.
7. Build High Capacity/Rapid Transit Network
    - Improve existing commuter rail service on the Music City Star and extend new commuter rail service on the Northwest Corridor to Clarksville.
    - Construct light rail along key high capacity corridors in Davidson County.
    - Develop Bus Rapid Transit (BRT) in key corridors in Davidson County.
    - Upgrade nine existing regional bus services to Rapid Bus Service, and provide new Rapid Bus Service along for regional corridors.

- Provide Freeway BRT along I-24 East, I-65 South, and Ellington Parkway/SR-386 corridors.
- Provide Bus-on-Shoulder service along I-24 West, I-65 North, I-40 East, and I-40 West corridors.
- Improve existing service to Nashville International Airport (BNA).

The recommended transit projects in the I-65 are captured in Table 7-1 and Figure 7-1. In addition to the numerous capital improvements and strategies identified in nMotion, one additional route improvement was identified as part of the I-65 Multimodal Corridor Study. nMotion recommends new regional bus service to the Town of Nolensville. It is recommended that this route extend all the way to SR 96 in the Triune area, which has high population and employment projections through 2040. This extension will provide a north-south transit corridor through eastern Williamson County and, ultimately, a direct link to Nashville and Davidson County.

Additionally, as a follow up the to the recommendations in nMotion, the Greater Nashville Regional Council will begin the South Corridor Transit Study in 2018. This study will identify a locally-preferred alternative for transit investment between Metropolitan Nashville-Davidson County and Maury County. The results of this study will refine some of the recommendations presented here.

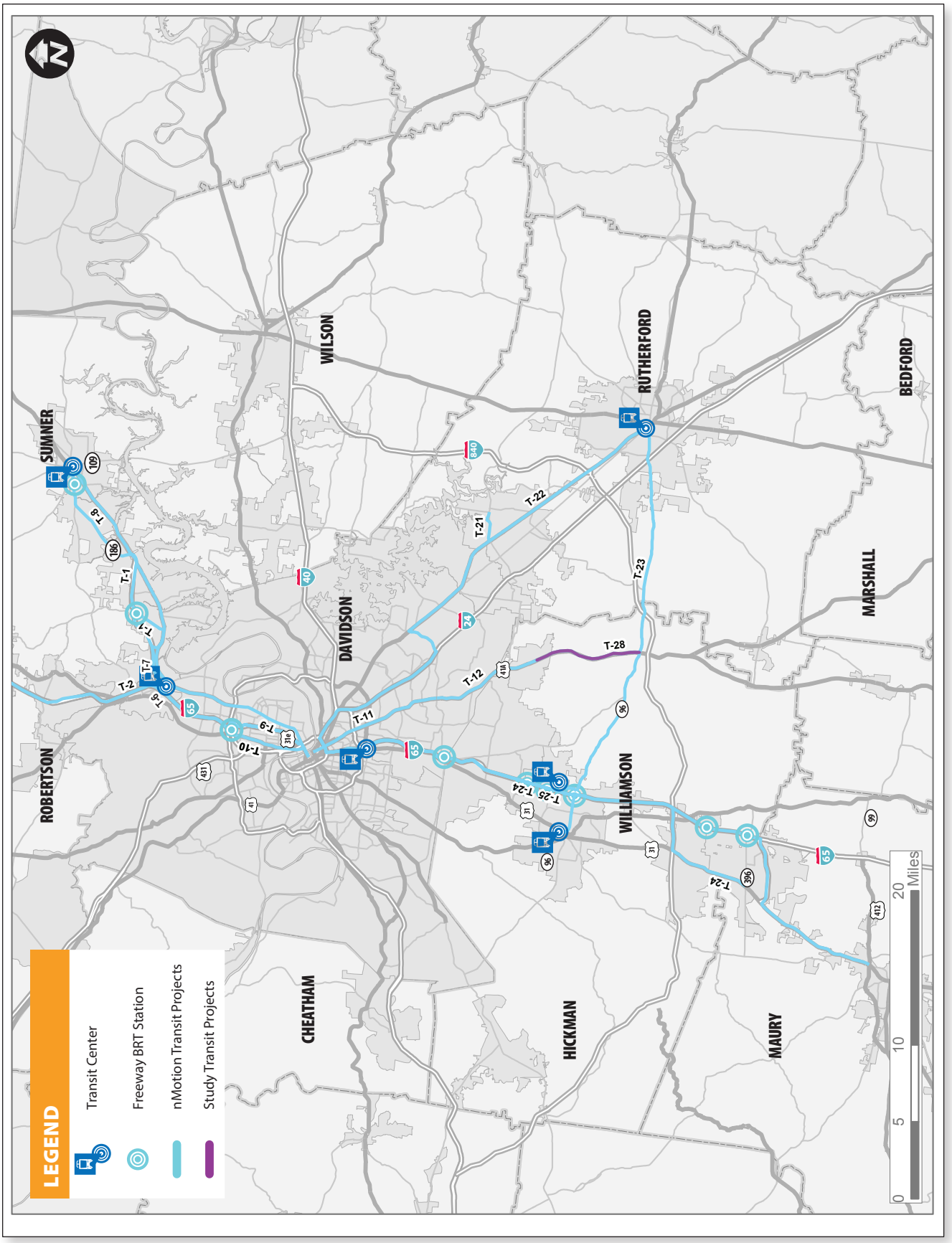
Table 7-1. Transit Improvements

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
T-1	NET Corridor Regional Express Bus Service	Several routes between Nashville and Gallatin		Provide new and expanded service to Sumner County, including additional express trips, additional service hours, and new park-and-ride opportunities	29.0	Davidson and Sumner	North
T-2	White House Express Service	SR-76	SR-386	Widening and strengthening of shoulders to 12-ft for bus on shoulder service. Further study of ramp metering for SR-174 (Long Hollow Pike), US-31W, and SR-257 (Bethel Road) to determine if necessary for safe routing	12.4	Robertson	North
T-3-5	I-65 North Freeway BRT Stations (3)	Goodlettesville	Gallatin	Construction of freeway BRT transit stop and park-and-ride lot	0.0	Davidson and Sumner	North
T-6	NET Corridor Interchange 2	Vietnam Veterans Pkwy (SR-386) at Conference Drive		Interchange modification for Traffic NB onto Conference Drive	0.0	Davidson	Central
T-7	NET Corridor Interchange 1	Vietnam Veterans Pkwy (SR-386) at I-65		Interchange modification WB to NB and SB to EB Traffic	0.0	Davidson	Central
T-8	Rapid Bus Service - Route 80R Gallatin	Outer end of Gallatin Pike LRT	Gallatin	Provide new rapid bus service to Gallatin	15.6	Davidson/ Sumner	Central
T-9	US-31E (Gallatin Pike) LRT	Downtown Nashville	Conference Drive	Construction of light-rail transit along US-31E (Gallatin Pike)	12.0	Davidson	Central
T-10	Dickerson Pike (US-31W) BRT	Hunters Lane	Downtown Nashville	Construction of bus rapid transit amenities along US-31W (Dickerson Pike). Project include dedicated bus lanes and improved pedestrian facilities.	7.2	Davidson	Central
T-11	Nolensville Pike (US-31A) LRT	Downtown Nashville	Lenox Village Drive	Construction of light rail transit along US-31A (Nolensville Pike)	8.8	Davidson	Central
T-12	Rapid Bus Service - Route 81R Nolensville	Outer end of Nolensville Pike LRT	Nolensville	Provide new rapid bus service to Nolensville	7.2	Davidson/ Williamson	Central

Table 7-1. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
T-13-18	I-65 South Freeway BRT Stations (6)	Downtown Nashville	Franklin	Construction of freeway BRT transit stop and park-and-ride lot	0.0	Davidson and Williamson	Central/ South
T-19	Transit-Pedestrian Network Improvements	Various Locations		Construction of transit-supportive pedestrian amenities, including sidewalks, landscaping, lighting, crosswalks, and ADA ramps	0.0	Davidson and Williamson	Central
T-20	Rapid Bus Service - Route 81R Nolensville	Nolensville	Murfreesboro Road (SR-96)	Provide new rapid bus service to Triune	7.0	Williamson	Central
T-21	Rapid Bus Service - Route 86R Smyrna/ LaVergne	Downtown Nashville	Smyrna/ LaVergne	Provide new rapid bus service to Smyrna and LaVergne	24.7	Davidson/ Rutherford	Central
T-22	Rapid Bus Service - Route 96R Murfreesboro	Downtown Nashville	Murfreesboro	Provide new rapid bus service to Murfreesboro	35.7	Davidson/ Rutherford	Central
T-23	Franklin to Mufreesboro Express Bus Service	Routes between Franklin and Mufressboro		Provide new service express service to from Franklin (Cool Springs) to Murfreesboro	26.0	Williamson and Rutherford	Central
T-24	South Corridor Regional Express Bus Service	Several routes between Nashville, Franklin, Spring Hill, and Columbia		Provide new and expanded service to Williamson and Maury County, including additional express trips, reverse commute trips, additional service hours, and new Park-and-Ride opportunities	43.0	Maury and Williamson	Central and South
T-25	Rapid Transit/ Managed Lanes between Nashville and Franklin	Downtown Nashville	Murfreesboro Road (SR-96)	Construction of managed lanes for freeway Bus Rapid Transit along I-65 from Nashville to Murfreesboro Road (SR-96)	18.6	Davidson and Williamson	Central/ South

Figure 7-1. Transit Improvements



7.2 Station Area Development and Access

Transit's success in the I-65 corridor will rely in part on the form and density of development near station areas, particularly those that service high-capacity or regional transit services. Transit-oriented development (TOD) generally describes development that includes a mixture of housing, office, retail and/or other amenities integrated into a walkable neighborhood and located within a half-mile of high-capacity or regional transit service.

For the I-65 Multimodal Corridor Study, the regional transit centers identified in the nMotion plan were assigned a typology based on their location and surrounding uses: urban center, urban neighborhood, or suburban center. Existing population and employment totals were analyzed to determine the density of people and jobs for the base year of the study (2010). Future projections were developed to illustrate what the density around these stations would be in the study's horizon year (2040) if existing development patterns remain the same (Trend) or if zoning regulations were adjusted to support transit-oriented development densities (Build).

As Table 7-2 shows, an additional 75,000 people and jobs could be located within a half-mile of the nMotion station areas by 2040 if local zoning ordinances plan for TOD. This represents, moreover, an increase of approximately 60,000 people and jobs relative to the current trend. These densities would increase ridership on high-capacity and regional transit routes, as well as provide economic development opportunities for the communities in which they are located. Ultimately, enabling these types of densities is the responsibility of local jurisdictions.

Another opportunity associated with regional transit investments is the ability of the surrounding community to access transit services. Currently, regional transit access relies on park-and-ride facilities. While these facilities are often conveniently located for automobiles in existing surface lots, the regional transit centers proposed in nMotion are more centrally-located within communities, with park-and-ride lots reserved for the very ends of regional routes.

Table 7-2. Regional Transit Station Area Development Densities

2010 Base Year

Station Areas	Total Population	Total Employment	Total People + Jobs	People + Jobs Density (per acre)
Urban Center	818	13,013	13,831	16
Urban Neighborhood	2,267	4,321	6,588	10
Suburban Center	1,917	2,633	4,550	4
Total	5,002	19,967	24,968	9

2040 Trend

Station Areas	Total Population	Total Employment	Total People + Jobs	People + Jobs Density (per acre)
Urban Center	3,284	17,928	21,212	24
Urban Neighborhood	3,183	5,937	9,120	15
Suburban Center	4,050	7,675	11,725	9
Total	10,517	31,540	42,057	15

2040 Build

Station Areas	Total Population	Total Employment	Total People + Jobs	People + Jobs Density (per acre)
Urban Center	26,400	26,400	52,800	60
Urban Neighborhood	17,584	7,536	25,120	40
Suburban Center	13,560	9,040	22,600	20
Total	57,544	42,976	100,520	38

While the regional transit centers will likely still provide park-and-ride access for automobile users, nMotion stresses the need to include safe, comfortable, and convenient bicycle and pedestrian networks. Table 7-3 shows the number of people within a five-minute walk or bicycle ride to a transit station, based on the population figures shown in Table 7-2. In the base year, these values are quite low with transit services relying on the existing park-and-ride lot network. The Trend and Build figures are based on the recommended regional transit centers. These figures will increase substantially, even under the Trend scenario. In the Build scenario, approximately 25,000 more will be within a five-minute walking and bicycling distance to regional transit.

Table 7-3. Walking and Bicycling Access to Transit Stations

Unit	Base (2010)	Trend (2040)	Build (2040)
Total People	Walk: 7,329 Bike: 61,154	Walk: 31,880 Bike: 228,969	Walk: 57,544 Bike: 254,633

8. Walking and Bicycling

Bicycle and pedestrian networks provide critical linkages throughout the corridor, providing important connections for people of all ages and abilities to local destinations and regional transit services. The bicycle and pedestrian facility recommendations for the study were identified using a three-pronged methodology.

- Previously-Planned Facilities – Local bicycle and pedestrian plans were reviewed for the various jurisdictions along the I-65 corridor. Projects planned on existing state routes were identified and included as recommendations in the study. At build-out, these recommendations would provide a base network around which local jurisdictions could construct a more fine-grained network.
- Inter-Community Links – Gaps between or among local networks were identified. Opportunities where a bikeway could link two communities, providing a seamless means of travel between them, were recommended as part of the study.
- Safety – Bicycle and pedestrian crash data for the latest four-year period was reviewed to identify areas with high incidences of bicycle and pedestrian crashes. Improvements to address these safety-deficient areas are recommended.

The recommendations are shown in Table 8-1 and Figure 8-1. By filling in gaps in local networks, providing inter-community linkages, and addressing safety hot spots, these projects can serve as a foundation for expanded multimodal transportation choice in the I-65 corridor.

Table 8-1. Recommended Bicycle and Pedestrian Projects

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
B-1	New Shackle Island Road (SR-258)	Johnny Case Parkway (US-31E)	Long Hollow Pike (SR-174)	Construction of Buffered Bike Lanes	5.2	Sumner	North
B-2	Johnny Cash Parkway/East Main Street (US-31E)	Big Station Camp Road	Center Point Road South	Construction of Paved Shoulders	8.8	Sumner	North
B-3	US-41 (Dickerson Pike)	US-431 (Trinity Lane)	Hart Lane	Safety - Construction of sidewalks along US-41. Project includes landscaping, crosswalks, and pedestrian amenities.	2.0	Davidson	Central
B-4	US-431 (Trinity Lane)	US-431 (Whites Creek Pike)	US-41 (Dickerson Pike)	Safety - Reconstruction of sidewalks along US-431 (Trinity Lane). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	1.3	Davidson	Central
B-5	Clarksville Pike (SR-12)	Ashland City Highway (SR-12)	Rosa Parks Boulevard (US-41 Alt)	Construction of Bike Lanes	1.1	Davidson	Central
B-6	Rosa Parks Boulevard (SR-12)	Buchanan Street	James Robertson Parkway (US-31)	Construction of Separated Bike Lanes	1.2	Davidson	Central
B-7	James Robertson Parkway (US-31)	Rosa Parks Boulevard (SR-12)	Church Street	Construction of Separated Bike Lanes	0.5	Davidson	Central
B-8	US-70 (Charlotte Pike)	14th Avenue North	George L. Davis Blvd.	Safety - Pedestrian improvements at interchange of US-70 and I-40/I-65. Project includes landscaping, lighting, crosswalks, in-roadway warning lights at ramps, and pedestrian amenities.	0.1	Davidson	Central
B-9	Rosa Parks Boulevard/8th Ave S. (US-31)	Church Street	Korean Veterans Boulevard	Construction of Separated Bike Lanes	0.5	Davidson	Central

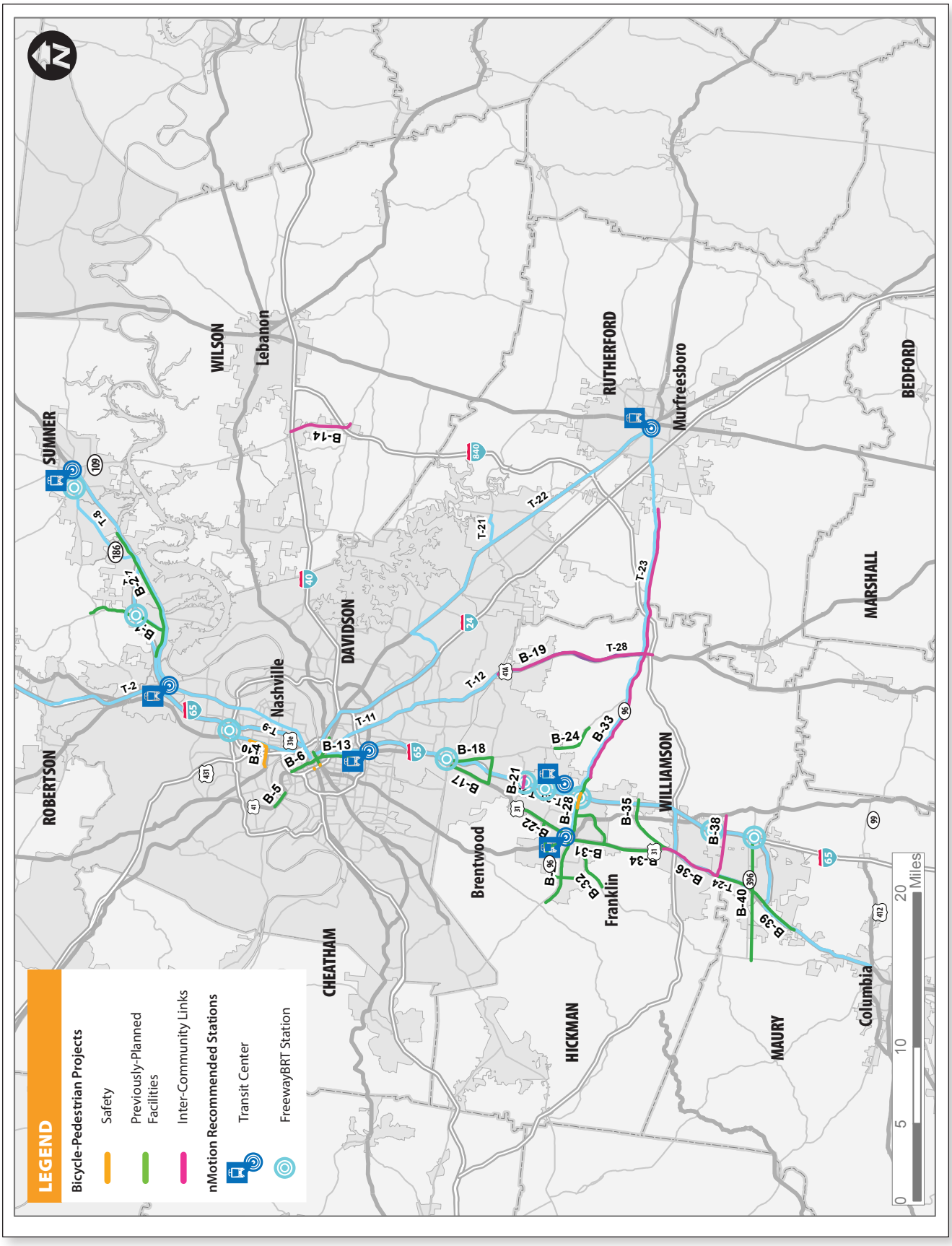
Table 8-1. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
B-10	Broadway (US-70)	1st Avenue	14th Avenue North	Construction of Separated Bike Lanes	1.0	Davidson	Central
B-11	US-431 (Broadway)	George L. Davis Blvd.	14th Avenue South	Reconstruction of sidewalks along US-431 (Broadway). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	0.1	Davidson	Central
B-12	Lafayette Street (US-31)	8th Avenue S (US-31)	Fairfield Avenue	Construction of Separated Bike Lanes	1.3	Davidson	Central
B-13	8th Avenue South (US-31)	Korean Veterans Boulevard	Bradford Avenue	Construction of Separated Bike Lanes	1.8	Davidson	Central
B-14	SR-109	I-40	I-840	Network - Construction of shared roadway facility	4.0	Wilson	Central
B-15	US-41 (Lafayette Street)	US-31 Alt/SR-11	1st Avenue South	Safety - Reconstruction of sidewalks along US-41 (Lafayette Street). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	0.3	Davidson	Central
B-16	SR-254 (Old Hickory Blvd)	Franklin Pike Circle	Franklin Pike	Safety - Reconstruction of sidewalks along SR-254 (Old Hickory Blvd). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	0.5	Davidson	Central
B-17	Main Street/Carters Creek Pike (SR-246)	Southall Road	Natchez Street	Construction of Multi-Use Path	3.1	Williamson	Central
B-18	Concord Road (SR-253)	Franklin Road (US31/SR 6)	Wilson Pike (SR-252)	Construction of Multi-Use Path	1.7	Williamson	Central
B-19	Nolensville Road (SR-11)	Burkitt Road	I-840	Network - Construction of on-road or off-road bicycle facilities	10.6	Williamson	Central
B-20	Franklin Road (US31/SR 6)	Concord Road (SR-253)	Maryland Way	Construction of Multi-Use Path	2.6	Williamson	Central
B-21	SR-441 (Moore's Lane)	Mallory Lane	Carrothers Parkway	Network - Construction of on-road facility or multi-use trail	0.8	Williamson	Central
B-22	Franklin Road (US31/SR 6)	SR-441 (Moore's Lane)	Harpeth River Bridge	Construction of Multi-Use Path; Can be constructed in concert with H-37	3.7	Williamson	Central
B-23	Mack Hatcher Pkwy (SR-397)	Hillsboro Road (SR-106/US-431)	Franklin Road (Sr-6/US-31)	Construction of Multi-Use Path	1.5	Williamson	Central
B-24	Wilson Pike (SR-252)	McEwan Drive	Trinity Lane	Network - Construction of Multi-Use Path	2.9	Williamson	Central
B-25	Mack Hatcher Pkwy (SR-397)	South of SR-96	US-431 (SR-106)	Construction of Multi-Use Path; Can be constructed with in concert with H-28	3.3	Williamson	Central
B-26	Hillsboro Road (SR-106/US-431)	Mack Hatcher Pkwy (SR-397)	Del Rio Pike	Construction of Bike Lanes with Sidewalks	1.0	Williamson	Central
B-27	SR-96	7th Ave North	Old Charlotte Pike	Construction of Multi-Use Path	4.4	Williamson	Central
B-28	SR-96	Harpeth River Bridge	Arno Road	Construction of Multi-Use Path; Portion could be constructed in concert with B-5	3.9	Williamson	Central

Table 8-1. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
B-29	SR-96 (Murfreesboro Road)	Southwinds Drive	Carothers Parkway	Safety - Construction of sidewalks or multi-use path along SR-96. Project includes landscaping, crosswalks, and pedestrian amenities.	1.0	Williamson	Central
B-30	Mack Hatcher Pkwy (SR-397)	SR-96 east of Franklin	Columbia Pike (US-31/SR-6) south of Franklin	Network - Construction of Multi-Use Path; Can be constructed with in concert with H-30	3.2	Williamson	Central
B-31	Columbia Pike (US-31/SR-6)	Fowlkes Street	Mack Hatcher Pkwy (SR-397)	Construction of Bike Lanes; Can be constructed in concert with H-31	1.9	Williamson	Central
B-32	Wilson Pike (SR-252)	Concord Road (SR-253)	Church Street East	Construction of Multi-Use Path	2.6	Williamson	Central
B-33	SR-96 (Murfreesboro Road)	East of Arno Road	Veterans Pkwy	Network - Construction of on-road or off-road bicycle facilities	18.3	Williamson/ Rutherford	Central
B-34	Columbia Pike (US-31/SR-6)	Goose Creek Bypass	Mack Hatcher Parkway (SR-397)	Construction of Multi-Use Path	3.9	Williamson	Central
B-35	Goose Creek Bypass (SR-248)	Columbia Pike (US-31/SR-6)	Long Lane	Construction of Bike Lanes with Sidewalks	4.1	Williamson	Central
B-36	US-31	SR-248 (Goose Creek Bypass)	North of Buckner Lane	Network - Construction of bike lane(s) or multi-use path	3.8	Williamson	Central
B-37	Buckner Road	Columbia Pike (SR-6/US-31)	Buckner Lane	Network - Construction of bike lane(s) or multi-use trail; can be constructed in concert with H-24	1.9	Williamson	Central
B-38	Buckner Road	Buckner Road/I-65 Interhchange	Lewisburg Pike (SR-106/US-431)	Network - Construction of bike lane(s) or multi-use trail; can be constructed in concert with H-22	2.1	Williamson	Central
B-39	US 31	Buckner Road	Carters Creek Station Road	Construction of Bike Lanes	6.2	Maury/ Williamson	Central/ South
B-40	SR-247 (Duplex Road/ Beechcroft Rd.)	I-65	SR-246 (Carters Creek Rd.)	Construction of Multi-Use Path	7.8	Williamson	Central

Figure 8-1. Recommended Bicycle and Pedestrian Projects



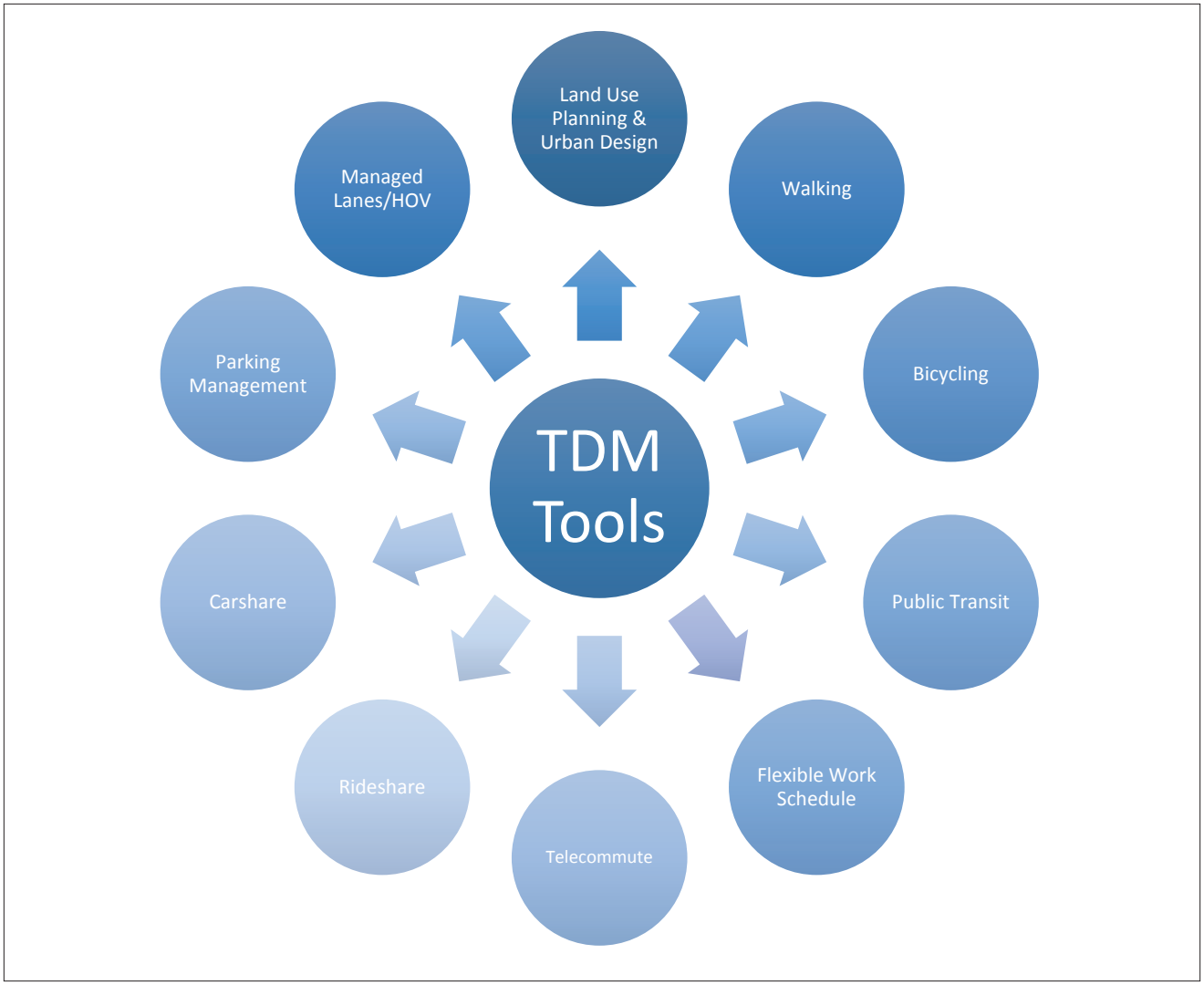
9. Transportation Demand Management

Conventionally, Transportation Demand Management (TDM) has been viewed largely as a congestion relief strategy, attempting to reduce travel and shift trips across modes and across time periods. More strategically, TDM is focused on expanding transportation options for people of all ages and abilities and improving transportation system efficiency. In either case, commuting mode shares offers a valuable measure of how well TDM programs are performing in a community, corridor, or region.

Throughout the I-65 corridor, commuting mode shares are dominated by single occupancy vehicles, representing between 85 and 90 percent of total work trips in many key travel markets. Importantly and notably, ridesharing accounts for much of the remaining trips in the same key travel markets with 10 to 15 percent of the commuting mode share. Walking, bicycling, and, in particular, transit commuting shares are well below national averages in the I-65 corridor.

As walking, bicycling, and transit facilities and services improve in tandem with land use planning and urban design strategies (Sections 7.0 and 8.0) in the I-65 corridor, TDM tools (Figure 9-1) will increasingly focus on employer-based strategies and ridesharing systems. According to a 2016 Tennessee Department of Transportation (TDOT) survey of employers, approximately half of the respondents in the Nashville region indicate that they already offer telecommuting, flexible work schedules, and carsharing programs to employees, and would consider providing emergency

Figure 9-1. Transportation Demand Management Tools



ride home, discounted transit passes, and incentives for not driving alone to work in the future.

While ridesharing is still unfolding with the advent of new technologies and new private service providers, it is clear that ridesharing will continue to play an important role filling the gap between fixed-route transit and single occupancy vehicles. To reinforce and expand existing employer-based programs, ridesharing systems, and TDM services more generally, below is a series of recommended TDM strategies for implementation in the I-65 corridor:

- Integrate TDM programs regionally and across the public and private sectors;
- Establish comprehensive marketing and information programs;
- Improve information and communication technologies that support real-time information and individual choice;
- Strengthen the ridesharing system of park-and-ride lots, High Occupancy Vehicle (HOV) lanes, and public and private ridesharing services; and
- Measure and report performance.

9.1 Regional TDM Program

In order for TDM programs to help reduce congestion and provide travel choices, they need to be cross sector, regionally comprehensive, and network oriented. If TDM programs are limited in scale and disconnected, they effectively mimic the "triple convergence" challenge posed by individual highway projects. Standalone TDM programs may result in reducing transportation demand for a period of time, but as an area experiences operational improvement, other people will shift their travel routes, times, and modes in response and absorb any short-term gains in system efficiency and supply.

Building on existing TDM programs provided by TDOT, the Regional Transit Authority of Middle Tennessee (RTA), the Transportation Management Association Group (TMA Group), and Metro Nashville, formal steps should be taken to organize services regionally, including:

- Establish a regional TDM advisory committee to strengthen partnerships between state and local governments and the private sector and to define regional TDM goals;
- Reposition existing TDM programs as regional services and consolidate service delivery; and
- Designate employment and activity centers as TDM districts and target programs and services in those areas.

9.2 TDM Marketing and Information Programs

Successful TDM programs clearly articulate that a safe and reliable transportation system is everyone's responsibility and in everyone's interest. Rather than viewing traffic congestion and limited transportation choices as someone else's problem to solve, TDM programs proactively bring different stakeholders to the table to develop plans and strategies collaboratively. In turn, upfront stakeholder outreach lays the groundwork for subsequent TDM customer marketing and information programs.

- Identify TDM coordinators throughout the region who can work with employers, school districts, chambers of commerce, and other organizations to build local support for and investment in TDM programs;
- Develop a regional outreach and engagement strategy that communicates and reports TDM benefits and results to elected officials, employers, and the general public on a regular basis; and
- Develop marketing material that program sponsors can use to promote TDM services, including travel options, financial and time incentives, and information resources.

9.3 Information and Communication Technologies

New information and communication technologies are reshaping TDM programs and services, and technologies that support real-time information and individual choice can provide a greater number of travel options throughout the day for a wider variety of people. Regional TDM stakeholders should partner to:

- Establish data collection and storage systems that support public and private sector providers of pre-trip and in route travel information (e.g., road conditions, optimal departure times, routing, travel choices, and comparative real-time information);
- Ensure that open data policies and protocols for publicly collected data incorporate TDM programs and services; and

- Coordinate ITS system improvements with TDM programs and services (e.g., managed lanes, transit technologies, and first/last mile).

9.4 Ridesharing System

For trips beyond walking and bicycling distances, ridesharing will assume a greater role as the I-65 corridor's population increases and autonomous vehicles expand the total number of vehicle trips. While there are certainly a number of contributing factors, including the current lack of transit services, it is important to underscore that rideshare commuting shares match or exceed statewide and national averages in the I-65 corridor despite high HOV violation rates. Recommendations to strengthen the ridesharing system include:

- Link park-and-ride lot planning and design to the designation of TDM districts in the corridor and ensure that a comprehensive set of TDM services (e.g., transit station amenities, carsharing, and bikesharing) are available at park-and-ride lots;
- Improve HOV lane enforcement and operations by adopting best practices in violation laws and policies and upgrading HOV facilities in conjunction with high capacity transit investments (e.g., complete HOV networks, direct access, and managed lanes); and
- Develop regional policies and programs for public ridesharing services that bridge fixed-route transit and private ridesharing services.

Table 9-1. Hierarchy of Efficient Commuting Strategies

Location Efficient	Work at home
	Telecommute
	Walk and bike
Technology Efficient	Transit
	Ridesharing
Resource Inefficient	Drive alone

9.5 TDM Performance Measures

Comprehensive, regionally based TDM programs shift the focus of performance measures from individuals and individual employers to a network of centers, corridors and communities. Regional TDM performance measures could include:

- Reductions in congestion;
- Reductions in energy consumption and air pollution;
- Annual commuting savings;
- Private sector TDM spending per dollar of public funding; and
- Commuting mode share.

10. Performance Evaluation

A key analytical component of the I-65 Multimodal Corridor Study is the evaluation framework for the proposed projects. To evaluate system performance in the I-65 corridor, the framework was developed to compare performance of base year conditions (2010); trend conditions (2040), and build conditions (2040). Table 10-1 summarizes the results of the performance evaluation. Generally, the Build scenario performed similarly to the Trend scenario on many of the aggregate metrics. The Build scenario did realize modest improvements in several traditional measures, such as auto travel times and vehicle hours of delay.

More significant performance improvements were realized with respect to land use development patterns near the proposed station areas. Additional benefits are likely to be realized at a more local level for many of the projects recommended. The system-level metrics presented here typically do not reflect the travel time, safety, and traveler comfort benefits of individual projects at smaller scales.

10.1 Additional Outreach and Analysis

Prior to finalizing the recommended multimodal solutions for the study, additional outreach and analysis activities were conducted to obtain input on the final recommendations, as well as ensure that no major

Table 10-1. Performance Summary

Goal	Performance Measure	Unit	Base (2010)	Trend (2040)	Build (2040)	Percent Change Trend v. Base	Percent Change Build v. Base
Moving Autos and Trucks	Auto Travel Times	Minutes	See Table 4-3			n/a	n/a
	Auto Vehicle Miles Traveled (VMT)	Miles (1,000s)	173,652	279,757	279,885	61%	61%
	Auto Vehicle Hours of Travel (VHT)	Hours (1,000s)	3,836	6,456	6,442	68%	68%
	Auto Vehicle Hours of Delay (VHD)	Hours	101,746	431,384	391,309	324%	285%
	Truck Vehicles Miles Traveled (VMT)	Miles (1,000s)	6,524	12,030	12,090	84%	85%
	Truck Vehicle Hours of Travel (VHT)	Hours	123,726	327,961	319,196	165%	158%
	Truck Vehicle Hours of Delay (VHD)	Hours	16,204	27,147	27,103	68%	67%
Moving People	Person Throughput	Persons per Day - North	177,569	252,815	259,888	42%	46%
		Persons per Day - South	205,076	275,077	290,187	34%	42%
Safety	Presence of Countermeasures at Safety Hotspots	High, Medium, or Low	See "Safety Recommendations"			n/a	n/a
Land Use Coordination	Presence of TOD at Stations	Total People and Jobs	24,968	38,456	100,520	54%	303%
Equity and Accessibility	People within a 5-Minute Walk or Bike Ride to a Station	Total People - Walk	7,329	31,880	57,544	335%	685%
		Total People - Bike	61,154	228,969	254,633	274%	316%
Air Quality/ Emissions	Carbon Intensity	Pounds per Day per Person	99.07	96.35	96.47	-3%	-3%

constraints are currently present in the study area with respect to project feasibility.

10.2 Public and Stakeholder Outreach

TDOT conducted a second round of public workshops for the study on the following dates and in the following locations:

- Goodlettsville: Delmas Long Community Center – June 12, 2017;
- Brentwood: Brentwood Public Library – June 20, 2017; and
- Spring Hill: Spring Hill City Hall – June 22, 2017.

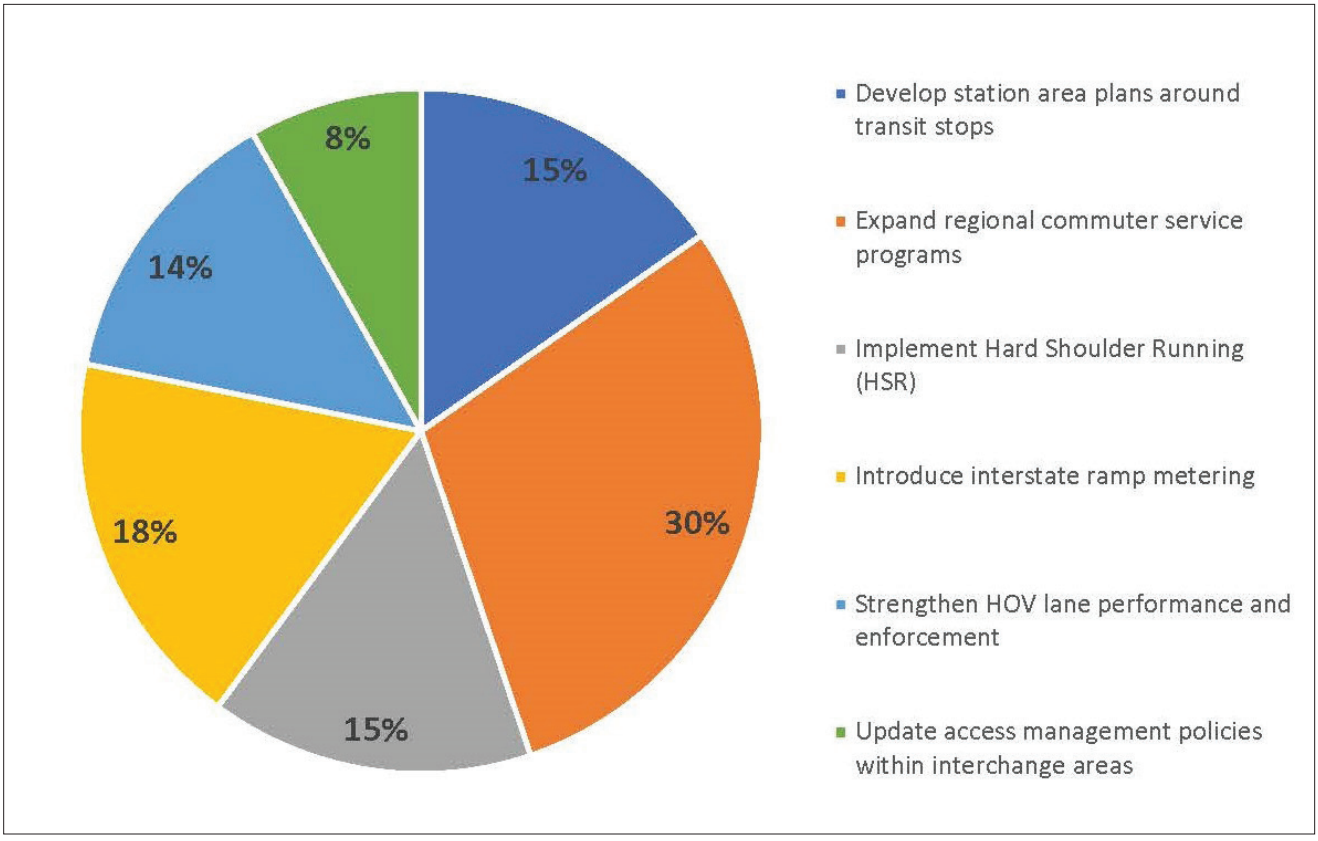
The goal of the second round of workshops was to give the public and key stakeholders a summary of the major deficiencies and needs that were identified in the corridor, as well as present the Phase 1 suite of recommended projects, programs, and policies. At the workshops, attendees identified additional deficiencies and needs, additional project recommendations, and additional non-construction policies, programs, and strategies that could be used to improve travel conditions in the project area.

Additional Policies, Programs, and Strategies

Among the meeting materials, attendees were specifically asked to express preferences for six non-construction related policies, programs, and strategies. Respondents were given six dot stickers to invest across the six categories. Dots could be allocated in any way the respondents chose; for example, all of the dots could be used on one category, spread equally, or distributed in any other combination. The policies, programs, and strategies are listed below in the order they appeared at the workshop, along with the number of dots each received. Figure 10-1 shows the percentage breakdown of all responses received.

- Develop station area plans around existing and future transit stations/stops – Emphasizing transit-oriented, mixed-use, and pedestrian/bicycle-friendly development. (28)
- Expand regional commuter service programs – Providing additional trip planning information, ridesharing resources, and transit incentives or benefits. (54)

Figure 10-1. Percentage Breakdown of Responses



- Implement Hard Shoulder Running (HSR) – Opening interstate shoulders in selected areas for general traffic use during peak hours. (28)
- Introduce interstate ramp metering – Managing the flow of vehicles entering the interstate in congested areas using a traffic signal on the ramp. (33)
- Strengthen High Occupancy Vehicle (HOV) lane performance and enforcement – Improving access points and separation, expanding violation detection strategies, and increasing penalties. (25)
- Update access management policies within interchange areas – Controlling the frequency and location of street intersections and driveways on interchange area crossroads. (15)

Additional Project Recommendations

Attendees were provided with maps that depicted the entire I-65 corridor from the Kentucky state line to the Alabama state line. The maps depicted all the Phase 1 projects discussed in the presentation. Attendees were asked to suggest additional projects, programs, or strategies they would like to see examined in Phase 2 of the analysis. All responses received were analyzed against previously identified deficiencies and needs and for project feasibility. Several additional project recommendations received from the public and key stakeholders were ultimately included in the final recommended multimodal solutions for the study.

10.3 Environmental Constraints and Fatal Flaws

A high-level analysis of environmental constraints within the corridor was conducted to determine whether "fatal flaws" were present with respect to the recommended multimodal solutions. Fatal flaws are major constraints that might render a project infeasible or unable to be constructed as proposed.

The fatal flaws considered as part of this analysis included the following:

- Environmental features, including wetlands and major river crossings; and
- Cultural resources, including National Register of Historic Places sites and districts.

No projects were found to be infeasible or unable to be constructed as a result of the analysis. All projects receiving federal funding will undergo an intensive preliminary review consistent with the requirements of the National Environmental Policy Act of 1969 (NEPA). During the NEPA review, the project will undergo consultation with the U.S. Army Corps of Engineers, the Tennessee State Historic Preservation Office (SHPO), and all state and federal agencies with regulatory authority over threatened and endangered species.

Traditionally-Underserved Populations

The project recommendations were also reviewed to ensure that equitable investments, consistent with anticipated growth patterns, traffic conditions, and safety needs, were made throughout the corridor, including to areas with high minority and low-income populations. Urban and rural equity issues, as described in Technical Memorandum 2 of this study, were considered during the development of the projects, programs, and strategies recommended as part of this study. Additionally, the TDOT Office of Community Transportation (OCT) conducted small-group stakeholder outreach to key partners throughout the study area.

A detailed Environmental Justice (EJ) impact analysis, consistent with the requirements of NEPA, will be conducted for all projects advanced by TDOT on a project-by-project basis. This analysis will ensure that no project will disproportionately impact any low-income or minority communities within the project impact area.

11. Recommended Multimodal Solutions

The final recommended multimodal solutions for the I-65 Multimodal Corridor Study are depicted in Figures 11-1, 11-2, and 11-3 and Table 11-1 through Table 11-6, with the exception of the ITS improvements which are illustrated in Figures 5-1, 5-2, and 5-3. The recommend improvements reflect the results of the technical analysis, input received from the public and key stakeholders, and coordination with TDOT.

Table 11-1. Mainline Improvements: Highway Capacity

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
H-1*	I-65	SR-25	Kentucky State Line	Widening, 4 to 6 lanes	8.8	Robertson	North
H-2	I-65/SR-109 Prop/ SR-41	N/A	N/A	Relocation of SR-109, new interchange at I-65, and widening of I-65 from south of new interchange to Kentucky state line	0.6	Sumner	North
H-3*	SR 109 Portland Bypass	SR-109 south of SR-76	SR-109 near Kirby Drive	Construct new 4 lane divided roadway	6.8	Sumner	North
H-4*	I-65	Bethel Road (SR-257)	SR-25	Widening, 4 to 6 lanes	8.7	Robertson	North
H-5*	SR-76	Charles Drive	New Hall Road	Widening, 2 to 4 lanes	2.1	Robertson	North
H-6	I-65	New interchange at New Hall Road in White House		New Interchange	N/A	Robertson	North
H-7	I-65 (SB only)	Blue Star Road (US-31)	Bethel Road (SR-257)	Widening, 2 to 3 lanes	5.2	Robertson	North
H-8*	NET Corridor Section 2 - Vietnam Veterans Pkwy (SR-386)	US-31E/ Saundersville Road	SR-109 Bypass	Transit Capital Expansion - Widening, 4 to 6 lanes for freeway Bus Rapid Transit service from Nashville to Gallatin (Project currently under study by TDOT)	6.9	Sumner	North
H-9	SR-109	North of the Cumberland River Bridge	SR-109 Portland Bypass south of Gallatin	Widen from 2 lanes to 4/5 lanes	1.3	Sumner	North
H-10#	I-65	Long Hollow Pike (SR-174)	Blue Star Road (US-31)	Widening, 4 to 6 lanes	1.8	Sumner	North
H-11*	Vietnam Veterans Pkwy (SR-386) at Forest Retreat Road	N/A	N/A	New Interchange (Project currently under study by TDOT)	0.0	Sumner	North

Table 11-1. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
H-12	I-65 at Springfield Highway (SR-11/US-41)	N/A	N/A	New Interchange	N/A	Davidson	Central
H-13*#	NET Corridor Section 1 - Vietnam Veterans Pkwy (SR-386)	I-65	US-31E/ Saundersville Road	Transit Capital Expansion - Widening, 4 to 6 lanes for freeway Bus Rapid Transit service from Nashville to Gallatin	8.9	Sumner	North
H-14	NET Corridor Transit - Ellington Pkwy (US 31E/SR-6) and I-65	Ellington Pkwy (SR-6) southern terminus	SR-386	Construction of managed Lanes along Ellington Pkwy (SR-6) and I-65 for freeway Bus Rapid Transit service from Nashville to Gallatin	10.0	Davidson	Central
H-15*	I-24	I-65	Old Hickory Blvd (SR-45)	Widening, 4 to 6 lanes	4.3	Davidson	Central
H-16	I-65	Briley Parkway	Nashville Core	Extend HOV lanes	4.2	Davidson	Central
H-17	Dickerson Pike (US 41)	SR-155 (Briley Pkwy)	Spring St	Widening, 4 to 6 lanes	4.7	Davidson	Central
H-18*	Clarksville Hwy (US-41A/SR-112)	SR-12 (Ashland City Hwy)	SR-155 (Briley Pkwy)	Widening, 2 to 5 lanes, with Multi-Use Trail	2.4	Davidson	Central
H-19*	Downtown Nashville Loop	N/A	N/A	Roadway/Junctions Reconstruction	12.2	Davidson	Central
H-20	I-65	I-40 (Exit 210)	I-40 (Exit 208)	Weaving Patterns	2.0	Davidson	Central
H-21	I-65	Armory Drive	Nashville Core	Extend HOV lanes	3.4	Davidson	Central
H-22*	I-24	I-40	I-840	Widening, I-40 to Haywood Lane - 8 to 10 lanes; Haywood Lane to I-840 - 6 to 8 lanes	23.2	Davidson and Rutherford	Central
H-23	Battery Lane/ Harding Place at Franklin Rd/ Improvements	SR-6 (Franklin Rd.) at SR-255 (Harding Pl.) and Battery Lane		Capacity improvements for intersection approaches	0.7	Davidson	Central
H-24	Nolensville Pike	South of Old Hickory Blvd (SR-245)	South of Burkitt Road	Reconstruction and widening, 2 to 5 lanes	4.5	Davidson and Williamson	Central
H-25	I-65	Old Hickory Blvd (SR-254)	Concord Road (SR-253)	New Interchange	0.0	Williamson	Central
H-26	Franklin Road (US-31/SR-6)	Concord Road (SR-253)	Moores Lane (SR-441)	Widening, 2 to 5 lanes	2.3	Williamson	Central
H-27	Franklin Road (US-31/SR-6)	SR-441 (Moore's Lane)	Harpeth River Bridge	Widening, 2 to 5 lanes	3.7	Williamson	Central
H-28	Nolensville Road (SR-11)	Burkitt Road	I-840	Widening with realignment from south of Clovercroft Road to north of Sunset Road in Nolensville	10.6	Williamson	Central
H-29*#	Mack Hatcher Pkwy (SR-397)	South of SR-96	US-431 (SR-106)	New construction, 4 lanes	3.3	Williamson	Central
H-30	East McEwen Drive	Near Cool Springs Blvd	Wilson Pike (SR-252)	Widening, 2 to 4 lanes	1.6	Williamson	Central

Table 11-1. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
H-31	Smyrna/Williamson County Connector	I-24 at Rocky Fork Road	McEwen Drive Extension	New Roadway	12.0	Williamson and Rutherford	Central
H-32*	Mack Hatcher Pkwy (SR-397)	SR-96 east of Franklin	Columbia Pike (US-31/SR-6) south of Franklin	Widening, 2 to 4 lanes	3.2	Williamson	Central
H-33*	Columbia Pike (US-31/SR-6)	Fowlkes Street	Mack Hatcher Pkwy (SR-397)	Widening, 2 to 4 lanes	1.9	Williamson	Central
H-34*#	Murfreesboro Road (SR-96)	East of Arno Road	Wilson Pike (SR-252)	Widening, 2 to 5 lanes	5.8	Williamson	Central
H-35	Lewisburg Pike (SR-106/US-431)	Mack Hatcher Pkwy (SR-397)	Donelson Creek Pkwy	Widening, 2 to 4 lanes	0.8	Williamson	Central
H-36	Peytonsville Road/ Goose Creek Bypass (SR-248)	SR-106 (Lewisburg Pike)	West of I-65	Widen existing 2 lane road to 4/5 lane	0.8	Williamson	Central
H-37*#	Murfreesboro Road (SR-96)	East of Wilson Pike (SR-252)	I-840	Widening, 2 to 5 lanes	5.5	Williamson	Central
H-38*	Columbia Pike (US-31/SR-6)	I-840	Mack Hatcher Pkwy (SR-397)	Widening, 2 to 4 lanes	5.0	Williamson	Central
H-39*	Murfreesboro Road (SR-96)	I-840	Veterans Pkwy	Widening, 2 to 5 lanes	6.9	Williamson and Rutherford	Central
H-40	I-65	I-840	SR-396 (Saturn Parkway)	Widening, 4 to 6 lanes	5.8	Williamson	Central
H-41	Buckner Road Widening	Columbia Pike (SR-6/US-31)	Buckner Lane	Widening	1.9	Williamson	Central
H-42	Buckner Road Extension	Buckner Road	Lewisburg Pike (SR-106/US-431)	New Roadway with New Interchange at I-65	2.1	Williamson	Central
H-43	Saturn Pkwy (SR-396) Extension	US-31	Carters Creek Pike (SR-246) at I-840	New Roadway	6.0	Maury and Williamson	Central
H-44	Duplex Road (SR-247)	SR-6/US-31	0.1 mile west of I-65	Widen Duplex Rd. from 2 to 3 lanes with add'l improvements	3.1	Maury and Williamson	Central
H-45	I-65	Saturn Parkway (SR-396)	Bear Creek Pike (SR-99/US-412)	Widening, 4 to 6 lanes	6.9	Maury	South
H-46	Bear Creek Pike (SR-99/US-412)	Nashville Highway (US-31)	US-431	Widening, 2 to 4 lanes	11.1	Maury	South

** Project included on IMPROVE Act project list*
Project included in 2018-2020 Comprehensive Multimodal Program

Table 11-2. Mainline Improvements: Safety

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
S-1	I-65 at SR-257 (Exit 104)	I-65 at SR-257 (Exit 104)		NB/Off Ramp Queuing	0.0	Robertson	North
S-2	I-65 at Bethel Road (SR-257) Interchange Lighting Improvements	I-65 at SR-257 (Exit 104)		Install interchange lightning	0.0	Sumner	North
S-3	Bethel Road (SR-257)	Lake Road	I-65	Widen shoulders and correct substandard horizontal geometries	2.3	Robertson	North
S-4	I-65 at US 31W Louisville Hwy (Exit 98)	I-65 at US 31W Louisville Hwy (Exit 98)		NB/Off Turn Lanes, SB/On Auxiliary Lane, NB/SB Signal Timing	0.0	Sumner	North
S-5	I-65 at US-31W (Exit 98)	I-65 at US-31W (Exit 98)		NB to WB Flyover	0.0	Sumner	North
S-6	I-65 Interchange Lighting at Rivergate Pkwy, Long Hollow Pk, US-31W	N/A	N/A	Interchange Lighting	N/A	Davidson	Central
S-7	I-65 at SR 174 Long Hollow Pike (Exit 97)	I-65 at SR 174 Long Hollow Pike (Exit 97)		SB/Off Turn Lanes, NB/SB Signal Timing	0.0	Davidson	North
S-8	I-65 at Trinity Lane (Exit 87)	I-65 at Trinity Lane (Exit 87)		NB/Off Ramp Auxiliary Lane Length	0.0	Davidson	Central
S-9	I-65 at Rosa L Parks Blvd (Exit 85)	I-65 at Rosa L Parks Blvd (Exit 85)		NB/Off Turn Lanes, SB/Off Turn Lanes, SB/On Turn Lanes	0.0	Davidson	Central
S-10	I-65 at Wedgewood Ave (Exit 81)"	I-65 at Wedgewood Ave (Exit 81)		SB/On Auxiliary Lane, NB/SB Signal Timing	0.0	Davidson	Central
S-11	I-65 at SR 254 Old Hickory Blvd (Exit 74)	I-65 at SR 254 Old Hickory Blvd (Exit 74)		Convert to to Diverging Diamond Interchange	0.0	Davidson	Central
S-12	I-65 at SR 253 Concord Rd (Exit 71)	I-65 at SR 253 Concord Rd (Exit 71)		NB/On Auxiliary Lane, SB/On Auxiliary Lane, NB/SB Signal Timing	0.0	Williamson	Central
S-13*	I-65 at Moores Lane	I-65 at Moores Lane		Interchange Modification	0.0	Williamson	Central
S-14	I-65 at SR 96 Murfreesboro Rd (Exit 65)	I-65 at SR 96 Murfreesboro Rd (Exit 65)		NB/Off Turn Lanes, SB/Off Turn Lanes, NB/SB Signal Timing	0.0	Williamson	Central
S-15	SR-96	Intersection with US-41A		Intersection Improvements	0.0	Williamson	Central
S-16	I-65 at SR 396 Saturn Parkway (Exit 53)	I-65 at SR 396 Saturn Parkway (Exit 53)		NB to WB Flyover	0.0	Maury	South
S-17	I-65 at US 412/SR 99 (Exit 46)	I-65 at US 412/SR 99 (Exit 46)		NB/SB Signalized Intersection	0.0	Maury	South
S-18	I-65 at SR 129 Lynnville Highway (Exit 27)	I-65 at SR 129 Lynnville Highway (Exit 27)		NB/On Turn Lane, SB/On Turn Lane	0.0	Marshall	South
S-19*	SR-99 (US-412) Interchange Modification	I-65 at SR 99 (US-412)		Interchange Modification	0.0	Maury	South
S-20	I-65 at SR 11/US 31A (Exit 22)	I-65 at SR 11/US 31A (Exit 22)		NB/SB Signalized Intersection	0.0	Giles	South
S-21	I-65 at SR 15/US 64 (Exit 14)	I-65 at SR 15/US 64 (Exit 14)		NB/SB Signalized Intersection	0.0	Giles	South
S-22*	Main Street (SR-7)	Union Hill Road (Ardmore)	Morrow Road (Ardmore)	Safety Improvements	0.9	Giles	South

** Project included on IMPROVE Act project list*

Table 11-3. ITS Improvements

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
0-1	Rapid Incident Scene Clearance (RISC)	Kentucky	Alabama	Contractual incentive-based program and operational policy to support open roads initiative related to truck crashes; North and South options	122.0	All	North, Central, and South
0-2	Conversion to Virtual Weigh Stations	Kentucky	Alabama	Portland weigh station	122.0	All	North, Central, and South
0-3	Smart Truck Parking	Kentucky	Alabama	Location TBD; Potential sites include the existing rest areas near Exit 22, Exit 46, and the Kentucky state line	122.0	All	North, Central, and South
0-4	I-65 Traffic Incident Management (TIM) Team	Kentucky	Alabama	North and South options	122.0	All	North, Central, and South
0-5	I-65 North ITS	Exit 108	Kentucky border	Install CCTV, DMS, and detection devices including fiber optic connections on I-65; Suggested DMS locations: SR-25/Main St (Exit 112) NB and SB, and SR-52 (Exit 117) SB.	13.0	Sumner	North
0-6	Connected Vehicle Technology Deployment	I-840	SR-76 (Exit 108)	Install DSRC radios	49.0	Davidson, Robertson, Sumner, and Williamson	North and Central
0-7	Adaptive Ramp Metering (ARM)	Exit 108 (SR-76)	Exit 90 (SR-155)	Install adaptive ramp metering devices and additional detection at 6 ramp locations in each direction	18.0	Davidson, Robertson, and Sumner Counties	North and Central
0-8	Adaptive Ramp Metering (ARM)	Exit 88 (I-24)	Exit 80 (US-440)	Install adaptive ramp metering devices and additional detection at 6 ramp locations in each direction	8.0	Davidson	Central
0-9	Dynamic on-ramp assignment - Southbound	Charlotte Ave	I-40/I-65 Split	Add arterial DMS along 14th Ave, add interstate shields or use gantries for junction pre-positioning on on-ramps and interstate facilities	1.0	Davidson	Central
0-10	Dynamic on-ramp assignment - Northbound	Broadway (US-70A)	I-40/I-65 Split	Add arterial DMS along 14th Ave, add interstate shields and deploy lane control gantries for junction pre-positioning on on-ramps and interstate facilities	1.0	Davidson	Central
0-11	Adaptive Ramp Metering (ARM)	Exit 80 (US-440)	Exit 53 (SR-396)	Install adaptive ramp metering devices and additional detection at 9 ramp locations in each direction	27.0	Davidson and Williamson	Central and South
0-12	Active Arterial Management US-31 E/Gallatin Pike	Rivergate Pkwy	Spring Street	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	10.0	Davidson	North and Central
0-13	Active Arterial Management (AAM) Dickerson Pike	US-31 W/ Louisville Hwy	US-431/ Trinity Ln	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	10.0	Davidson and Sumner	North and Central
0-14	Active Arterial Management (AAM) Franklin Rd	Demonbreun	Mack Hatcher	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	18.0	Davidson and Williamson	Central
0-15	Active Arterial Management (AAM) Nolesville Pike (US-41)	Korean Veterans Blvd	Old Hickory Blvd	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	9.0	Davidson	Central
0-16	Active Arterial Management (AAM) Old Hickory Blvd	Hillsboro Rd (US-431)	US-41	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	15.0	Davidson	Central

Table 11-3. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
O-17	Active Arterial Management (AAM) Hillsboro Rd (US 431)	Broadway (US-70A)	Mack Hatcher	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	16.0	Davidson and Williamson	Central
O-18	Active Arterial Management (AAM) Nolensville Pike (US-41)	I-840	US-231/ Colloredo Blvd/Lane Pkwy	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	28.0	Williamson, Rutherford, and Bedford	South
O-19	I-65 South ITS	MM 57.6	Alabama border	Install CCTV, DMS, and detection devices including fiber optic connections on I-65; Suggested DMS locations: SR-396/ Saturn Pkwy (Exit 53) NB and SB, SR-50/New Lewisburg Hwy (Exit 37) NB and SB, and SR-11/ Alt US-31/Sam Davis Hwy (Exit 22) NB.	67.0	Maury and Giles	South

Table 11-4. Freight Improvements

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
F-1	I-65 Weight Station near TN/KY State Line	N/A	N/A	Roadway Reconstruction and New Weigh Station	0.0	Sumner	North
F-2	I-65	Northbound direction - Diverging area of I-40 and I-65 (West of Nashville Loop)		Diverging area geometry correction - Adding lane(s)	0.2	Davidson	Central
F-3	I-65	Nortbound direction - Merging area of I-40 and I-65 (South of Nashville Loop)		Merge area geometry correction - Adding lane (s)	0.3	Davidson	Central
F-4	Ramp Improvement	Northbound ramp from I-24 to Hermitage Ave		Diverging area geometry correction - Adding lane(s)	0.2	Davidson	Central
F-5	Harding Place (SR-255)	McGavock Pike	Donelson Pike	Widening	0.4	Davidson	Central
F-6	Old Hickory Blvd (SR-254)	I-65	Nolensville Road (US-41A/SR-11)	Widening	4.1	Davidson	Central
F-7	Harding Place (SR-255)	Nolensville Road (US-41A/SR-11)	Jonquil Drive	Widening	0.5	Davidson	Central
F-8	I-65 (NB only)	Rivergate Parkway	US-31W/SR-41	Widen from 4/6 to 8 lanes	5.7	Davidson and Sumner	Central
F-9	I-65/I-24	I-24 junction, south of Fern Avenue	Trinity Lane (US-431)	Replace underpass to accommodate 6 lanes in each direction	1.7	Davidson	Central
F-10	I-65/I-40	I-65 junction (east of Demonbreun Street)	I-40 junction (west of Charlotte Avenue)	Widen to 8 lanes	4.3	Davidson	Central
F-11	I-65	Harding Place (SR-255)	I-40	Widen from 6 to 8 lanes	9.7	Davidson	Central

Table 11-5. Transit Improvements

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
T-1	NET Corridor Regional Express Bus Service	Several routes between Nashville and Gallatin		Provide new and expanded service to Sumner County, including additional express trips, additional service hours, and new park-and-ride opportunities	29.0	Davidson and Sumner	North
T-2	White House Express Service	SR-76	SR-386	Widening and strengthening of shoulders to 12-ft for bus on shoulder service. Further study of ramp metering for SR-174 (Long Hollow Pike), US-31W, and SR-257 (Bethel Road) to determine if necessary for safe routing	12.4	Robertson	North
T-3-5	I-65 North Freeway BRT Stations (3)	Goodlettesville	Gallatin	Construction of freeway BRT transit stop and park-and-ride lot	0.0	Davidson and Sumner	North
T-6	NET Corridor Interchange 2	Vietnam Veterans Pkwy (SR-386) at Conference Drive		Interchange modification for Traffic NB onto Conference Drive	0.0	Davidson	Central
T-7	NET Corridor Interchange 1	Vietnam Veterans Pkwy (SR-386) at I-65		Interchange modification WB to NB and SB to EB Traffic	0.0	Davidson	Central
T-8	Rapid Bus Service - Route 80R Gallatin	Outer end of Gallatin Pike LRT	Gallatin	Provide new rapid bus service to Gallatin	15.6	Davidson/ Sumner	Central
T-9	US-31E (Gallatin Pike) LRT	Downtown Nashville	Conference Drive	Construction of light-rail transit along US-31E (Gallatin Pike)	12.0	Davidson	Central
T-10	Dickerson Pike (US-31W) BRT	Hunters Lane	Downtown Nashville	Construction of bus rapid transit amenities along US-31W (Dickerson Pike). Project include dedicated bus lanes and improved pedestrian facilities.	7.2	Davidson	Central
T-11	Nolensville Pike (US-31A) LRT	Downtown Nashville	Lenox Village Drive	Construction of light rail transit along US-31A (Nolensville Pike)	8.8	Davidson	Central
T-12	Rapid Bus Service - Route 81R Nolensville	Outer end of Nolensville Pike LRT	Nolensville	Provide new rapid bus service to Nolensville	7.2	Davidson/ Williamson	Central
T-13-18	I-65 South Freeway BRT Stations (6)	Downtown Nashville	Franklin	Construction of freeway BRT transit stop and park-and-ride lot	0.0	Davidson and Williamson	Central/ South
T-19	Transit-Pedestrian Network Improvements	Various Locations		Construction of transit-supportive pedestrian amenities, including sidewalks, landscaping, lighting, crosswalks, and ADA ramps	0.0	Davidson and Williamson	Central
T-20	Rapid Bus Service - Route 81R Nolensville	Nolensville	Murfreesboro Road (SR-96)	Provide new rapid bus service to Triune		Williamson	Central
T-21	Rapid Bus Service - Route 86R Smyrna/ LaVergne	Downtown Nashville	Smyrna/ LaVergne	Provide new rapid bus service to Smyrna and LaVergne	24.7	Davidson/ Rutherford	Central
T-22	Rapid Bus Service - Route 96R Murfreesboro	Downtown Nashville	Murfreesboro	Provide new rapid bus service to Murfreesboro	35.7	Davidson/ Rutherford	Central
T-23	Franklin to Mufreesboro Express Bus Service	Routes between Franklin and Mufressboro		Provide new service express service to from Franklin (Cool Springs) to Murfreesboro	26.0	Williamson and Rutherford	Central

Table 11-5. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
T-24	South Corridor Regional Express Bus Service	Several routes between Nashville, Franklin, Spring Hill, and Columbia		Provide new and expanded service to Williamson and Maury County, including additional express trips, reverse commute trips, additional service hours, and new Park-and-Ride opportunities	43.0	Maury and Williamson	Central and South
T-25	Rapid Transit/Managed Lanes between Nashville and Franklin	Downtown Nashville	Murfreesboro Road (SR-96)	Construction of managed lanes for freeway Bus Rapid Transit along I-65 from Nashville to Murfreesboro Road (SR-96)	18.6	Davidson and Williamson	Central/ South

Table 11-6. Recommended Bicycle and Pedestrian Projects

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
B-1	New Shackle Island Road (SR-258)	Johnny Case Parkway (US-31E)	Long Hollow Pike (SR-174)	Construction of Paved Shoulders	5.2	Sumner	North
B-2	Johnny Cash Parkway/ East Main Street (US-31E)	Big Station Camp Road	Center Point Road South	Construction of Buffered Bike Lanes	8.8	Sumner	North
B-3	US-41 (Dickerson Pike)	US-431 (Trinity Lane)	Hart Lane	Safety - Construction of sidewalks along US-41. Project includes landscaping, crosswalks, and pedestrian amenities.	2.0	Davidson	Central
B-4	US-431 (Trinity Lane)	US-431 (Whites Creek Pike)	US-41 (Dickerson Pike)	Safety - Reconstruction of sidewalks along US-431 (Trinity Lane). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	1.3	Davidson	Central
B-5	Clarksville Pike (SR-12)	Ashland City Highway (SR-12)	Rosa Parks Boulevard (US-41 Alt)	Construction of Bike Lanes	1.1	Davidson	Central
B-6	Rosa Parks Boulevard (SR-12)	Buchanan Street	James Robertson Parkway (US-31)	Construction of Separated Bike Lanes	1.2	Davidson	Central
B-7	James Robertson Parkway (US-31)	Rosa Parks Boulevard (SR-12)	Church Street	Construction of Separated Bike Lanes	0.5	Davidson	Central
B-8	US-70 (Charlotte Pike)	14th Avenue North	George L. Davis Blvd.	Safety - Pedestrian improvements at interchange of US-70 and I-40/I-65. Project includes landscaping, lighting, crosswalks, in-roadway warning lights at ramps, and pedestrian amenities.	0.1	Davidson	Central
B-9	Rosa Parks Boulevard/8th Ave S. (US-31)	Church Street	Korean Veterans Boulevard	Construction of Separated Bike Lanes	0.5	Davidson	Central
B-10	Broadway (US-70)	1st Avenue	14th Avenue North	Construction of Separated Bike Lanes	1.0	Davidson	Central

Table 11-6. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
B-11	US-431 (Broadway)	George L. Davis Blvd.	14th Avenue South	Reconstruction of sidewalks along US-431 (Broadway). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	0.1	Davidson	Central
B-12	Lafayette Street (US-31)	8th Avenue S (US-31)	Fairfield Avenue	Construction of Separated Bike Lanes	1.3	Davidson	Central
B-13	8th Avenue South (US-31)	Korean Veterans Boulevard	Bradford Avenue	Construction of Separated Bike Lanes	1.8	Davidson	Central
B-14	SR-109	I-40	I-840	Network - Construction of shared roadway facility	4.0	Wilson	Central
B-15	US-41 (Lafayette Street)	US-31 Alt/SR-11	1st Avenue South	Safety - Reconstruction of sidewalks along US-41 (Lafayette Street). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	0.3	Davidson	Central
B-16	SR-254 (Old Hickory Blvd)	Franklin Pike Circle	Franklin Pike	Safety - Reconstruction of sidewalks along SR-254 (Old Hickory Blvd). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	0.5	Davidson	Central
B-17	Main Street/Carters Creek Pike (SR-246)	Southall Road	Natchez Street	Construction of Multi-Use Path	3.1	Williamson	Central
B-18	Concord Road (SR-253)	Franklin Road (US31/SR 6)	Wilson Pike (SR-252)	Construction of Multi-Use Path	1.7	Williamson	Central
B-19	Nolensville Road (SR-11)	Burkitt Road	I-840	Network - Construction of on-road or off-road bicycle facilities	10.6	Williamson	Central
B-20	Franklin Road (US-31/SR-6)	Concord Road (SR-253)	Maryland Way	Construction of Multi-Use Path	2.6	Williamson	Central
B-21	SR-441 (Moore's Lane)	Mallory Lane	Carrothers Parkway	Network - Construction of on-road facility or multi-use trail	0.8	Williamson	Central
B-22	Franklin Road (US-31/SR-6)	SR-441 (Moore's Lane)	Harpeth River Bridge	Construction of Multi-Use Path; Can be constructed in concert with H-37	3.7	Williamson	Central
B-23	Mack Hatcher Pkwy (SR-397)	Hillsboro Road (SR-106/US-431)	Franklin Road (SR-6/US-31)	Construction of Multi-Use Path	1.5	Williamson	Central
B-24	Wilson Pike (SR-252)	McEwan Drive	Trinity Lane	Network - Construction of Multi-Use Path	2.9	Williamson	Central
B-25	Mack Hatcher Pkwy (SR-397)	South of SR-96	US-431 (SR-106)	Construction of Multi-Use Path; Can be constructed with in concert with H-28	3.3	Williamson	Central
B-26	Hillsboro Road (SR-106/US-431)	Mack Hatcher Pkwy (SR-397)	Del Rio Pike	Construction of Bike Lanes with Sidewalks	1.0	Williamson	Central
B-27	SR-96	7th Ave North	Old Charlotte Pike	Construction of Multi-Use Path	4.4	Williamson	Central
B-28	SR-96	Harpeth River Bridge	Arno Road	Construction of Multi-Use Path; Portion could be constructed in concert with B-5	3.9	Williamson	Central
B-29	SR-96 (Murfreesboro Road)	Southwinds Drive	Carothers Parkway	Safety - Construction of sidewalks or multi-use path along SR-96. Project includes landscaping, crosswalks, and pedestrian amenities.	1.0	Williamson	Central

Table 11-6. (continued)

ID	Project Name	Termini (From)	Termini (To)	Description	Length of Project (miles)	County	Sub-Area
B-30	Mack Hatcher Pkwy (SR-397)	SR-96 east of Franklin	Columbia Pike (US-31/SR-6) south of Franklin	Network - Construction of Multi-Use Path; Can be constructed with in concert with H-30	3.2	Williamson	Central
B-31	Columbia Pike (US-31/SR-6)	Fowlkes Street	Mack Hatcher Pkwy (SR-397)	Construction of Bike Lanes; Can be constructed in concert with H-31	1.9	Williamson	Central
B-32	Wilson Pike (SR-252)	Concord Road (SR-253)	Church Street East	Construction of Multi-Use Path	2.6	Williamson	Central
B-33	SR-96 (Murfreesboro Road)	East of Arno Road	Veterans Pkwy	Network - Construction of on-road or off-road bicycle facilities	18.3	Williamson/ Rutherford	Central
B-34	Columbia Pike (US-31/SR-6)	Goose Creek Bypass	Mack Hatcher Parkway (SR-397)	Construction of Multi-Use Path	3.9	Williamson	Central
B-35	Goose Creek Bypass (SR-248)	Columbia Pike (US-31/SR-6)	Long Lane	Construction of Bike Lanes with Sidewalks	4.1	Williamson	Central
B-36	US-31	SR-248 (Goose Creek Bypass)	North of Buckner Lane	Network - Construction of bike lane(s) or multi-use path	3.8	Williamson	Central
B-37	Buckner Road	Columbia Pike (SR-6/US-31)	Buckner Lane	Network - Construction of bike lane(s) or multi-use trail; can be constructed in concert with H-24	1.9	Williamson	Central
B-38	Buckner Road	Buckner Road/I-65 Interhchange	Lewisburg Pike (SR-106/US-431)	Network - Construction of bike lane(s) or multi-use trail; can be constructed in concert with H-22	2.1	Williamson	Central
B-39	US-31	Buckner Road	Carters Creek Station Road	Construction of Bike Lanes	6.2	Maury/ Williamson	Central/ South
B-40	SR-247 (Duplex Road/ Beechcroft Rd.)	I-65	SR-246 (Carters Creek Rd.)	Construction of Multi-Use Path	7.8	Williamson	Central

Figure 11-1. Recommended Multimodal Solutions: North Sub-Area

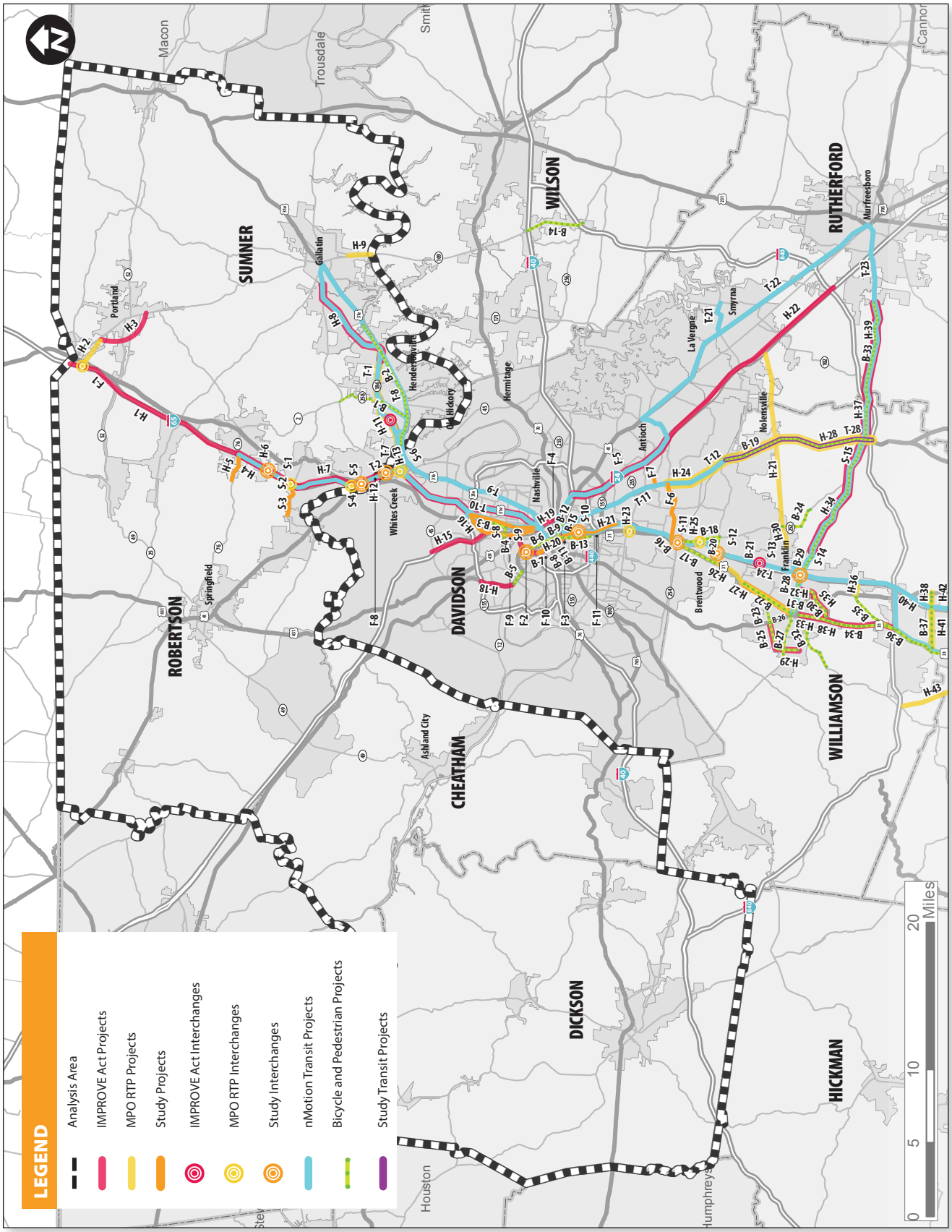


Figure 11-2. Recommended Multimodal Solutions: Central Sub-Area

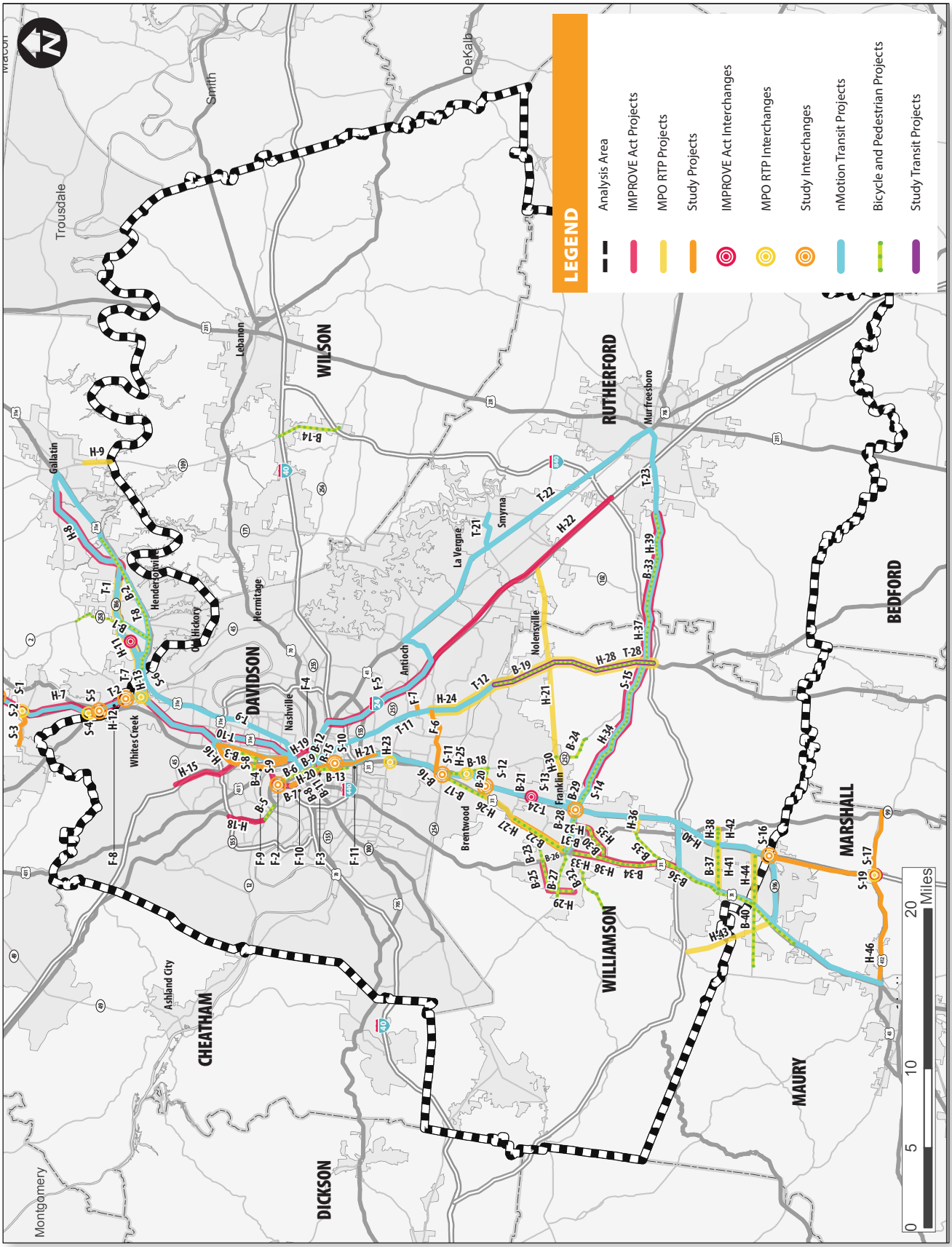
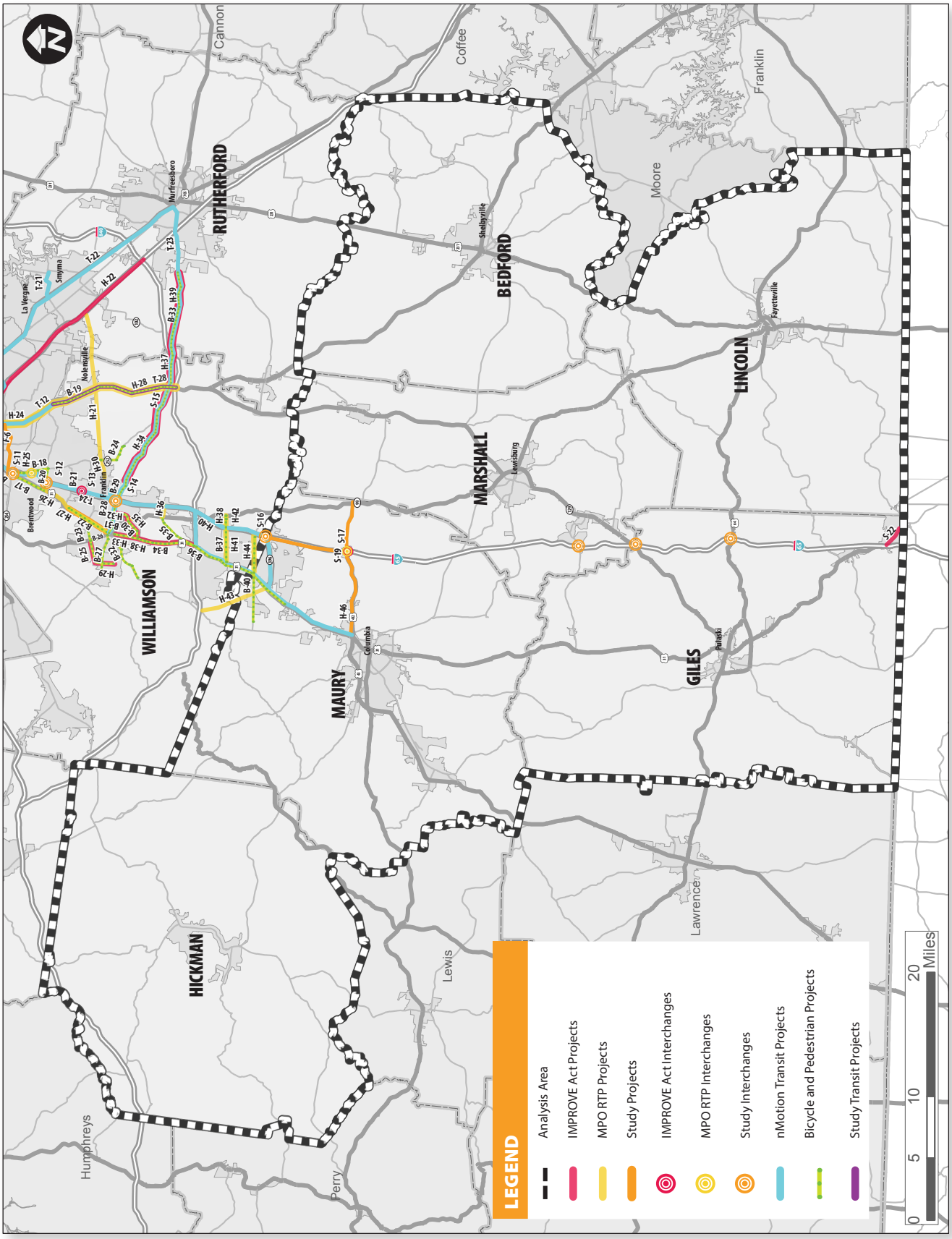
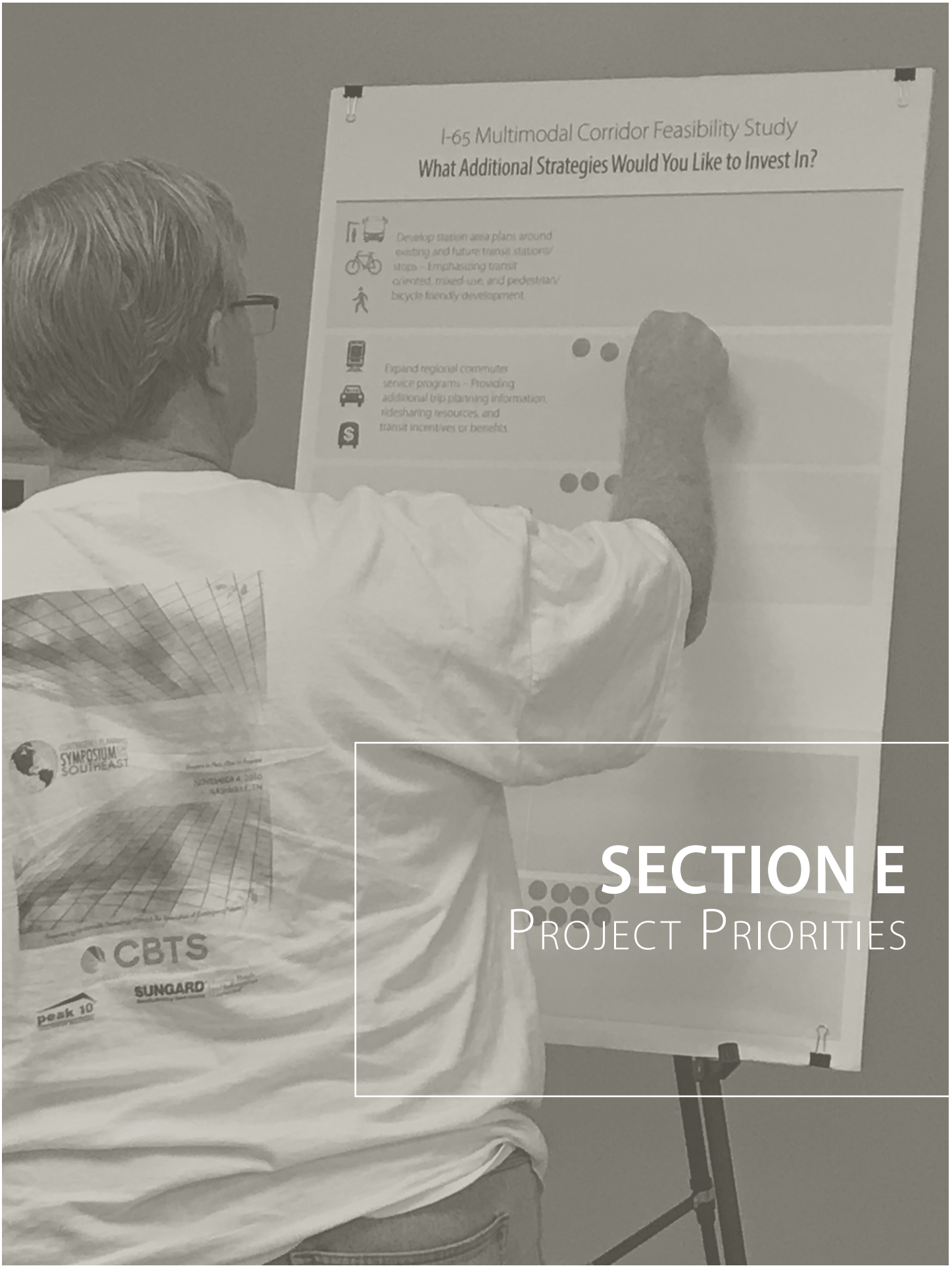


Figure 11-3. Recommended Multimodal Solutions: South Sub-Area





SECTION E
Project Priorities

SECTION E: PROJECT PRIORITIES

1. Introduction

Today's decisions on how to improve the transportation system in the I-65 corridor will play an important role in how growth and development unfold in the study area. Accordingly, the purpose of this section, representing the project recommendations of the I-65 Multimodal Corridor Study, is twofold:

- First, to provide a project priority and phasing tool that builds on the goals and objectives for the corridor; and
- Second, to rank the study's proposed multimodal improvements that address the identified transportation deficiencies and needs in the corridor.

The goals and objectives for the I-65 corridor (Table 1-1) were developed early in the study and reinforce the three strategic emphasis areas in the Tennessee Department of Transportation's (TDOT) 25-Year Long-Range Transportation Policy Plan: efficiency, effectiveness, and economic competitiveness. The priority and phasing tool, in turn, extends the goals and objectives and associated performance measures, and defines a set of criteria that serve as the basis for project ranking. It is important to underscore that the project ranking criteria represent only one source of data and information. Other policy, planning, and programming factors, beyond the scope of this study, will determine all final project development and funding decisions.

Table 1-1. I-65 Corridor Goals and Objectives

Goals	Objectives		
Provide efficient and reliable travel within and through the I-65 corridor.	Improve travel times among destinations in the region, with an emphasis on reducing peak period travel times.	Provide transportation options for people and freight.	Optimize freight movement in and through the region.
Improve safety conditions in the corridor, both on I-65 and parallel and connecting routes, for all transportation users.	Reduce crash rates along the corridor, especially crash "hot spots" for motorists and non-motorists.	Implement or upgrade technologies that promote safety and effective incident management.	
Coordinate transportation investments with land use decision-making.	Improve street networks and access management in interchange areas.	Encourage transit-oriented development along proposed high-capacity transit routes.	
Invest in transportation improvements equitably throughout the corridor.	Expand transportation options for traditionally underserved populations within the corridor.		
Protect the natural environment, and historic and cultural resources within the corridor.	Identify transportation improvements that are not likely to result in major impacts to environmental, social, and cultural resources.	Pursue investments and strategies that minimize greenhouse gas emissions.	
Maintain and enhance partnerships with both regional and local partners.			

2. Priority Setting and Phasing Tool

2.1 Approach and Methodology

Prior TDOT interstate corridor studies have used a common set of guidelines to prioritize recommended improvements and identify priorities by time horizon. Previous prioritization guidelines include:

- Projects located in the same place should be coordinated such that corresponding construction phases are completed at the same time;
- Projects with lower costs should be completed first given that funding for more budget intensive projects may not be readily available;
- Consistency with the status of the project in the MPO planning process, if applicable, should be considered; and
- Projects should be ranked based on benefit/cost ratio.

For the I-65 Multimodal Corridor Study, the proposed prioritization and phasing approach builds on the common set of guidelines from the earlier corridor studies, but shifts the focus from developing a single, static list of priorities to generating data and information that can serve as a flexible decision-making support tool. Assuming system preservation will remain the highest priority, the priority setting and phasing tool centers on proposed new transportation improvements in the I-65 corridor. The tool evaluates proposed improvements in each modal and strategy area across five categories, and orders the results by weighted scores. Importantly, the weights for each criterion can be adjusted based on policy, planning, and programming direction, and the results of the analysis can be considered separately or compared as different scenarios. Table 2-1 summarizes the five prioritization criteria and related measures for the modal and strategy areas included in the study.

2.2 Prioritization Criteria and Measures

Mobility/Safety

Base Year (2010) and 2040 Existing Plus Committed (E+C) Volume-to-Capacity (V/C) ratios, derived from the Tennessee Statewide Travel Demand Model, Version 2 (TSM), serve as the mobility/safety prioritization measures for the proposed highway capacity, intelligent transportation systems (ITS), and freight improvements in the study. For freight improvements, the mobility/safety criterion also includes Base Year truck percentages from the TSM. While there is also a standalone list of safety improvements focused primarily on interchange areas and separately measured by crash rates, many of the mobility improvements will also generate safety benefits and the mobility criterion includes "safety" in the title to reflect those benefits. As reported in "Technical Memorandum 2: Assessment of Existing and Future Deficiencies," 84 percent of all crashes in the study area between 2013 and 2015 were in Davidson and Williamson Counties in areas with higher levels of congestion.

Additionally, for transit, the prioritization tool utilizes fixed-route hours of service as the Level of Service (LOS) to evaluate mobility/safety. Although there are a number of capacity and service quality variables available to describe transit LOS, fixed-route hours of service were identified as a specific deficiency in Technical Memorandum 2 and were a prime concern in public meetings. Finally, assuming that proposed improvements will provide the greatest benefits where demand is likely highest, the mobility/safety prioritization criterion for bicycle and pedestrian projects is measured using Base Year and 2040 population within a one-mile buffer of the recommended project.

Multimodal Investment Opportunity

The multimodal investment opportunity criterion captures the number of other proposed study improvements that occurr along the same general route or alignment as a given recommended project. This criterion builds on the prior studies' guideline to coordinate projects in close proximity, and flags opportunities to integrate recommendations across modes and strategies. For prioritization purposes, the measure helps to identify locations where multimodal

Table 2-1. I-65 Prioritization Criteria and Measures by Mode and Strategy

Mode/ Strategy	Prioritization Criteria and Measures				
	Mobility/ Safety	Multimodal	Accessibility/ Economic Development	Implementation	Cost Efficiency
Highway Capacity	Base V/C	Number of Modal Projects	Base Total Employment	Cost	Benefit/Cost Ratio (Method 1)
	2040 E+C V/C		2040 Total Employment		Benefit/Cost Ratio (Method 2)
Safety	Crash Rate	Number of Modal Projects	Base Total Employment	Cost	Benefit/Cost Ratio (Method 1)
			2040 Total Employment		Benefit/Cost Ratio (Method 2)
ITS	Base V/C	Number of Modal Projects	Base Total Employment	Cost	Benefit/Cost Ratio
	2040 E+C V/C		2040 Total Employment		
Freight	Base V/C	Number of Modal Projects	Base Total Employment	Cost	Benefit/Cost Ratio (Method 1)
	2040 E+C V/C		2040 Total Employment		Benefit/Cost Ratio (Method 2)
	Truck Percentage				
Transit	LOS	Number of Modal Projects	Base Total Employment	Cost	n/a
			2040 Total Employment		
Bicycle and Pedestrian	Base Total Population	Number of Modal Projects	Base Total Employment	Cost	Benefit/Cost Ratio
	2040 Total Population		2040 Total Employment		

solutions could be a critical strategy for improving the transportation system.

Accessibility and Economic Development

The ability to reach a destination (accessibility) and the ability to reach markets (economic development) rely heavily on the safety, convenience, and comfort of the transportation system for all users. While there are many types of destinations and markets to reach, improvements in each of the modal and strategy areas can affect employment-related accessibility and economic development. As a proxy for overall accessibility and economic development, the criterion then relies on the Base Year and 2040 employment within a one-mile buffer of the proposed improvement.

Implementation

Implementing projects clearly relies on a wide variety of factors, including community support, environmental constraints, constructability, costs, and funding availability. For prioritization purposes in the I-65 study, and recognizing the overlap with the cost efficiency criterion below, the implementation criterion uses planning level project costs to measure the proposed improvements. This criterion also dovetails with earlier interstate corridor study guidelines. Of course, lower costs by themselves are not necessarily a good indicator of when a project should be implemented, but in conjunction with the other criteria, can highlight improvements that are more feasible in the short-term. Again, as is the case with all of the criteria, cost can be weighted as needed and lower cost projects do not have to receive equal consideration with other measures.

Cost Efficiency

The fifth and final project criterion in the prioritization tool evaluates potential benefits against the planning level costs to understand relative cost efficiency. For the highway capacity, safety, and freight improvements, two summary benefit/cost (B/C) ratios are calculated. The "B/C-1" ratio estimates the value of project travel time savings based on average speeds for the network surrounding the project. The "B/C-2" ratio estimates the value of aggregate travel time savings based on the change in total Vehicle Hours Traveled (VHT) for the network surrounding the project. While B/C-1 emphasizes project specific benefits, B/C-2 quantifies network benefits. Taken together, the two measures, which are snapshots in time, support a relatively easy and balanced way to evaluate cost efficiency. The methodologies for both measures follow:

- B/C-1 Method:
    1. Calculate the overall average speeds for the network surrounding the Trend and Build area by dividing VMT by VHT;
    2. Calculate the project travel time based on the average speeds from step 1 and the project length;
    3. Calculate the travel time saving by subtracting values from step 2;
    4. Calculate operational benefits by multiplying the travel time saving by 250 working days a year and value of time, and
    5. Calculate the B/C ratio.
- B/C-2 Method:
    1. Calculate the travel time saving by subtracting Build VHT from Trend VHT for the network surrounding the project;
    2. Calculate operational benefits by multiplying the travel time saving by 250 working days a year and value of time; and
    3. Calculate B/C ratio.

B/C ratios for the ITS improvements were derived using the Federal Highway Administration's (FHWA) Tool for Operations Benefit Cost Analysis (TOPS-BC), Version 1.2. B/C ratios for the bicycle recommendations were calculated based on the Benefit-Cost Analysis of Bicycle Facilities Tool from the University of North Carolina Highway Safety Research Center. A benefit-cost ratio was not calculated for the transit improvements because this study did not include the modeling of transit routes. Finally, since different benefit-cost methods were used for different modes and strategies, the B/C ratios should not be compared across modes and strategies.

3. Project Rankings

As noted earlier, the project rankings included here represent just one way of prioritizing the proposed improvements and the measures represent only one source of data and information. The priority setting tool itself includes a high degree of flexibility by allowing a criterion's weight to be set to any value relative to the other criteria. Over time, as data is refined or additional data sources become available, prioritization criteria and measures can also be updated and expanded. Ultimately, whether and when improvements are implemented will depend again on a much broader decision-making process that reflects policy, planning, and programming factors beyond the scope of this study.

3.1 Project Rankings by Mode and Strategy

The following sections highlight the recommended improvements that rank highly when the prioritization criteria are all assumed to have the same weight. Maps of all proposed improvements can be found in Figures 3-1, 3-2, and 3-3. The full list of project rankings, under the same assumption of equal weighting, are included by mode or strategy in Tables 3-5 through 3-10.

Highway Capacity

Table 3-1 summarizes the ten proposed highway capacity projects that rank the highest when the prioritization criteria are weighted equally. Importantly, many of the higher ranked projects focus on improving travel to, from, and through downtown Nashville on I-65. Reconstructing the downtown interstate loop and extending High Occupancy Vehicle (HOV) lanes to the loop, in particular, emphasize the need to improve operations and modal choices between downtown Nashville and surrounding communities. The complete highway capacity project ranking (Table 3-5) identifies a number of parallel and intersecting arterials, especially in Williamson County, that are high priorities, including Nolensville Road (US-41A/SR-11), Mack Hatcher Parkway (SR 397), Columbia Pike (US-31/SR 6), and Franklin Road (US-31/SR 6).

Table 3-1. Highway Capacity Improvements: Highly Ranked Projects

ID	Project Name	Termini (From)	Termini (To)	Description	Length (miles)	County	Source	Source Horizon
H-19	Downtown Nashville Loop	N/A	N/A	Roadway/Junctions Reconstruction	12.2	Davidson	MPO RTP*	2040
H-20	I-65	I-40 (Exit 210)	I-40 (Exit 208)	Weaving Patterns	2.0	Davidson	Task 3	2030
H-21	I-65	Armory Drive	Nashville Core	Extend HOV lanes	3.4	Davidson	Task 3	2030
H-22	I-24	I-40	I-840	Widening, I-40 to Haywood Lane - 8 to 10 lanes; Haywood Lane to I-840 - 6 to 8 lanes	23.2	Davidson and Rutherford	Task 3*	2030
H-16	I-65	Briley Parkway	Nashville Core	Extend HOV lanes	4.2	Davidson	Task 3	2030
H-24	Nolensville Pike (US-41A/SR-11)	South of Old Hickory Blvd (SR-245)	South of Burkitt Road	Reconstruction and widening, 2 to 5 lanes	4.5	Davidson and Williamson	MPO RTP	2020
H-10	I-65	Long Hollow Pike (SR-174)	Blue Star Road (US-31)	Widening, 4 to 6 lanes	1.8	Sumner	MPO RTP*	2030
H-25	I-65	Old Hickory Blvd (SR-254)	Concord Road (SR-253)	New Interchange	0.0	Williamson	MPO RTP	2030
H-32	Mack Hatcher Pkwy (SR-397)	SR-96 east of Franklin	Columbia Pike (US-31/SR-6) south of Franklin	Widening, 2 to 4 lanes	3.2	Williamson	Task 3*	2030
H-7	I-65 (SB only)	Blue Star Road (US-31)	Bethel Road (SR-257)	Widening, 4 to 6 lanes	5.2	Robertson	MPO RTP*	2030

* Project included on IMPROVE Act project list

Safety

With the exception of three proposed improvements (S-22, S-3, and S-16), all of the standalone safety projects (Table 3-6) are relatively low cost ($1 million or less) and recommended for further analysis and implementation in the short-term or in conjunction with other planned near-term improvements, for example, the widening of I-65 to the state line with Kentucky.

Intelligent Transportation Systems

For data reasons, only nine of the nineteen ITS projects were ranked using the prioritization tool (Table 3-2). Similar to the highway capacity improvements, ITS projects, including dynamic on-ramp assignment and active arterial management, in, near, or closely linked to downtown Nashville rank the highest, and highlight the importance of a coordinated and multimodal strategy for improving I-65 through Davidson and Williamson Counties in particular. The unranked ITS projects are primarily statewide and ramp metering improvements, and even though they were not evaluated with the prioritization tool, many have potentially strong B/C ratios and should be studied further.

Freight

Table 3-10 ranks the full list of standalone freight projects. Consistent with other findings, improving the system-to-system interchanges of I-65 and I-40 in downtown Nashville are a high priority – again, stressing the importance of loop operations to all modes. Other projects of note include improving east-west connectivity, specifically Old Hickory Boulevard (SR 254) and Harding Place (SR 255), between I-65 and freight generators located near I-24 and Nashville International Airport (BNA).

Table 3-2. ITS Improvements: Highly Ranked Projects

ID	Project Name	Termini (From)	Termini (To)	Description	Length (miles)	County	Source	Source Horizon
0-17	Active Arterial Management (AAM) Hillsboro Rd (US-431)	Broadway (US-70A)	Mack Hatcher	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	16.0	Davidson and Williamson	Task 3	2030
0-9	Dynamic on-ramp assignment - Southbound	Charlotte Ave	I-40/I-65 Split	Add arterial DMS along 14th Ave, add interstate shields or use gantries for junction pre-positioning on on-ramps and interstate facilities	1.0	Davidson	Task 3	2030
0-10	Dynamic on-ramp assignment - Northbound	Broadway (US-70A)	I-40/I-65 Split	Add arterial DMS along 14th Ave, add interstate shields and deploy lane control gantries for junction pre-positioning on on-ramps and interstate facilities	1.0	Davidson	Task 3	2030
0-15	Active Arterial Management (AAM) Nolesville Pike (US-41)	Korean Veterans Blvd	Old Hickory Blvd	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	9.0	Davidson	Task 3	2030
0-14	Active Arterial Management (AAM) Franklin Rd	Demonbreun	Mack Hatcher	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	18.0	Davidson and Williamson	Task 3	2040
0-12	Active Arterial Management US-31 E/Gallatin Pike	Rivergate Pkwy	Spring Street	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	10.0	Davidson	Task 3	2030
0-16	Active Arterial Management (AAM) Old Hickory Blvd	Hillsboro Rd (US-431)	US-41	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	15.0	Davidson	Task 3	2030
0-18	Active Arterial Management (AAM) Nolensville Pike (US-41)	I-840	US-231/ Colloredo Blvd/Lane Pkwy	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	28.0	Williamson, Rutherford, and Bedford	Task 3	2040
0-13	Active Arterial Management (AAM) Dickerson Pike	US-31 W/ Louisville Hwy	US-431/ Trinity Ln	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	10.0	Davidson and Sumner	Task 3	2030

Transit

Transit improvements in the I-65 corridor between downtown Nashville and Williamson and Maury Counties and along Nolensville Road rank the highest, reinforcing growth trends in the central sub-area and public input during the study (Table 3-3). The series of Northeast Transit (NET) Corridor recommendations in Davidson and Sumner Counties also rank highly. With so much overlap between the highly ranked highway capacity and transit improvements, strategically coordinating projects across modes will be paramount.

Walking and Bicycling

The fast-growing areas of south and east Williamson County and north Maury County present a number of opportunities to implement important walking and bicycle facilities (Table 3-4). In higher speed, higher vehicle volume environments, multi-use paths provide a safe and comfortable option for all ages and abilities to walk and bike. Highly ranked projects include multi-use paths in the Buckner Road area and along Columbia Pike (US 31/SR 6) and Murfreesboro Road (SR 96). Closer to downtown Nashville, the Trinity Lane and Broadway interchange areas with I-65 both experience recurring pedestrian safety issues and rank highly in the prioritization tool.

Table 3-3. Transit Improvements: Highly Ranked Projects

ID	Project Name	Termini (From)	Termini (To)	Description	Length (miles)	County	Source	Source Horizon
T-24	South Corridor Regional Express Bus Service	Several routes between Nashville, Franklin, Spring Hill, and Columbia		Provide new and expanded service to Williamson and Maury County, including additional express trips, reverse commute trips, additional service hours, and new Park-and-Ride opportunities	45.9	Davidson/ Sumner	nMotion	2030
T-11	Nolensville Pike (US-41A) LRT	Downtown Nashville	Lenox Village Drive	Construction of light rail transit along US-31A (Nolensville Pike)	5.5	Davidson and Williamson	Central/ South	Central/ South
T-13-18	I-65 South Freeway BRT Stations (6)	Downtown Nashville	Franklin	Construction of freeway BRT transit stop and park-and-ride lot	0.0	Davidson	nMotion	2030
T-10	Dickerson Pike (US-31W) BRT	Hunters Lane	Downtown Nashville	Construction of bus rapid transit amenities along US-31W (Dickerson Pike). Project includes dedicated bus lanes and improved pedestrian facilities.	4.7	Davidson and Williamson	MPO RTP / nMotion	2030
T-25	Rapid Transit/ Managed Lanes between Nashville and Franklin	Downtown Nashville	Murfreesboro Road (SR-96)	Construction of managed lanes for freeway Bus Rapid Transit along I-65 from Nashville to Murfreesboro Road (SR-96)	18.8	Davidson/ Williamson	nMotion	2030
T-1	NET Corridor Regional Express Bus Service	Several routes between Nashville and Gallatin		Provide new and expanded service to Sumner County, including additional express trips, additional service hours, and new park-and-ride opportunities	30.0	Davidson and Sumner	MPO RTP	2020
T-9	US-31E (Gallatin Pike) LRT	Downtown Nashville	Conference Drive	Construction of light-rail transit along US-31E (Gallatin Pike)	4.9	Sumner	nMotion	2030
T-3-5	I-65 North Freeway BRT Stations (3)	Goodlettesville	Gallatin	Construction of freeway BRT transit stop and park-and-ride lot	0.0	Davidson	MPO RTP	2030
T-6	NET Corridor Interchange 2	Vietnam Veterans Pkwy (SR-386) at Conference Drive		Interchange modification for Traffic NB onto Conference Drive	0.0	Davidson and Sumner	nMotion	2030
T-7	NET Corridor Interchange 1	Vietnam Veterans Pkwy (SR-386) at I-65		Interchange modification WB to NB and SB to EB Traffic	0.0	Sumner	nMotion	2030

Table 3-4. Walking and Bicycling Improvements: Highly Ranked Projects

ID	Project Name	Termini (From)	Termini (To)	Description	Length (miles)	County	Source	Source Horizon
B-38	Buckner Road	Buckner Road/I-65 Interhchange	Lewisburg Pike (SR-106/ US-431)	Network - Construction of bike lane(s) or multi-use trail; can be constructed in concert with H-22	2.1	Williamson	Task 3	2040
B-34	Columbia Pike (US-31/ SR-6)	Goose Creek Bypass	Wilson Pike (SR-252)	Construction of Multi-Use Path	3.9	Williamson	Connect Franklin	2030
B-33	Murfreesboro Road (SR-96)	East of Arno Road	Veterans Pkwy	Network - Construction of on-road or off-road bicycle facilities	18.3	Williamson/ Rutherford	Task 3	2030
B-37	Buckner Road	Columbia Pike (SR-6/US-31)	Buckner Lane	Network - Construction of bike lane(s) or multi-use trail; can be constructed in concert with H-24	1.9	Williamson	Task 3	2040
B-35	Goose Creek Bypass (SR-248)	Columbia Pike (US-31/SR-6)	Long Lane	Construction of bike lanes and sidewalks	4.1	Williamson	Connect Franklin	2040
B-7	James Robertson Parkway (US-31)	Rosa Parks Boulevard (SR-12)	Church Street	Construction of Separated Bike Lanes	0.5	Davidson	Nashville WalknBike	2030
B-36	US-31	SR-248 (Goose Creek Bypass)	North of Buckner Lane	Network - Construction of bike lane(s) or multi-use path	3.8	Williamson	Task 3	2020
B-11	Broadway (US-431)	George L. Davis Blvd.	14th Avenue South	Reconstruction of sidewalks along US-431 (Broadway). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	0.1	Davidson	Task 3	2020
B-4	Trinity Lane (US-431)	Whites Creek Pike (US-431)	Dickerson Pike (US-41)	Safety - Reconstruction of sidewalks along US-431 (Trinity Lane). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	1.3	Davidson	Task 3	2020
B-30	Mack Hatcher Pkwy (SR-397)	SR-96 east of Franklin	Columbia Pike (US-31/ SR-6) south of Franklin	Network - Construction of Multi-Use Path; Can be constructed with in concert with H-30	3.2	Williamson	Connect Franklin	2030

3.2 Key Findings

The priority setting and phasing tool provides a performance-based framework for ranking projects by mode and strategy that builds on the goals and objectives identified in the I-65 corridor study. Incorporating weighted criteria, the tool can be used to evaluate different policy scenarios across a wide range of variables including mobility, safety, accessibility, and cost. The rankings generated by the tool can then serve as a resource for much broader discussions surrounding project development and funding.

The rankings reported in this section reflect a scenario where all criteria and measures are weighted equally. With that assumption in mind, the rankings spotlight two closely related opportunities: first, improving the downtown Nashville interstate loop and the highways connecting to it, both interstates and arterials, should be a high priority for future travel in the I-65 corridor; and second, all modes and strategies have an important role in improving the I-65 corridor, especially for travel to, from, and through the Nashville core. Significantly, the IMPROVE Act, the state transportation funding bill signed into law in 2017, has set the stage for many of the recommended improvements to move forward, with specific project studies already underway.

Figure 3-1. Recommended Multimodal Solutions: North Sub-Area

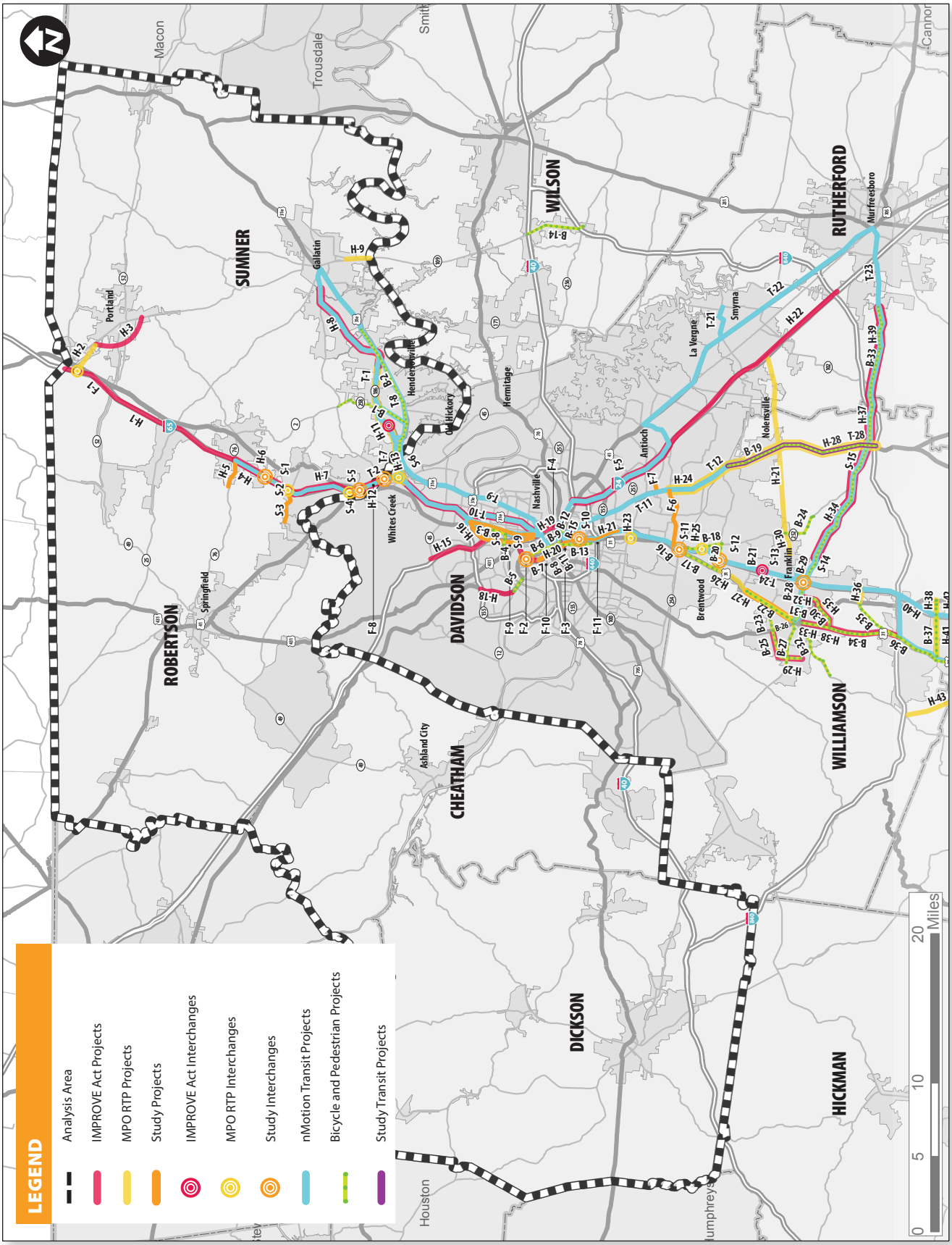


Figure 3-2. Recommended Multimodal Solutions: Central Sub-Area

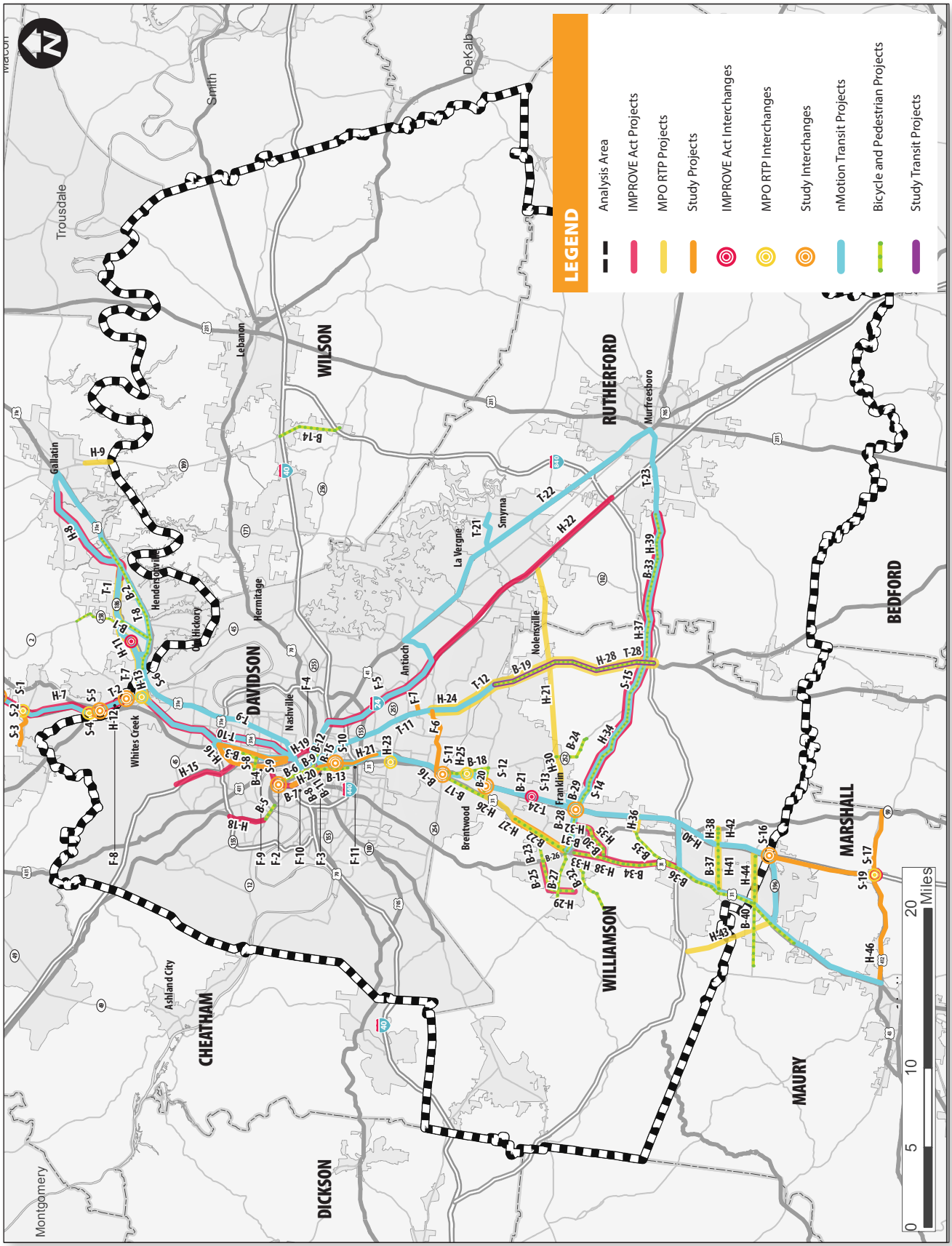


Figure 3-3. Recommended Multimodal Solutions: South Sub-Area

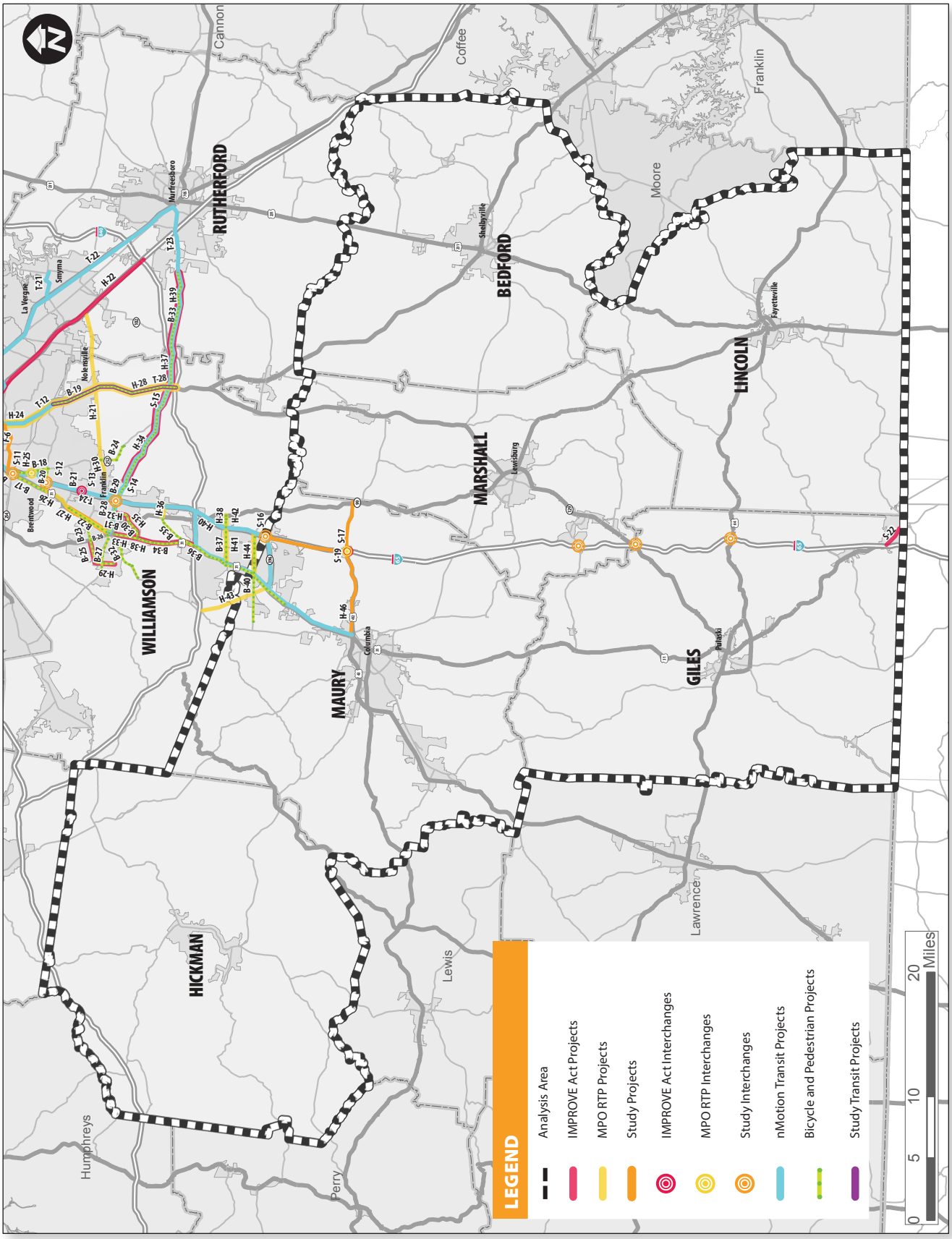


Table 3-5. Highway Capacity Improvements: Project Rankings

						(1) Mobility/Safety		(2) Multimodal	(3) Access/Econ Dev		(4) Implementation	(5) Cost Efficiency						
						Base V/C	2040 E+C V/C	# of Projects	Base Total Employment	2040 Total Employment	Cost (millions$)	B/C (Method 1)	B/C (Method 2)					
						Base V/C Weight	2040 E+C V/C Weight	Multimodal Weight	Base TE Weight	2040 TE Weight	Cost Weight	B/C-1 Weight	B/C-2 Weight					
ID	Project Name	Termini (From)	Termini (To)	Description	Length (miles)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	RANKING 1	RANKING 2	County	Source	Source Horizon
H-19	Downtown Nashville Loop	N/A	N/A	Roadway/Junctions Reconstruction	12.2	1.04	1.32	5	136,041	229,874	$189.42	19.40	0.17	4.9402	4.7755	Davidson	MPO RTP*	2040
H-20	I-65	I-40 (Exit 210)	I-40 (Exit 208)	Weaving Patterns	2.0	0.83	1.13	3	107,513	177,211	$8.60	0.90	1.44	4.5972	4.7647	Davidson	Task 3	2030
H-21	I-65	Armory Drive	Nashville Core	Extend HOV lanes	3.4	0.93	1.21	3	76,609	116,299	$39.59	0.30	0.12	4.0895	4.1014	Davidson	Task 3	2030
H-22	I-24	I-40	I-840	Widening, I-40 to Haywood Lane - 8 to 10 lanes; Haywood Lane to I-840 - 6 to 8 lanes	23.2	0.97	1.25	0	63,064	107,575	$192.75	104.60	0.65	3.7204	2.7994	Davidson and Rutherford	Task 3*	2030
H-16	I-65	Briley Parkway	Nashville Core	Extend HOV lanes	4.2	1.01	1.39	2	13,257	40,398	$50.79	1.60	0.08	3.2815	3.2756	Davidson	Task 3	2030
H-24	Nolensville Pike (US-41A/SR-11)	South of Old Hickory Blvd (SR-245)	South of Burkitt Road	Reconstruction and widening, 2 to 5 lanes	4.5	1.02	1.46	1	4,261	7,771	$29.77	11.20	(0.11)	3.1652	3.0443	Davidson and Williamson	MPO RTP	2020
H-10	I-65	Long Hollow Pike (SR-174)	Blue Star Road (US-31)	Widening, 4 to 6 lanes	1.8	0.72	0.87	5	5,461	7,560	$15.36	1.00	0.02	3.1244	3.1169	Sumner	MPO RTP*	2030
H-25	I-65	Old Hickory Blvd (SR-254)	Concord Road (SR-253)	New Interchange	0.0	0.86	1.19	2	9,417	15,584	$8.20	0.20	0.73	3.0717	3.1591	Williamson	MPO RTP	2030
H-32	Mack Hatcher Pkwy (SR-397)	SR-96 east of Franklin	Columbia Pike (US-31/SR-6) south of Franklin	Widening, 2 to 4 lanes	3.2	0.71	1.28	1	7,830	16,076	$26.07	21.00	1.48	2.9191	2.8985	Williamson	Task 3*	2030
H-7	I-65 (SB only)	Blue Star Road (US-31)	Bethel Road (SR-257)	Widening, 4 to 6 lanes	5.2	0.58	0.71	6	1,767	2,955	$39.03	4.90	(0.08)	2.9142	2.8580	Robertson	MPO RTP*	2030
H-33	Columbia Pike (US-31/SR-6)	Fowlkes Street	Mack Hatcher Pkwy (SR-397)	Widening, 2 to 4 lanes	1.9	0.55	0.89	1	12,542	19,986	$11.25	14.60	3.10	2.5655	2.8042	Williamson	Task 3*	2030
H-27	Franklin Road (US31/SR 6)	SR-441 (Moore's Lane)	Harpeth River Bridge	Widening, 2 to 5 lanes	3.7	0.38	0.72	2	20,509	33,149	$24.48	16.50	(0.15)	2.5176	2.3413	Williamson	Task 3	2040
H-12	I-65 at Springfield Highway (US-41/SR-11)	N/A	N/A	New Interchange	0.0	0.64	0.79	2	351	517	$8.20	0.40	(0.17)	2.4559	2.4312	Davidson	MPO RTP	Illustrative
H-4	I-65	Bethel Road (SR-257)	SR-25	Widening, 4 to 6 lanes	8.7	0.52	0.65	4	3,031	7,265	$60.22	6.10	(0.06)	2.4116	2.3459	Robertson	MPO RTP*	2030
H-26	Franklin Road (US31/SR 6)	Concord Road (SR-253)	Moores Lane (SR-441)	Widening, 2 to 5 lanes	2.3	0.51	0.92	1	11,454	21,696	$15.21	(2.80)	(1.53)	2.3601	2.1996	Williamson	MPO RTP	2020
H-40	I-65	I-840	SR-396 (Saturn Parkway)	Widening, 4 to 6 lanes	5.8	0.53	0.79	3	412	4,501	$48.15	2.80	(0.12)	2.3503	2.3090	Williamson	MPO RTP	2020
H-11	Vietnam Veterans Pkwy (SR-386) at Forest Retreat Road	N/A	N/A	New Interchange	0.0	0.61	0.85	1	2,888	4,633	$8.20	0.00	0.05	2.3343	2.3399	Sumner	Task 3*	2030
H-17	Dickerson Pike (US-41)	SR-155 (Briley Pkwy)	Spring St	Widening, 4 to 6 lanes	4.7	0.32	0.65	1	21,659	54,987	$20.73	9.60	0.40	2.3022	2.2593	Davidson	Task 3	2040
H-18	Clarksville Hwy (US-41A/SR-112)	SR-12 (Ashland City Hwy)	SR-155 (Briley Pkwy)	Widening, 2 to 5 lanes	2.4	0.67	1.02	0	3,771	6,264	$18.88	0.20	0.22	2.3018	2.3271	Davidson	Task 3*	2030
H-13	NET Corridor Section 1 - Vietnam Veterans Pkwy (SR-386)	I-65	US-31E/Saundersville Road	Transit Capital Expansion - Widening, 4 to 6 lanes for freeway Bus Rapid Transit service from Nashville to Gallatin	8.9	0.68	0.87	1	21,702	34,412	$85.26	1.90	0.01	2.3014	2.2842	Sumner	MPO RTP/ nMotion*	2030
H-28	Nolensville Road (US-41A/SR-11)	Burkitt Road	I-840	Widening with realignment from south of Clovercroft Road to north of Sunset Road in Nolensville	10.6	0.30	0.97	3	741	7,786	$49.75	4.20	(0.15)	2.2742	2.2155	Williamson	MPO RTP	Illustrative
H-34	Murfreesboro Road (SR-96)	East of Arno Road	Wilson Pike (SR-252)	Widening, 2 to 5 lanes	5.8	0.39	1.24	1	1,034	5,953	$44.37	7.30	(0.03)	2.2641	2.1906	Williamson	MPO RTP*	2020
H-6	I-65	New interchange at New Hall Road in White House		New Interchange	0.0	0.52	0.65	2	556	1,489	$8.20	0.20	(0.23)	2.2485	2.2186	Robertson	Task 3	2030
H-41	Buckner Road Widening	Columbia Pike (SR-6/US-31)	Buckner Lane	Widening	1.9	0.53	0.85	1	909	4,141	$14.38	0.10	(0.16)	2.2095	2.1887	Williamson	MPO RTP	Illustrative
H-14	NET Corridor Transit - Ellington Pkwy (US-31E/SR-6) and I-65	Ellington Pkwy (SR-6) southern terminus	SR-386	Construction of managed Lanes along Ellington Pkwy (SR-6) and I-65 for freeway Bus Rapid Transit service from Nashville to Gallatin	10.0	0.49	0.63	2	34,245	63,436	$123.98	9.20	0.06	2.2084	2.1282	Davidson	MPO RTP/ nMotion*	2030

* Project included on IMPROVE Act project list

Table 3-5. (cont.)

						(1) Mobility/Safety		(2) Multimodal	(3) Access/Econ Dev		(4) Implementation	(5) Cost Efficiency						
						Base V/C	2040 E+C V/C	# of Projects	Base Total Employment	2040 Total Employment	Cost (millions$)	B/C (Method 1)	B/C (Method 2)					
						Base V/C Weight	2040 E+C V/C Weight	Multimodal Weight	Base TE Weight	2040 TE Weight	Cost Weight	B/C-1 Weight	B/C-2 Weight					
ID	Project Name	Termini (From)	Termini (To)	Description	Length (miles)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	RANKING 1	RANKING 2	County	Source	Source Horizon
H-45	I-65	Saturn Parkway (SR-396)	Bear Creek Pike (SR-99/ US-412)	Widening, 4 to 6 lanes	6.9	0.26	0.45	5	838	2,627	$54.39	2.60	(0.27)	2.1518	2.0944	Maury	Task 3	2030
H-42	Buckner Road Extension	Buckner Road	Lewisburg Pike (SR-106/ US-431)	New Roadway with New Interchange at I-65	2.1	0.53	0.79	1	141	1,813	$24.52	(0.10)	(0.29)	2.0981	2.0633	Williamson	MPO RTP	Illustrative
H-38	Columbia Pike (US-31/SR-6)	I-840	Mack Hatcher Pkwy (SR-397)	Widening, 2 to 4 lanes	5.0	0.34	0.54	2	2,236	5,756	$27.92	17.00	0.86	2.0893	2.0315	Williamson	Task 3*	2030
H-30	East McEwen Drive	Near Cool Springs Blvd	Wilson Pike (SR-252)	Widening, 2 to 4 lanes	1.6	0.22	1.12	0	5,064	14,733	$7.06	3.60	0.56	2.0778	2.1116	Williamson	MPO RTP	2030
H-35	Lewisburg Pike (SR-106/US-431)	Mack Hatcher Pkwy (SR-397)	Donelson Creek Pkwy	Widening, 2 to 4 lanes	0.8	0.27	1.05	0	2,104	4,299	$3.53	7.30	8.19	2.0644	2.9947	Williamson	MPO RTP	2030
H-1	I-65	SR-25	Kentucky State Line	Widening, 4 to 6 lanes	8.8	0.46	0.54	3	463	738	$54.74	2.20	0.01	2.0558	2.0356	Robertson	MPO RTP*	2030
H-23	Battery Lane/Harding Place at Franklin Rd/ Improvements	SR-6 (Franklin Rd.) at SR-255 (Harding Pl.) and Battery Lane		Capacity improvements for intersection approaches	0.7	0.43	0.64	1	4,221	5,380	$3.09	(0.50)	(1.95)	2.0521	1.8191	Davidson	MPO RTP	2020
H-15	I-24	I-65	Old Hickory Blvd (SR-45)	Widening, 4 to 6 lanes	4.3	0.68	0.81	0	4,205	16,561	$52.51	0.50	0.04	2.0440	2.0438	Davidson	Task 3*	2030
H-44	Duplex Road (SR-247)	SR-6/US-31	0.1 mile west of I-65	Widen Duplex Rd. from 2 to 3 lanes with add'l improvements	3.1	0.21	0.68	1	1,148	10,366	$6.84	10.70	(1.57)	1.9547	1.6603	Maury and Williamson	MPO RTP	2020
H-37	Murfreesboro Road (SR-96)	East of Wilson Pike (SR-252)	I-840	Widening, 2 to 5 lanes	5.5	0.20	0.69	2	171	3,637	$39.38	1.20	(0.25)	1.8225	1.7802	Williamson	MPO RTP*	2020
H-29	Mack Hatcher Pkwy (SR-397)	South of SR-96	US-431 (SR-106)	New construction, 4 lanes	3.3	0.30	0.67	1	2,007	3,210	$37.75	4.00	(0.17)	1.7851	1.7266	Williamson	Task 3*	2030
H-36	Peytonsville Road/Goose Creek Bypass (SR-248)	SR-106 (Lewisburg Pike)	West of I-65	Widen existing 2 lane road to 4/5 lane	0.8	0.35	0.42	1	157	659	$8.29	0.80	0.85	1.7595	1.8557	Williamson	MPO RTP	2020
H-46	Bear Creek Pike (SR-99/US-412)	Nashville Highway (US-31)	US-431	Widening, 2 to 4 lanes	11.1	0.26	0.55	2	2,322	4,174	$59.72	7.10	(0.20)	1.7533	1.6611	Maury	Task 3	2030
H-2	I-65/SR-109 Prop/SR-41	N/A	N/A	Relocation of SR 109, new interchange at I-65, and widening of I-65 from south of new interchange to Kentucky state line	0.6	0.41	0.54	0	92	140	$14.29	0.00	0.10	1.6912	1.7033	Sumner	MPO RTP	2020
H-9	SR-109	North of the Cumberland River Bridge	SR-109 Portland Bypass south of Gallatin	Widen from 2 lanes to 4/5 lanes	1.3	0.36	0.42	0	1,841	3,392	$8.60	0.00	0.01	1.6175	1.6186	Sumner	MPO RTP	2020
H-5	SR-76	Charles Drive	New Hall Road	Widening, 2 to 4 lanes	2.1	0.23	0.50	0	1,636	3,782	$12.13	0.70	(0.28)	1.5359	1.4946	Robertson	Task 3*	2030
H-8	NET Corridor Section 2 - Vietnam Veterans Pkwy (SR-386)	US-31E/Saundersville Road	SR-109 Bypass	Transit Capital Expansion - Widening, 4 to 6 lanes for freeway Bus Rapid Transit service from Nashville to Gallatin	6.9	0.35	0.60	0	5,798	12,571	$62.87	(0.20)	0.03	1.5167	1.5225	Sumner	MPO RTP/ nMotion*	2030
H-39	Murfreesboro Road (SR-96)	I-840	Veterans Pkwy	Widening, 2 to 5 lanes	6.9	0.16	0.49	1	413	3,105	$33.47	(0.20)	(0.22)	1.4971	1.4727	Williamson and Rutherford	Task 3*	2030
H-3	SR-109 Portland Bypass	SR-109 south of SR-76	SR-109 near Kirby Drive	Construct new 4 lane divided roadway	6.8	0.23	0.43	0	1,429	2,250	$59.98	0.30	(0.01)	1.2277	1.2238	Sumner	MPO RTP*	2020
H-43	Saturn Pkwy (SR-396) Extension	US-31	Carters Creek Pike (SR-246) at I-840	New Roadway	6.0	0.14	0.28	0	1,644	6,565	$70.92	5.70	(0.16)	1.0536	0.9791	Maury and Williamson	MPO RTP	Illustrative
H-31	Smyrna/Williamson County Connector	I-24 at Rocky Fork Road	McEwen Drive Extension	New Roadway	12.0	0.22	0.52	0	1,897	6,563	$120.84	(11.20)	(0.09)	0.8762	0.9721	Williamson and Rutherford	MPO RTP	Illustrative

* Project included on IMPROVE Act project list

Table 3-6. Safety Improvements: Project Rankings

						(1) Mobility/ Safety	(2) Multimodal	(3) Access/Econ Dev		(4) Implementation	(5) Cost Efficiency						
						Crash Rate	# of Projects	Base Total Employment	2040 Total Employment	Cost (millions$)	B/C (Method 1)	B/C (Method 2)					
						Mobility/ Safety Weight	Multimodal Weight	Base TE Weight	2040 TE Weight	Cost Weight	B/C-1 Weight	B/C-2 Weight					
ID	Project Name	Termini (From)	Termini (To)	Description	Length (miles)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	RANKING 1	RANKING 2	County	Source	Source Horizon
S-9	I-65 at Rosa L Parks Blvd (Exit 85)	I-65 at Rosa L Parks Blvd (Exit 85)		NB/Off Turn Lanes, SB/Off Turn Lanes, SB/On Turn Lanes	0.0	2.72	1	16,387	28,949	$0.99	2.86	6.70	3.7171	3.7622	Davidson	Task 3	2020
S-13	I-65 at Moores Lane	I-65 at Moores Lane		Interchange Modification	0.0	0.63	0	17,292	25,925	$0.60	2.15	26.01	3.0560	3.7578	Williamson	MPO RTP*	2020
S-8	I-65 at Trinity Lane (Exit 87)	I-65 at Trinity Lane (Exit 87)		NB/Off Ramp Auxiliary Lane Length	0.0	5.67	1	3,324	14,207	$0.75	2.05	4.12	2.9566	2.9672	Davidson	Outreach	
S-10	I-65 at Wedgewood Ave (Exit 81)	I-65 at Wedgewood Ave (Exit 81)		SB/On Auxiliary Lane, NB/SB Signal Timing	0.0	0.84	1	15,433	21,492	$0.88	0.31	8.28	2.9370	3.1826	Davidson	Task 3	2020
S-14	I-65 at SR-96 Murfreesboro Rd (Exit 65)	I-65 at SR-96 Murfreesboro Rd (Exit 65)		NB/Off Turn Lanes, SB/Off Turn Lanes, NB/SB Signal Timing	0.0	0.87	0	5,015	9,921	$0.77	17.01	31.40	2.6862	2.6862	Williamson	Task 3	2020
S-6	I-65 at Rivergate Pkwy, Long Hollow Pk, US-31W	N/A		Interchange Lighting	0.0	1.34	1	7,422	10,985	$0.44	1.10	(1.24)	2.3022	2.1982	Davidson	MPO RTP	2020
S-15	SR-96	Intersection with US-41A		Intersection Improvements	0.0	0.63	4	38	852	$0.82	0.24	6.98	2.0511	2.2593	Williamson	Outreach	
S-4	I-65 at US-31W Louisville Hwy (Exit 98)	I-65 at US-31W Louisville Hwy (Exit 98)		NB/Off Turn Lanes, SB/On Auxiliary Lane, NB/SB Signal Timing	0.0	0.62	3	666	953	$0.44	1.73	(1.14)	1.9755	1.8372	Sumner	Task 3	2020
S-5	I-65 at US-31W (Exit 98)	I-65 at US-31W (Exit 98)		NB to WB Flyover	0.0	0.62	3	602	853	$0.55	1.82	(1.47)	1.9592	1.8054	Sumner	Outreach	
S-17	I-65 at US-412/SR-99 (Exit 46)	I-65 at US-412/SR-99 (Exit 46)		NB/SB Signalized Intersection	0.0	1.1	3	31	61	$0.33	0.07	20.70	1.9090	2.5644	Maury	Task 3	2020
S-19	I-65 at SR-99 (US-412)	I-65 at SR-99 (US-412)		Interchange Modification	0.0	1.1	3	31	61	$0.40	0.13	15.11	1.9043	2.3777	Williamson	MPO RTP*	2020
S-7	I-65 at SR-174 Long Hollow Pike (Exit 97)	I-65 at SR-174 Long Hollow Pike (Exit 97)		SB/Off Turn Lanes, NB/SB Signal Timing	0.0	0.55	1	4,772	6,575	$0.77	1.78	1.61	1.8548	1.8012	Davidson	Task 3	2020
S-11	I-65 at SR-254 Old Hickory Blvd (Exit 74)	I-65 at SR-254 Old Hickory Blvd (Exit 74)		Convert to to Diverging Diamond Interchange	0.0	2.62	0	6,390	11,024	$4.41	2.06	2.44	1.7624	1.7187	Davidson	Task 3	2020
S-2	I-65 at Bethel Road (SR-257) Interchange Lighting Improvements	I-65 at SR-257 (Exit 104)		Install interchange lightning	0.0	0.58	2	408	961	$0.49	0.76	(2.24)	1.6410	1.5249	Sumner	MPO RTP	2020
S-1	I-65 at SR-257 (Exit 104)	I-65 at SR-257 (Exit 104)		NB/Off Ramp Queuing	0.0	0.58	2	419	995	$0.66	0.90	(0.87)	1.6284	1.5474	Robertson	Outreach	
S-12	I-65 at SR-253 Concord Rd (Exit 71)	I-65 at SR-253 Concord Rd (Exit 71)		NB/On Auxiliary Lane, SB/On Auxiliary Lane, NB/SB Signal Timing	0.0	0.66	0	3,853	7,537	$1.10	1.55	2.88	1.5477	1.5486	Williamson	Task 3	2020
S-20	I-65 at SR-11/US-31A (Exit 22)	I-65 at SR-11/US-31A (Exit 22)		NB/SB Signalized Intersection	0.0	2.46	0	52	54	$0.60	0.01	(0.63)	1.3620	1.3416	Giles	Task 3	2020
S-21	I-65 at SR-15/US-64 (Exit 14)	I-65 at SR-15/US-64 (Exit 14)		NB/SB Signalized Intersection	0.0	1.21	0	17	13	$0.37	0.00	(0.79)	1.1663	1.1410	Giles	Task 3	2020
S-18	I-65 at SR-129 Lynnville Highway (Exit 27)	I-65 at SR-129 Lynnville Highway (Exit 27)		NB/On Turn Lane, SB/On Turn Lane	0.0	1.04	0	48	56	$0.42	0.00	1.26	1.1341	1.1741	Marshall	Task 3	2020
S-22	Main Street (SR-7)	Union Hill Road (Ardmore)	Morrow Road (Ardmore)	Safety Improvements	0.9	0.86	0	399	484	$1.98	0.01	(0.06)	0.9347	0.9326	Giles	Task 3*	2030
S-3	Bethel Road (SR-257)	Lake Road	I-65	Widen shoulders and correct substandard horizontal geometries	2.3	0.58	0	806	1,528	$2.87	1.65	(0.17)	0.9275	0.8248	Robertson	Outreach	
S-16	I-65 at SR-396 Saturn Parkway (Exit 53)	I-65 at SR-396 Saturn Parkway (Exit 53)		NB to WB Flyover	0.0	1.56	2	260	1,385	$7.72	0.78	(0.33)	0.8839	0.8274	Maury	Task 3	2020

Table 3-7. ITS Improvements: Project Rankings

						(1) Mobility/Safety		(2) Multimodal	(3) Access/Econ Dev		(4) Implementation	(5) Cost Efficiency						
						Base V/C	2040 E+C V/C	# of Projects	Base Total Employment	2040 Total Employment	Cost (millions$)	B/C (Method 1)	B/C (Method 2)					
						Base V/C Weight	2040 E+C V/C Weight	Multimodal Weight	Base TE Weight	2040 TE Weight	Cost Weight	B/C-1 Weight	B/C-2 Weight					
ID	Project Name	Termini (From)	Termini (To)	Description	Length (miles)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	RANKING 1	RANKING 2	County	Source	Source Horizon
0-17	Active Arterial Management (AAM) Hillsboro Rd (US-431)	Broadway (US-70A)	Mack Hatcher	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	16.0	0.91	1.18	2	125,754	182,264	$4.2	2.39		5.6840		Davidson and Williamson	Task 3	2030
0-9	Dynamic on-ramp assignment - Southbound	Charlotte Ave	I-40/I-65 Split	Add arterial DMS along 14th Ave, add interstate shields or use gantries for junction pre-positioning on on-ramps and interstate facilities	1.0	1.18	1.21	2	100,495	162,444	$6.0	1.30		5.3529		Davidson	Task 3	2030
0-10	Dynamic on-ramp assignment - Northbound	Broadway (US-70A)	I-40/I-65 Split	Add arterial DMS along 14th Ave, add interstate shields and deploy lane control gantries for junction pre-positioning on on-ramps and interstate facilities	1.0	1.18	1.21	2	92,500	147,822	$6.0	1.30		5.2359		Davidson	Task 3	2030
0-15	Active Arterial Management (AAM) Nolesville Pike (US-41)	Korean Veterans Blvd	Old Hickory Blvd	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	9.0	0.45	1.01	2	105,214	166,206	$2.7	2.63		5.0742		Davidson	Task 3	2030
0-14	Active Arterial Management (AAM) Franklin Rd	Demonbreun	Mack Hatcher	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	18.0	0.86	1.08	0	147,324	233,044	$3.8	1.39		4.7274		Davidson and Williamson	Task 3	2040
0-12	Active Arterial Management US-31 E/Gallatin Pike	Rivergate Pkwy	Spring Street	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	10.0	0.91	1.06	1	42,026	72,520	$2.9	2.47		4.1296		Davidson	Task 3	2030
0-16	Active Arterial Management (AAM) Old Hickory Blvd	Hillsboro Rd (US-431)	US-41	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	15.0	1.03	1.11	0	33,648	62,459	$3.7	4.62		4.0969		Davidson	Task 3	2030
0-18	Active Arterial Management (AAM) Nolensville Pike (US-41)	I-840	US-231/Colloredo Blvd/Lane Pkwy	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	28.0	0.94	0.93	2	8,668	17,373	$2.9	1.46		3.8659		Williamson, Rutherford, and Bedford	Task 3	2040
0-13	Active Arterial Management (AAM) Dickerson Pike	US-31W/ Louisville Hwy	US-431/Trinity Ln	Last mile connectivity between intersections, install detection for all intersections, MOUs, and Consultant Operations to optimize signal timing and detect incidents along corridor	10.0	0.37	0.94	1	17,093	40,578	$2.2	2.08		3.2180		Davidson and Sumner	Task 3	2030
0-1	Rapid Incident Scene Clearance (RISC)	Kentucky	Alabama	Contractual incentive-based program and operational policy to support open roads initiative related to truck crashes; North and South options	122.0						$1.3					All	Task 3	2040
0-2	Conversion to Virtual Weigh Stations	Kentucky	Alabama	Portland weigh station	122.0						$0.9					All	Task 3	2040
0-3	Smart Truck Parking	Kentucky	Alabama	Location TBD; Potentials include the existing rest areas near Exit 22, Exit 46, and the Kentucky state line	122.0						$1.0					All	Task 3	2030
0-4	I-65 Traffic Incident Management (TIM) Team	Kentucky	Alabama	North and South options	122.0						$2.0					All	Task 3	2030
0-5	I-65 North ITS	Exit 108	Kentucky border	Install CCTV, DMS, and detection devices including fiber optic connections on I-65; Suggested DMS locations: SR-25/Main St (Exit 112) NB and SB, and SR-52 (Exit 117) SB.	13.0						$4.0					Sumner	Task 3	2030
0-6	Connected Vehicle Technology Deployment	I-840	SR-76 (Exit 108)	Install DSRC radios	49.0						$0.7					Davidson, Robertson, Sumner, and Williamson	Task 3	2020

Table 3-7. (cont.)

						(1) Mobility/Safety		(2) Multimodal	(3) Access/Econ Dev		(4) Implemen-tation	(5) Cost Efficiency						
						Base V/C	2040 E+C V/C	# of Projects	Base Total Employment	2040 Total Employment	Cost (millions$)	B/C (Method 1)	B/C (Method 2)					
						Base V/C Weight	2040 E+C V/C Weight	Multimodal Weight	Base TE Weight	2040 TE Weight	Cost Weight	B/C-1 Weight	B/C-2 Weight					
ID	Project Name	Termini (From)	Termini (To)	Description	Length (miles)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	RANKING 1	RANKING 2	County	Source	Source Horizon
0-7	Adaptive Ramp Metering (ARM)	Exit 108 (SR-76)	Exit 90 (SR-155)	Install adaptive ramp metering devices and additional detection at 6 ramp locations in each direction	18.0						$1.3					Davidson, Robertson, and Sumner Counties	Task 3	2030
0-8	Adaptive Ramp Metering (ARM)	Exit 88 (I-24)	Exit 80 (US-440)	Install adaptive ramp metering devices and additional detection at 6 ramp locations in each direction	8.0						$1.3					Davidson	Task 3	2030
0-11	Adaptive Ramp Metering (ARM)	Exit 80 (US-440)	Exit 53 (SR-396)	Install adaptive ramp metering devices and additional detection at 9 ramp locations in each direction	27.0						$1.3					Davidson and Williamson	Task 3	2030
0-19	I-65 South ITS	MM 57.6	Alabama border	Install CCTV, DMS, and detection devices including fiber optic connections on I-65; Suggested DMS locations: SR-396/Saturn Pkwy (Exit 53) NB and SB, SR-50/New Lewisburg Hwy (Exit 37) NB and SB, and SR-11/Alt US-31/Sam Davis Hwy (Exit 22) NB.	67.0						$19.5					Maury and Giles	Task 3	2030

Table 3-8. Freight Improvements: Project Rankings

						(1) Mobility/Safety			(2) Multimodal	(3) Access/Econ Dev		(4) Implementation	(5) Cost Efficiency						
						Base V/C	2040 E+C V/C	Truck %	# of Projects	Base Total Employment	2040 Total Employment	Cost (millions$)	B/C (Method 1)	B/C (Method 2)					
						Base V/C Weight	2040 E+C V/C Weight	Multimodal Weight	Multimodal Weight	Base TE Weight	2040 TE Weight	Cost Weight	B/C-1 Weight	B/C-2 Weight					
ID	Project Name	Termini (From)	Termini (To)	Description	Length (miles)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	RANKING 1	RANKING 2	County	Source	Source Horizon
F-3	I-65	Nortbound direction - Merging area of I-40 and I 65 (South of Nashville Loop)		Merge area geometry correction - Adding lane(s)	0.3	1.50	1.82	0.34	1	66,323	106,525	$3.66	0.00	0.07	5.9371	5.9437	Davidson	Task 3	2040
F-2	I-65	Northbound direction - Diverging area of I-40 and I 65 (West of Nashville Loop)		Diverging area geometry correction - Adding lane(s)	0.2	1.25	1.68	0.36	1	24,830	46,389	$4.10	0.02	0.36	4.4699	4.5041	Davidson	Task 3	2030
F-6	Old Hickory Blvd (SR-254)	I-65	Nolensville Road (US-41A/SR-11)	Widening	4.1	1.20	1.28	0.40	1	12,100	20,577	$9.04	60.52	1.02	4.2740	3.3731	Davidson	Task 3	2020
F-1	I-65 Weigh Station near TN/KY State Line	N/A	N/A	Roadway Reconstruction and New Weigh Station	0.0	1.00	1.00	1	1	73	105	$3.27	10.31	10.31	4.0258	4.8555	Sumner	MPO RTP	2020
F-4	Ramp Improvement	Northbound ramp from I-24 to Hermitage Ave		Diverging area geometry correction - Adding lane(s)	0.2	1.03	1.13	0.23	0	21,592	35,514	$1.14	0.00	0.08	3.0750	3.0825	Davidson	Task 3	2040
F-7	Harding Place (SR-255)	Nolensville Road (US-41A/SR-11)	Jonquil Drive	Widening	0.5	1.01	1.54	0.41	0	7,571	10,137	$1.06	0.25	(0.36)	3.0236	2.9847	Davidson	Task 3	2040
F-5	Harding Place (SR-255)	McGavock Pike	Donelson Pike	Widening	0.4	0.41	0.81	0.49	0	17,613	43,796	$0.86	(0.35)	(1.70)	2.7841	2.6246	Davidson	Task 3	2040

Table 3-9. Transit Improvements: Project Rankings

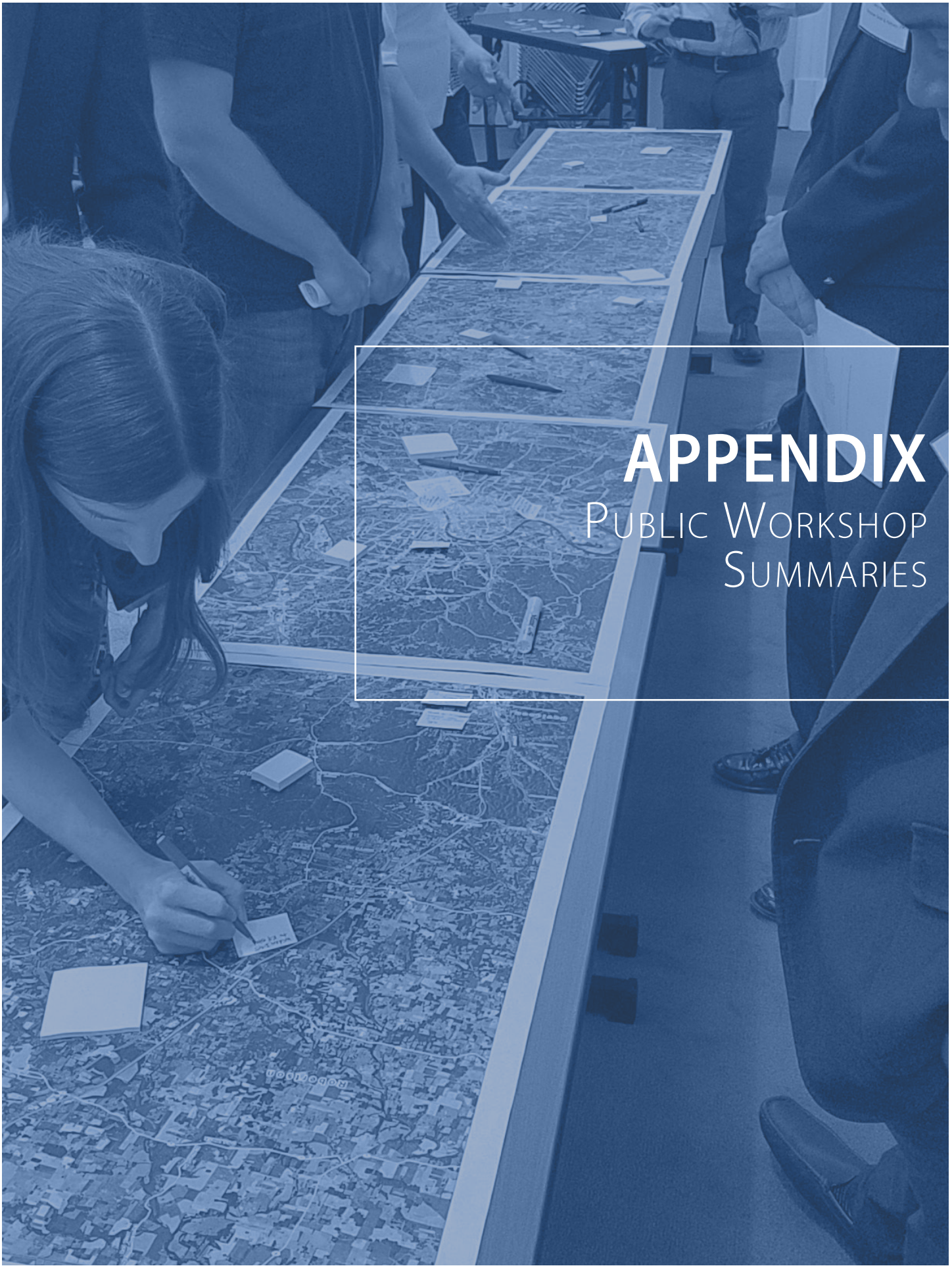
						(1) Mobility/ Safety	(2) Multimodal	(3) Access/Econ Dev		(4) Implemen-tation	(5) Cost Efficiency						
						LOS (hrs/day)	# of Projects	Base Total Employment	2040 Total Employment	Cost (millions$)	B/C (Method 1)	B/C (Method 2)					
						LOS Weight	Multimodal Weight	Base TE Weight	2040 TE Weight	Cost Weight	B/C-1 Weight	B/C-2 Weight					
ID	Project Name	Termini (From)	Termini (To)	Description	Length (miles)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	RANKING 1	RANKING 2	County	Source	Source Horizon
T-24	South Corridor Regional Express Bus Service	Several routes between Nashville, Franklin, Spring Hill, and Columbia		Provide new and expanded service to Williamson and Maury County, including additional express trips, reverse commute trips, additional service hours, and new Park-and-Ride opportunities	45.9	0.21	5	110,014	187,412	$26.71			4.2138		Davidson/ Sumner	nMotion	2030
T-11	Nolensville Pike (US-41A) LRT	Downtown Nashville	Lenox Village Drive	Construction of light rail transit along US-31A (Nolensville Pike)	5.5	0.77	2	90,279	139,556	$430.50			3.3069		Davidson and Williamson	Central/ South	2030
T-13-18	I-65 South Freeway BRT Stations (6)	Downtown Nashville	Franklin	Construction of freeway BRT transit stop and park-and-ride lot	0.0	0.21	0	91,642	144,168	$3.97			2.8469		Davidson	nMotion	2030
T-10	Dickerson Pike (US-31W) BRT	Hunters Lane	Downtown Nashville	Construction of bus rapid transit amenities along US-31W (Dickerson Pike). Project include dedicated bus lanes and improved pedestrian facilities.	4.7	0.83	2	26,326	63,219	$235.00			2.6582		Davidson and Williamson	MPO RTP / nMotion	2030
T-25	Rapid Transit/Managed Lanes between Nashville and Franklin	Downtown Nashville	Murfreesboro Road (SR-96)	Construction of managed lanes for freeway Bus Rapid Transit along I-65 from Nashville to Murfreesboro Road (SR-96)	18.8	0.21	0	91,642	144,168	$335.50			2.3977		Davidson/ Williamson	nMotion	2030
T-1	NET Corridor Regional Express Bus Service	Several routes between Nashville and Gallatin		Provide new and expanded service to Sumner County, including additional express trips, additional service hours, and new park-and-ride opportunities	30.0	0.21	3	19,852	39,278	$1.25			2.2383		Davidson and Sumner	MPO RTP	2020
T-9	US-31E (Gallatin Pike) LRT	Downtown Nashville	Conference Drive	Construction of light-rail transit along US-31E (Gallatin Pike)	4.9	0.79	1	55,853	96,068	$738.00			2.1703		Sumner	nMotion	2030
T-3-5	I-65 North Freeway BRT Stations (3)	Goodlettesville	Gallatin	Construction of freeway BRT transit stop and park-and-ride lot	0.0	0.21	2	11,296	22,370	$1.99			1.8693		Davidson	MPO RTP	2030
T-6	NET Corridor Interchange 2	Vietnam Veterans Pkwy (SR-386) at Conference Drive		Interchange modification for Traffic NB onto Conference Drive	0.0	0.21	2	8,351	12,636	$13.42			1.7751		Davidson and Sumner	nMotion	2030
T-7	NET Corridor Interchange 1	Vietnam Veterans Pkwy (SR-386) at I-65		Interchange modification WB to NB and SB to EB Traffic	0.0	0.21	2	5,897	9,292	$26.84			1.7168		Sumner	nMotion	2030
T-22	Rapid Bus Service - Route 96R Murfreesboro	Downtown Nashville	Murfreesboro	Provide new rapid bus service to Murfreesboro	33.6	0.21	1	14,088	23,011	$6.52			1.6920		Davidson	nMotion	2030
T-2	White House Express Service	SR-76	SR-386	Widening and strengthening of shoulders to 12-ft for bus on shoulder service. Further study of ramp metering for SR-174 (Long Hollow Pike), US-31W, and SR-257 (Bethel Road) to determine if necessary for safe routing	12.0	0.00	3	716	1,708	$2.40			1.6124		Davidson	MPO RTP	2030
T-20	Rapid Bus Service - Route 81R Nolensville	Nolensville	Murfreesboro Road (SR-96)	Provide new rapid bus service to Triune	7.0	0.00	3	38	845	$1.36			1.6030		Williamson and Rutherford	nMotion	2030
T-21	Rapid Bus Service - Route 86R Smyrna/LaVergne	Downtown Nashville	Smyrna/LaVergne	Provide new rapid bus service to Smyrna and LaVergne	24.0	0.19	1	2,196	3,892	$4.66			1.4594		Davidson	nMotion	2030
T-8	Rapid Bus Service - Route 80R Gallatin	Outer end of Gallatin Pike LRT	Gallatin	Provide new rapid bus service to Gallatin	17.5	0.21	0	8,339	18,155	$3.40			1.4181		Sumner	nMotion	2030
T-12	Rapid Bus Service - Route 81R Nolensville	Outer end of Nolensville Pike LRT	Nolensville	Provide new rapid bus service to Nolensville	5.8	0.00	2	156	1,678	$1.13			1.4088		Davidson	Central/ South	2030
T-23	Franklin to Mufreesboro Express Bus Service	Routes between Franklin and Mufressboro		Provide new service express service to from Franklin (Cool Springs) to Murfreesboro	31.2	0.00	0	21,411	34,091	$6.05			1.3683		Davidson	nMotion	2030
T-19	Transit-Pedestrian Network Improvements	Various Locations		Construction of transit-supportive pedestrian amenities, including sidewalks, landscaping, lighting, crosswalks, and ADA ramps											Maury and Williamson	nMotion	2030

Table 3-10. Walking and Bicycling Improvements: Project Rankings

						(1) Mobility/Safety		(2) Multimodal	(3) Access/Econ Dev		(4) Implementation	(5) Cost Efficiency						
						Base Total Population	2040 Total Population	# of Projects	Base Total Employment	2040 Total Employment	Cost (millions$)	B/C (Method 1)	B/C (Method 2)					
						Base Pop Weight	2040 Pop Weight	Multimodal Weight	Base TE Weight	2040 TE Weight	Cost Weight	B/C-1 Weight	B/C-2 Weight					
ID	Project Name	Termini (From)	Termini (To)	Description	Length (miles)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	RANKING 1	RANKING 2	County	Source	Source Horizon
B-38	Buckner Road	Buckner Road/I-65 Interhchange	Lewisburg Pike (SR-106/US-431)	Network - Construction of bike lane(s) or multi-use trail; can be constructed in concert with H-22	2.1	24,464	33,418	1	88,161	140,390	$1.60	1.85		4.6953		Williamson	Task 3	2040
B-34	Columbia Pike (US-31/SR-6)	Goose Creek Bypass	Mack Hatcher Parkway (SR-397)	Construction of Multi-Use Path	3.9	15,895	23,826	1	96,939	158,412	$2.93	0.91		4.0847		Williamson	Connect Franklin	2030
B-33	SR-96 (Murfreesboro Road)	East of Arno Road	Veterans Pkwy	Network - Construction of on-road or off-road bicycle facilities	18.3	15,063	22,254	3	79,274	130,917	$4.58	1.43		4.0502		Williamson/ Rutherford	Task 3	2030
B-37	Buckner Road	Columbia Pike (SR-6/US-31)	Buckner Lane	Network - Construction of bike lane(s) or multi-use trail; can be constructed in concert with H-24	1.9	12,185	19,221	1	81,870	137,173	$1.44	3.80		3.8094		Williamson	Task 3	2040
B-35	Goose Creek Bypass (SR-248)	Columbia Pike (US-31/SR-6)	Long Lane	Construction of Bike Lanes with Sidewalks	4.1	15,330	23,560	1	62,470	109,651	$1.02	2.37		3.7273		Williamson	Connect Franklin	2040
B-7	James Robertson Parkway (US-31)	Rosa Parks Boulevard (SR-12)	Church Street	Construction of Separated Bike Lanes	0.5	11,062	16,834	0	78,329	124,476	$0.69	8.38		3.4237		Davidson	Nashville WalknBike	2030
B-36	US-31	SR-248 (Goose Creek Bypass)	North of Buckner Lane	Network - Construction of bike lane(s) or multi-use path	3.8	11,201	18,344	1	74,818	128,374	$2.89	1.17		3.3512		Williamson	Task 3	2020
B-11	US-431 (Broadway)	George L. Davis Blvd.	14th Avenue South	Reconstruction of sidewalks along US-431 (Broadway). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	0.1	5,767	28,574	1	780	7,842	$0.05	105.00		3.3427		Davidson	Task 3	2020
B-4	US-431 (Trinity Lane)	US-431 (Whites Creek Pike)	US-41 (Dickerson Pike)	Safety - Reconstruction of sidewalks along US-431 (Trinity Lane). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	1.3	10,520	16,681	0	69,453	113,166	$0.57	13.16		3.3013		Davidson	Task 3	2020
B-30	Mack Hatcher Pkwy (SR-397)	SR-96 east of Franklin	Columbia Pike (US-31/SR-6) south of Franklin	Network - Construction of Multi-Use Path; Can be constructed with in concert with H-30	3.2	25,502	36,777	1	16,485	28,068	$2.42	3.27		3.2495		Williamson	Connect Franklin	2030
B-22	Franklin Road (US-31/SR-6)	SR-441 (Moore's Lane)	Harpeth River Bridge	Construction of Multi-Use Path; Can be constructed in concert with H-37	3.7	18,570	38,410	1	15,936	28,856	$2.81	2.45		2.9455		Williamson	Connect Franklin	2040
B-19	Nolensville Road (SR-11)	Burkitt Road	I-840	Network - Construction of on-road or off-road bicycle facilities	10.6	12,931	29,137	2	20,499	33,131	$2.65	1.85		2.9148		Williamson	Task 3	2040
B-31	Columbia Pike (US-31/SR-6)	Fowlkes Street	Mack Hatcher Pkwy (SR-397)	Construction of On-Road Bike Lanes; Can be constructed in concert with H-31	1.9	15,417	20,750	1	8,843	15,840	$0.47	11.21		2.6897		Williamson	Connect Franklin	2030
B-6	Rosa Parks Boulevard (SR-12)	Buchanan Street	James Robertson Parkway (US-31)	Construction of Separated Bike Lanes	1.2	11,001	16,381	0	50,466	86,396	$1.80	4.03		2.6539		Davidson	Nashville WalknBike	2030
B-29	SR-96 (Murfreesboro Road)	Southwinds Drive	Carothers Parkway	Safety - Construction of sidewalks or multi-use path along SR-96. Project includes landscaping, crosswalks, and pedestrian amenities.	1.0	11,223	22,946	1	11,308	17,571	$0.63	7.10		2.5520		Williamson	Task 3	2020
B-21	SR-441 (Moore's Lane)	Mallory Lane	Carrothers Parkway	Network - Construction of on-road facility or multi-use trail	0.8	13,877	27,891	0	10,675	15,051	$0.61	4.45		2.4054		Williamson	Task 3	2020
B-9	Rosa Parks Boulevard/8th Ave S (US-31)	Church Street	Korean Veterans Boulevard	Construction of Separated Bike Lanes	0.5	8,433	38,940	0	1,541	11,077	$0.78	7.75		2.3592		Davidson	Nashville WalknBike	2030
B-14	SR-109	I-40	I-840	Network - Construction of shared roadway facility	4.0	13,544	21,109	0	2,526	13,440	$0.08	8.97		2.2561		Wilson	Task 3	2020
B-2	Johnny Cash Parkway/East Main Street (US-31E)	Big Station Camp Road	Center Point Road South	Construction of Buffered Bike Lanes	8.8	13,444	18,443	1	5,010	20,576	$2.20	4.91		2.1927		Sumner	Hendersonville Bicycle Plan	2040
B-5	Clarksville Pike (SR-12)	Ashland City Highway (SR-12)	Rosa Parks Boulevard (US-41 Alt)	Construction of Bike Lanes	1.1	9,717	18,943	0	7,466	14,947	$0.23	16.59		2.1582		Davidson	Nashville WalknBike	2030

Table 3-10. (cont.)

						(1) Mobility/Safety		(2) Multimodal	(3) Access/Econ Dev		(4) Implementation	(5) Cost Efficiency						
						Base Total Population	2040 Total Population	# of Projects	Base Total Employment	2040 Total Employment	Cost (millions$)	B/C (Method 1)	B/C (Method 2)					
						Base Pop Weight	2040 Pop Weight	Multimodal Weight	Base TE Weight	2040 TE Weight	Cost Weight	B/C-1 Weight	B/C-2 Weight					
ID	Project Name	Termini (From)	Termini (To)	Description	Length (miles)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	RANKING 1	RANKING 2	County	Source	Source Horizon
B-25	Mack Hatcher Pkwy (SR-397)	South of SR-96	US-431 (SR-106)	Construction of Multi-Use Path; Can be constructed with in concert with H-28	3.3	15,829	28,723	0	8,038	16,487	$2.48	1.33		2.1412		Williamson	Connect Franklin	2030
B-16	SR-254 (Old Hickory Blvd)	Franklin Pike Circle	Franklin Pike	Safety - Reconstruction of sidewalks along SR-254 (Old Hickory Blvd). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	0.5	10,192	21,586	0	2,144	3,491	$0.32	14.06		2.0783		Davidson	Task 3	2020
B-1	New Shackle Island Road (SR-258)	Johnny Case Parkway (US-31E)	Long Hollow Pike (SR-174)	Construction of Paved Shoulders	5.2	12,482	18,205	0	8,966	24,107	$1.30	5.00		2.0308		Sumner	Hendersonville Bicycle Plan	2040
B-13	8th Avenue South (US-31)	Korean Veterans Boulevard	Bradford Avenue	Construction of Separated Bike Lanes	1.8	9,490	17,847	0	2,472	12,354	$0.83	11.59		1.9048		Davidson	Nashville WalknBike	2030
B-26	Hillsboro Road (SR-106/ US-431)	Mack Hatcher Pkwy (SR-397)	Del Rio Pike	Construction of Bike Lanes with Sidewalks	1.0	6,332	9,441	0	23,032	36,972	$0.85	5.18		1.8682		Williamson	Connect Franklin	2030
B-15	US-41 (Lafayette Street)	US-31 Alt/SR-11	1st Avenue South	Safety - Reconstruction of sidewalks along US-41 (Lafayette Street). Project includes landscaping, lighting, crosswalks, in-roadway warning lights at on-ramps, and pedestrian amenities.	0.3	3,703	14,820	0	2,164	5,260	$0.19	32.89		1.8626		Davidson	Task 3	2020
B-17	Main Street/Carters Creek Pike (SR-246)	Southall Road	Natchez Street	Construction of Multi-Use Path	3.1	10,475	20,419	0	12,543	19,991	$2.34	1.25		1.8094		Williamson	Connect Franklin	2040
B-28	SR-96	Harpeth River Bridge	Arno Road	Construction of Multi-Use Path; Portion could be constructed in concert with B-5	3.9	8,900	12,553	1	12,563	22,017	$2.96	3.20		1.8063		Williamson	Connect Franklin	2040
B-8	US-70 (Charlotte Pike)	14th Avenue North	George L. Davis Blvd.	Safety - Pedestrian improvements at interchange of US-70 and I-40/I-65. Project includes landscaping, lighting, crosswalks, in-roadway warning lights at ramps, and pedestrian amenities.	0.1	5,138	17,832	0	992	3,731	$0.05	3.75		1.7207		Davidson	Task 3	2020
B-3	US-41 (Dickerson Pike)	US-431 (Trinity Lane)	Hart Lane	Safety - Construction of sidewalks along US-41. Project includes landscaping, crosswalks, and pedestrian amenities.	2.0	4,912	6,223	1	9,319	15,465	$1.30	5.77		1.7160		Davidson	Task 3	2020
B-10	Broadway (US-70)	1st Avenue	14th Avenue North	Construction of Separated Bike Lanes	1.0	6,103	12,060	1	141	1,813	$1.50	4.73		1.6882		Davidson	Nashville WalknBike	2030
B-18	Concord Road (SR-253)	Franklin Road (US-31/SR-6)	Wilson Pike (SR-252)	Construction of Multi-Use Path	1.7	7,753	18,419	0	5,539	7,895	$1.31	2.28		1.6856		Williamson	Brentwood 2040 MTP	2040
B-39	US-31	Buckner Road	Carters Creek Station Road	Construction of Bike Lanes	6.2	5,814	8,643	0	22,455	34,283	$1.56	2.89		1.6633		Maury/ Williamson	Spring Hill BP Plan	2030
B-20	Franklin Road (US-31/SR 6)	Concord Road (SR-253)	Maryland Way	Construction of Multi-Use Path	2.6	8,504	15,994	0	7,679	10,699	$1.99	1.45		1.5703		Williamson	Brentwood 2040 MTP	2040
B-32	Wilson Pike (SR-252)	Concord Road (SR-253)	Church Street East	Construction of Multi-Use Path	2.6	8,882	11,813	0	10,622	15,873	$1.99	2.64		1.5522		Williamson	Brentwood 2040 MTP	2040
B-23	Mack Hatcher Pkwy (SR-397)	Hillsboro Road (SR-106/US-431)	Franklin Road (SR-6/US-31)	Construction of Multi-Use Path	1.5	2,548	14,100	0	311	1,178	$1.16	3.72		1.3131		Williamson	Connect Franklin	2020
B-40	SR-247 (Duplex Road/ Beechcroft Rd.)	I-65	SR-246 (Carters Creek Rd.)	Construction of Multi-Use Path	7.8	10,539	20,060	1	908	4,126	$5.95	1.06		1.3073		Williamson	Spring Hill BP Plan	2020
B-24	Wilson Pike (SR-252)	McEwan Drive	Trinity Lane	Network - Construction of Multi-Use Path	2.9	3,246	12,471	0	147	2,085	$2.19	1.07		1.1044		Williamson	Connect Franklin	2040
B-27	SR-96	7th Ave North	Old Charlotte Pike	Construction of Multi-Use Path	4.4	4,951	8,038	0	4,738	9,168	$3.36	1.98		0.9615		Williamson	Connect Franklin	2040
B-12	Lafayette Street (US-31)	8th Avenue S (US-31)	Fairfield Avenue	Construction of Separated Bike Lanes	1.3	1,353	3,310	0	821	1,947	$2.00	3.75		0.8584		Davidson	Nashville WalknBike	2030



APPENDIX
Public Workshop Summaries

APPENDIX

Public Workshop Summaries

I-65 Multimodal Corridor Study
Public Workshop #1: Nashville Summary

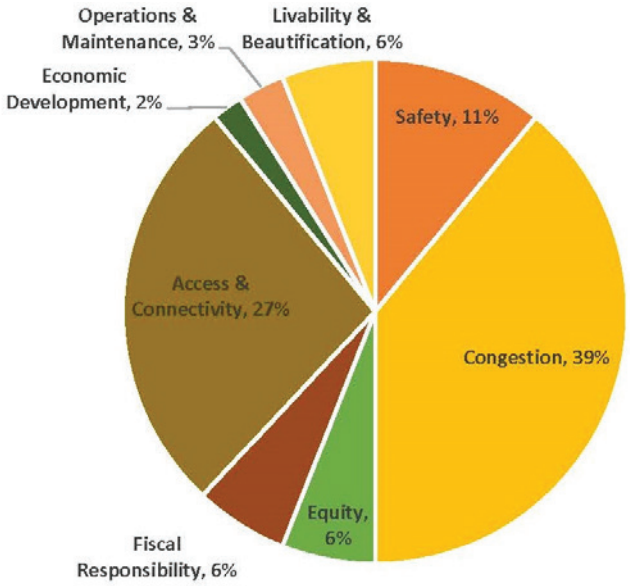
The Tennessee Department of Transportation (TDOT) held the first of three public workshops for the I-65 Multimodal Corridor Study on October 18, 2016, at the Nashville Main Public Library in downtown Nashville. The workshop had 53 attendees sign in and was held from 11:30 AM to 1:00 PM.

The goal of the I-65 Multimodal Corridor Study is to examine potential multimodal transportation improvements that would address existing and emerging transportation system issues associated with the corridor. The recommendations will reflect identified deficiencies along the route with an emphasis on safety, corridor capacity, and freight diversion. The public workshop focused on defining corridor priorities, establishing a vision for the corridor, and identifying specific issues or concerns. Following are the results from the workshop.

Dot Board – Corridor Priorities

In the Corridor Priorities activity, attendees were asked to vote on their top priorities using a dot board. Attendees were given three dots and told they could distribute them however they pleased, whether voting for three priorities or voting three times for a single priority. The priorities reflected seven overarching themes: Safety, Congestion, Access and Connectivity, Operations and Maintenance, Livability and Beautification, Fiscal Responsibility, and Economic Development.

A total of 64 votes were received. The pie chart to the right summarizes the results of the activity.



Establishing a Corridor Vision Statement – "Three Words or Phrases"

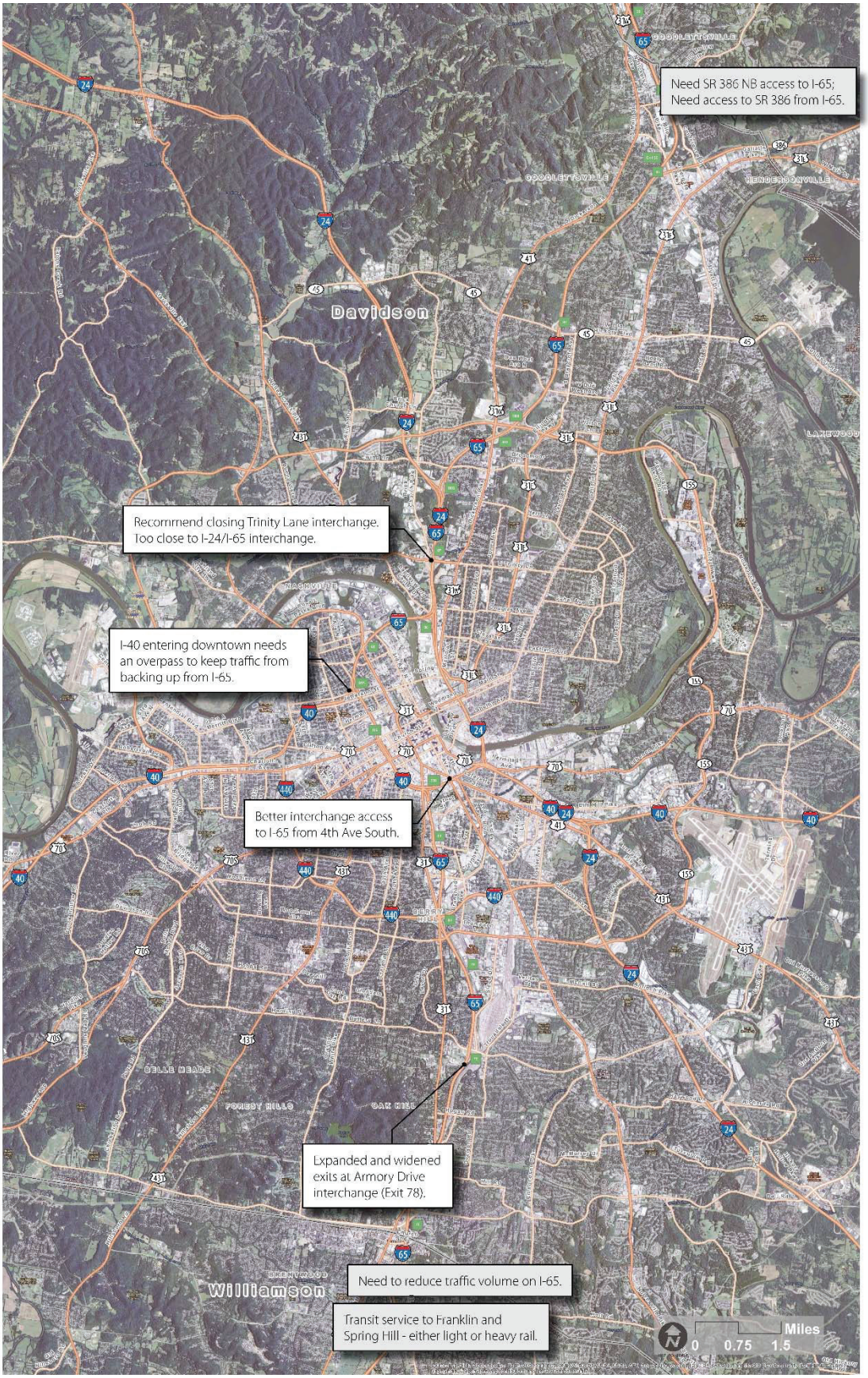
Meeting attendees were asked to list words or phrases to describe their vision for I-65 corridor. The "Wordle" below highlights key words and phrases based on the number of times they were mentioned. The words and phrases will be used in the coming months to guide the development of the draft vision statement for the corridor and the study's recommendations.

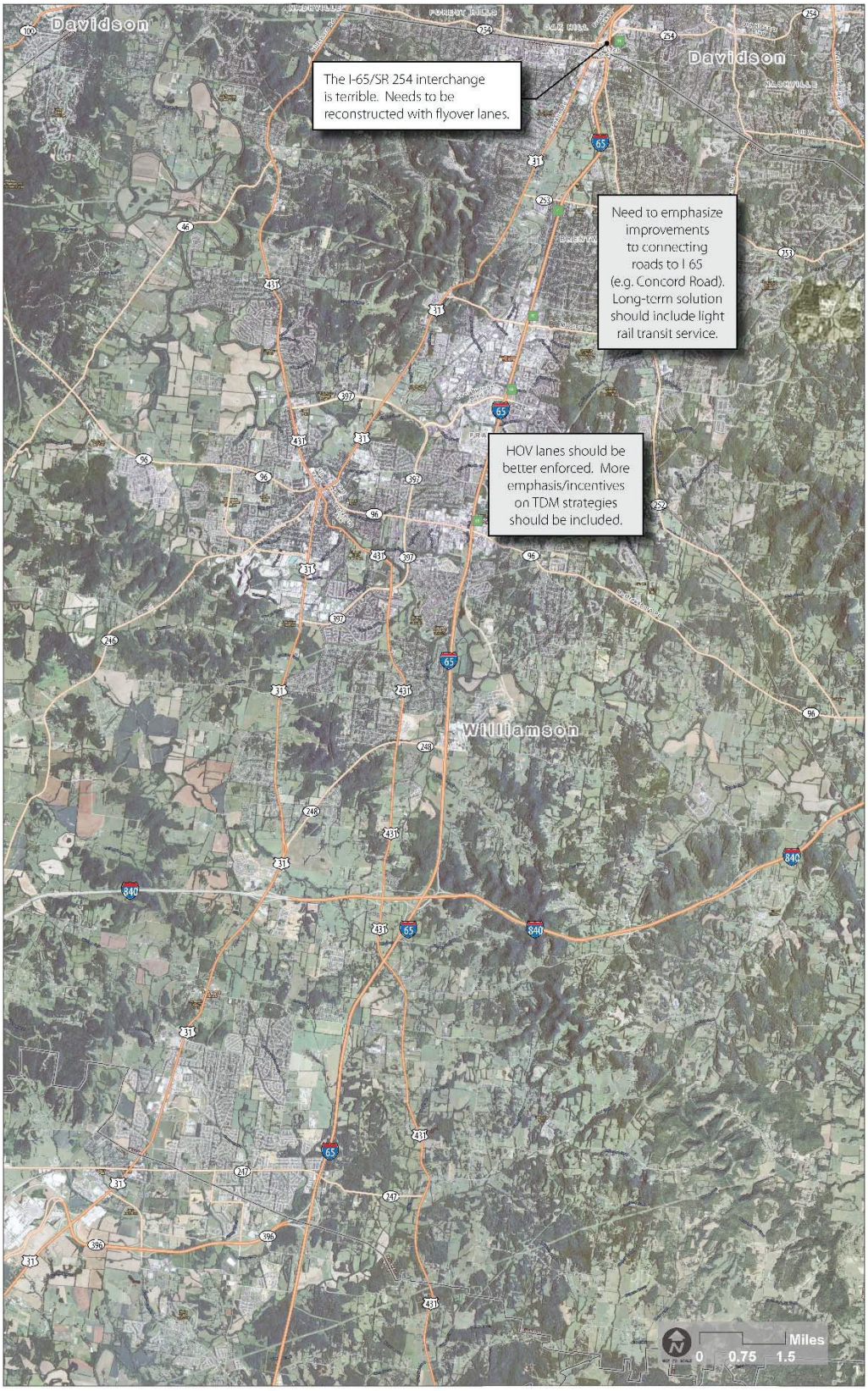


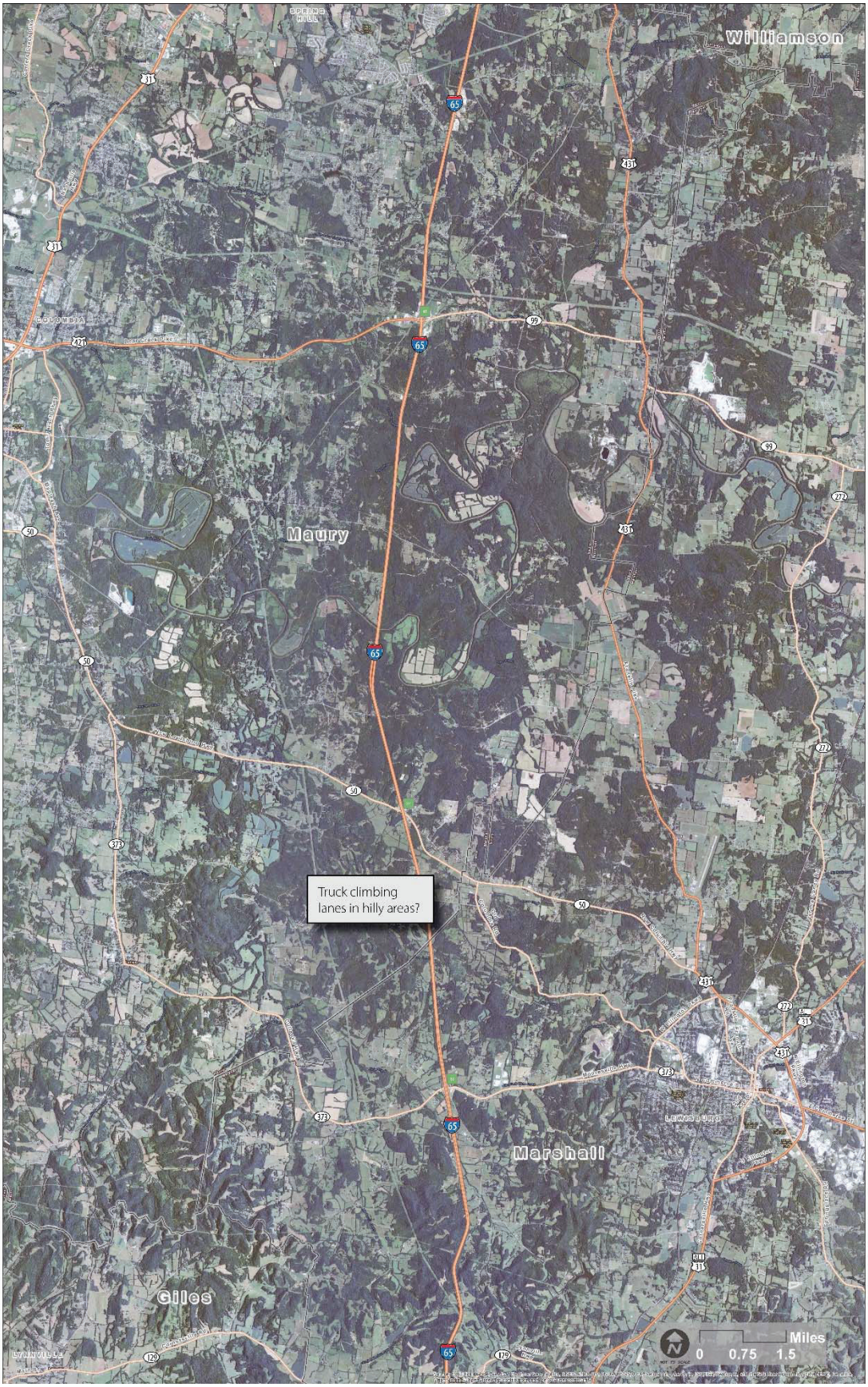
Mapping Exercise – Issues and Opportunities

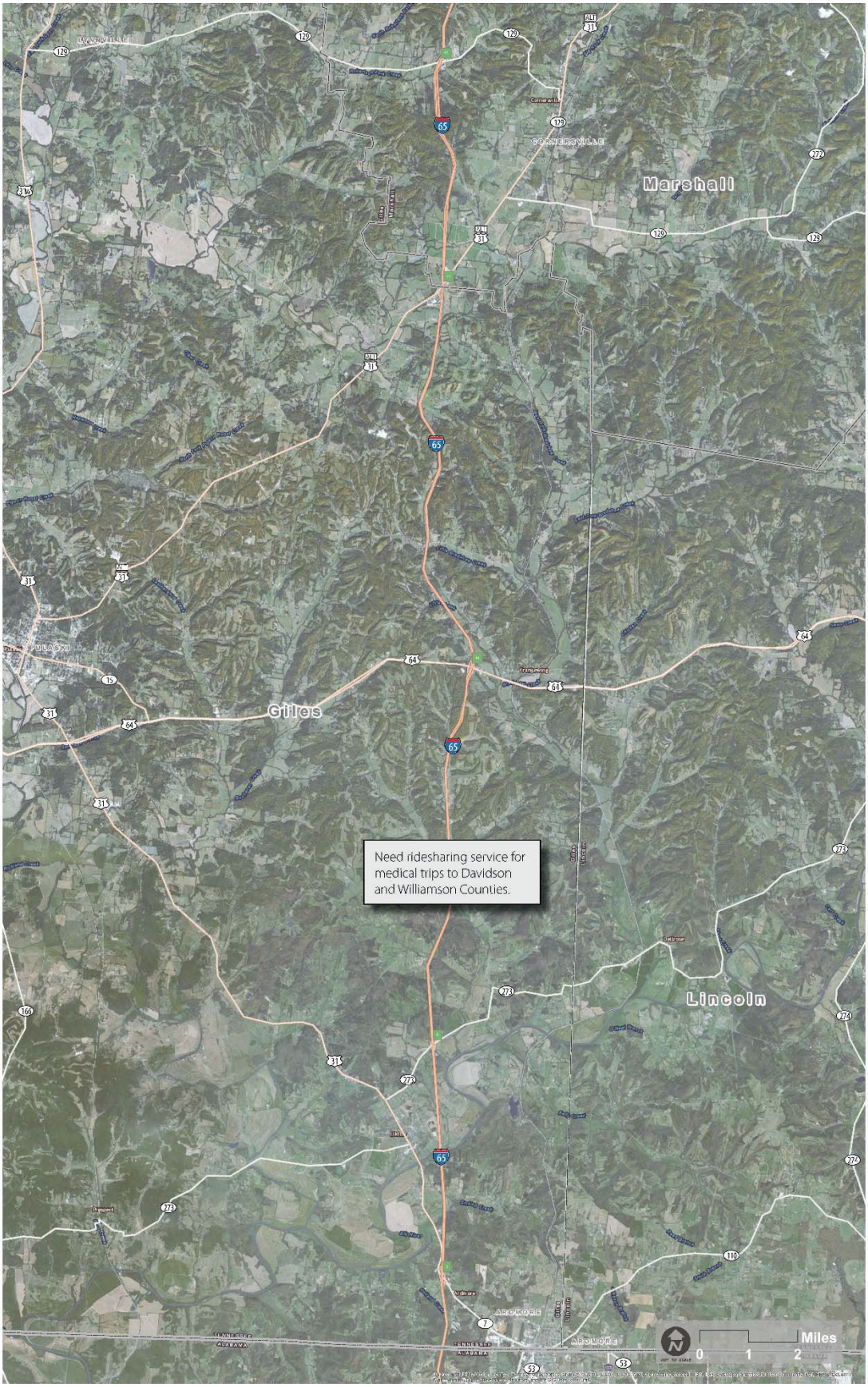
Attendees were provided with a series of maps depicting the entire corridor and asked to identify specific issues or opportunities along the corridor. These comments will be used by the project team to refine the identification of existing and future deficiencies and the development of recommendations for the corridor. The maps on the following pages summarize the comments received.


Widen I-65 to the Kentucky state line.
Finish SR 109 corridor (the "I-840" of this part of the region).
Robertson
Sumner
Davidson
Recommend interchange at SR 386 and Forest Retreat to relieve traffic at New Shackle Island interchange.
Need help on SR 386. Long travel times from Hendersonville to I-65 and on I-65 to downtown Nashville.
Need to incorporate transit into I-65 and 386 corridors.
Miles
0 0.75 1.5


Need SR 386 NB access to I-65;
Need access to SR 386 from I-65.
Davidson
Recommend closing Trinity Lane interchange.
Too close to I-24/I-65 interchange.
I-40 entering downtown needs
an overpass to keep traffic from
backing up from I-65.
Better interchange access
to I-65 from 4th Ave South.
Lxpanded and widened
exits at Armory Drive
interchange (Exit 78).
Williamson
Need to reduce traffic volume on I-65.
Transit service to Franklin and
Spring Hill - either light or heavy rail.
Miles
0 0.75 1.5


Davidson
Davidson
The I-65/SR 254 interchange is terrible. Needs to be reconstructed with flyover lanes.
Need to emphasize improvements to connecting roads to I 65 (e.g. Concord Road). Long-term solution should include light rail transit service.
HOV lanes should be better enforced. More emphasis/incentives on TDM strategies should be included.
Williamson
Miles
0 0.75 1.5


Williamson
Maury
Marshall
Giles
Truck climbing lanes in hilly areas?
Miles
0
0.75
1.5


Marshall
Giles
Lincoln
Need ridesharing service for medical trips to Davidson and Williamson Counties.
Miles
0
1
2

I-65 Multimodal Corridor Study
Public Workshop #2: Portland Summary

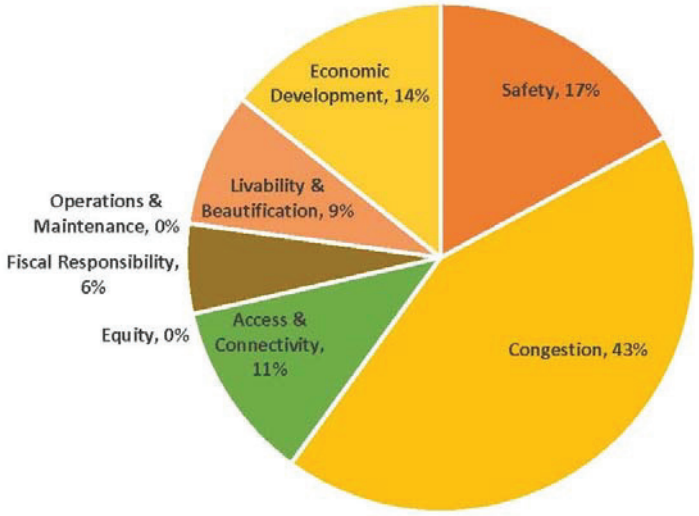
The Tennessee Department of Transportation (TDOT) held the second of three public workshops for the I-65 Multimodal Corridor Study on October 25, 2016, at Portland High School in Portland, Tennessee. The workshop had 36 attendees sign in and was held from 5:30 PM to 7:00 PM.

The goal of the I-65 Multimodal Corridor Study is to examine potential multimodal transportation improvements that would address existing and emerging transportation system issues associated with the corridor. The recommendations will reflect identified deficiencies along the route with an emphasis on safety, corridor capacity, and freight diversion. The public workshop focused on defining corridor priorities, establishing a vision for the corridor, and identifying specific issues or concerns. Following are the results from the workshop.

Dot Board – Corridor Priorities

In the Corridor Priorities activity, attendees were asked to vote on their top priorities using a dot board. Attendees were given three dots and told they could distribute them however they pleased, whether voting for three priorities or voting three times for a single priority. The priorities reflected seven overarching themes: Safety, Congestion, Access and Connectivity, Operations and Maintenance, Livability and Beautification, Fiscal Responsibility, and Economic Development.

A total of 35 votes were received. The pie chart to the right summarizes the results of the activity.



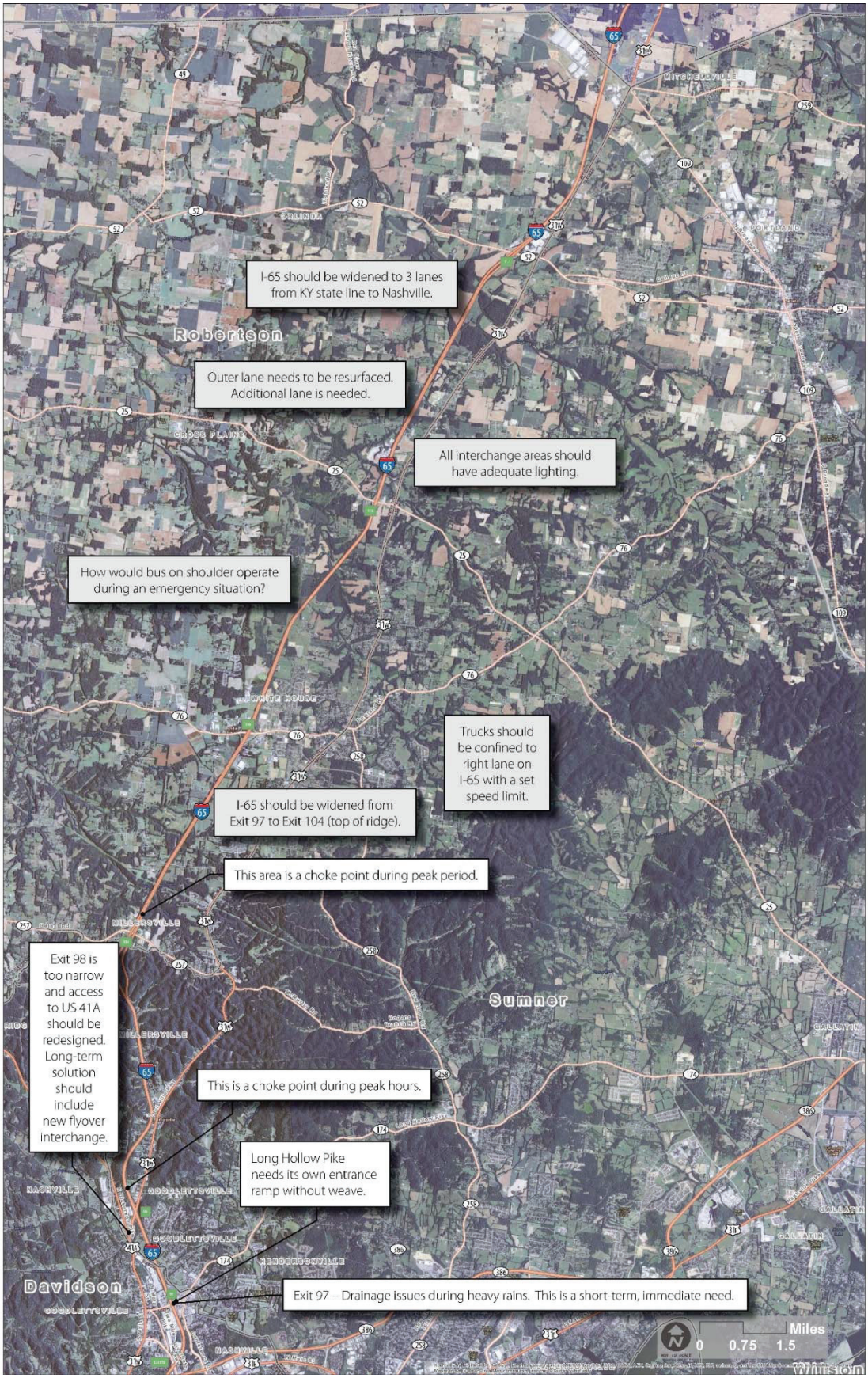
Establishing a Corridor Vision Statement – "Three Words or Phrases"

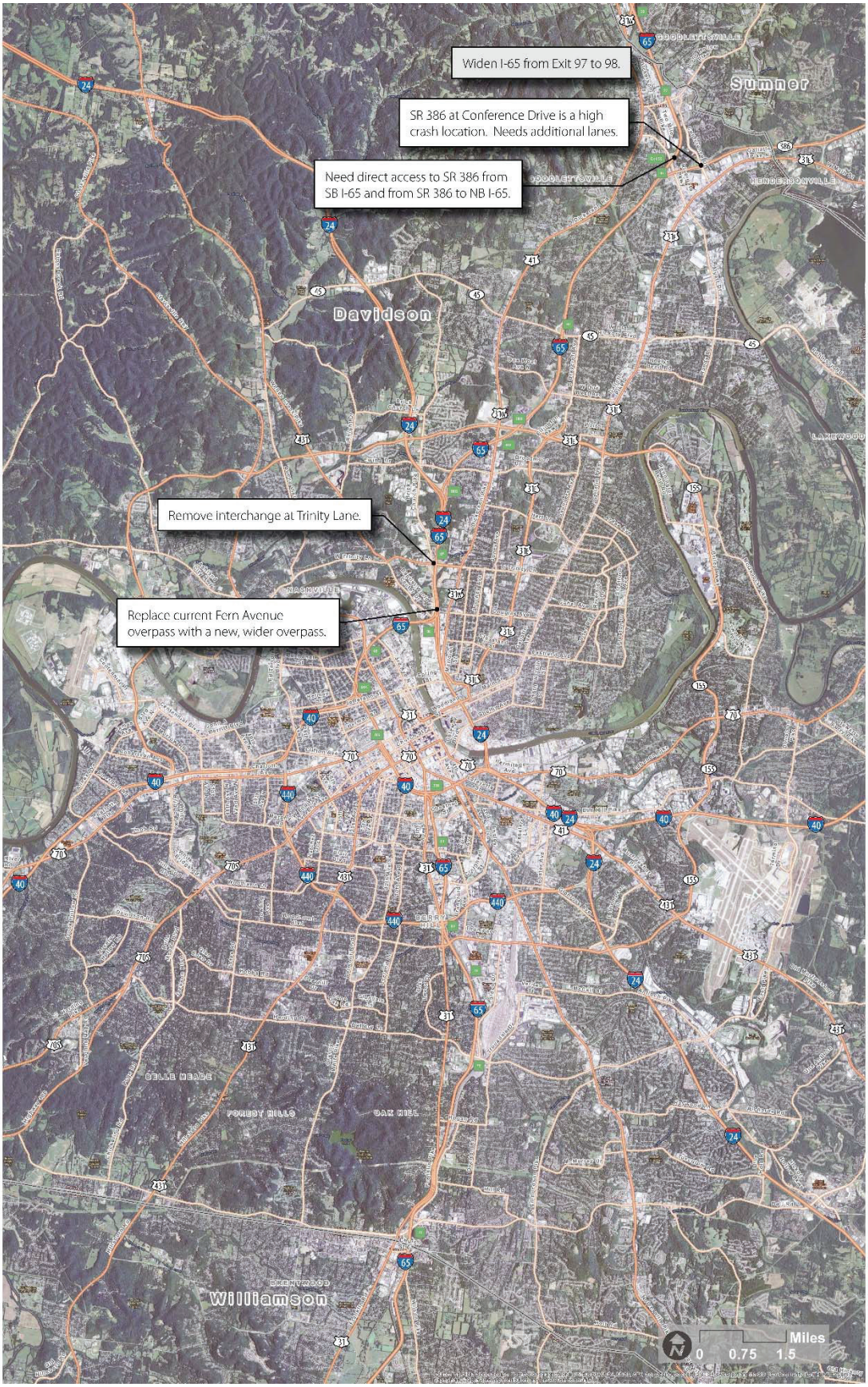
Meeting attendees were asked to list words or phrases to describe their vision for the I-65 corridor. The "Wordle" below highlights key words and phrases based on the number of times they were mentioned. The words and phrases will be used in the coming months to guide the development of the draft vision statement for the corridor and the study's recommendations.



Mapping Exercise – Issues and Opportunities

Attendees were provided with a series of maps depicting the entire corridor and asked to identify specific issues or opportunities along the corridor. These comments will be used by the project team to refine the identification of existing and future deficiencies and the development of recommendations for the corridor. The maps on the following pages summarize the comments received. Only maps on which comments were provided are shown.


I-65 should be widened to 3 lanes from KY state line to Nashville.
Robertson
Outer lane needs to be resurfaced. Additional lane is needed.
All interchange areas should have adequate lighting.
How would bus on shoulder operate during an emergency situation?
Trucks should be confined to right lane on I-65 with a set speed limit.
I-65 should be widened from Exit 97 to Exit 104 (top of ridge).
This area is a choke point during peak period.
Exit 98 is too narrow and access to US 41A should be redesigned. Long-term solution should include new flyover interchange.
Sumner
This is a choke point during peak hours.
Long Hollow Pike needs its own entrance ramp without weave.
Davidson
Exit 97 – Drainage issues during heavy rains. This is a short-term, immediate need.
Miles
0 0.75 1.5


Widen I-65 from Exit 97 to 98.
SR 386 at Conference Drive is a high crash location. Needs additional lanes.
Need direct access to SR 386 from SB I-65 and from SR 386 to NB I-65.
Remove interchange at Trinity Lane.
Replace current Fern Avenue overpass with a new, wider overpass.
Sumner
Davidson
Williamson
Miles
0 0.75 1.5

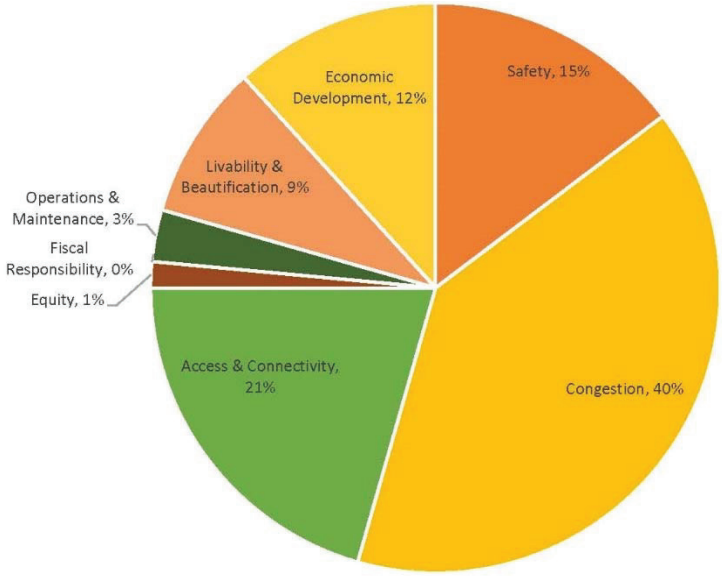
I-65 Multimodal Corridor Study
Public Workshop #3: Williamson County Summary

The Tennessee Department of Transportation (TDOT) held the third of three public workshops for the I-65 Multimodal Corridor Study on November 15, 2016, at the Williamson County Public Library in Franklin, Tennessee. The workshop had 38 attendees sign in and was held from 5:30 PM to 7:00 PM.

The goal of the I-65 Multimodal Corridor Study is to examine potential multimodal transportation improvements that would address existing and emerging transportation system issues associated with the corridor. The recommendations will reflect identified deficiencies along the route with an emphasis on safety, corridor capacity, and freight diversion. The public workshop focused on defining corridor priorities, establishing a vision for the corridor, and identifying specific issues or concerns. Following are the results from the workshop.

Dot Board – Corridor Priorities

In the Corridor Priorities activity, attendees were asked to vote on their top priorities using a dot board. Attendees were given three dots and told they could distribute them however they pleased, whether voting for three priorities or voting three times for a single priority. The priorities reflected seven overarching themes: Safety, Congestion, Access and Connectivity, Operations and Maintenance, Livability and Beautification, Fiscal Responsibility, and Economic Development.



A total of 68 votes were received. The pie chart to the right summarizes the results of the activity.

Establishing a Corridor Vision Statement – "Three Words or Phrases"

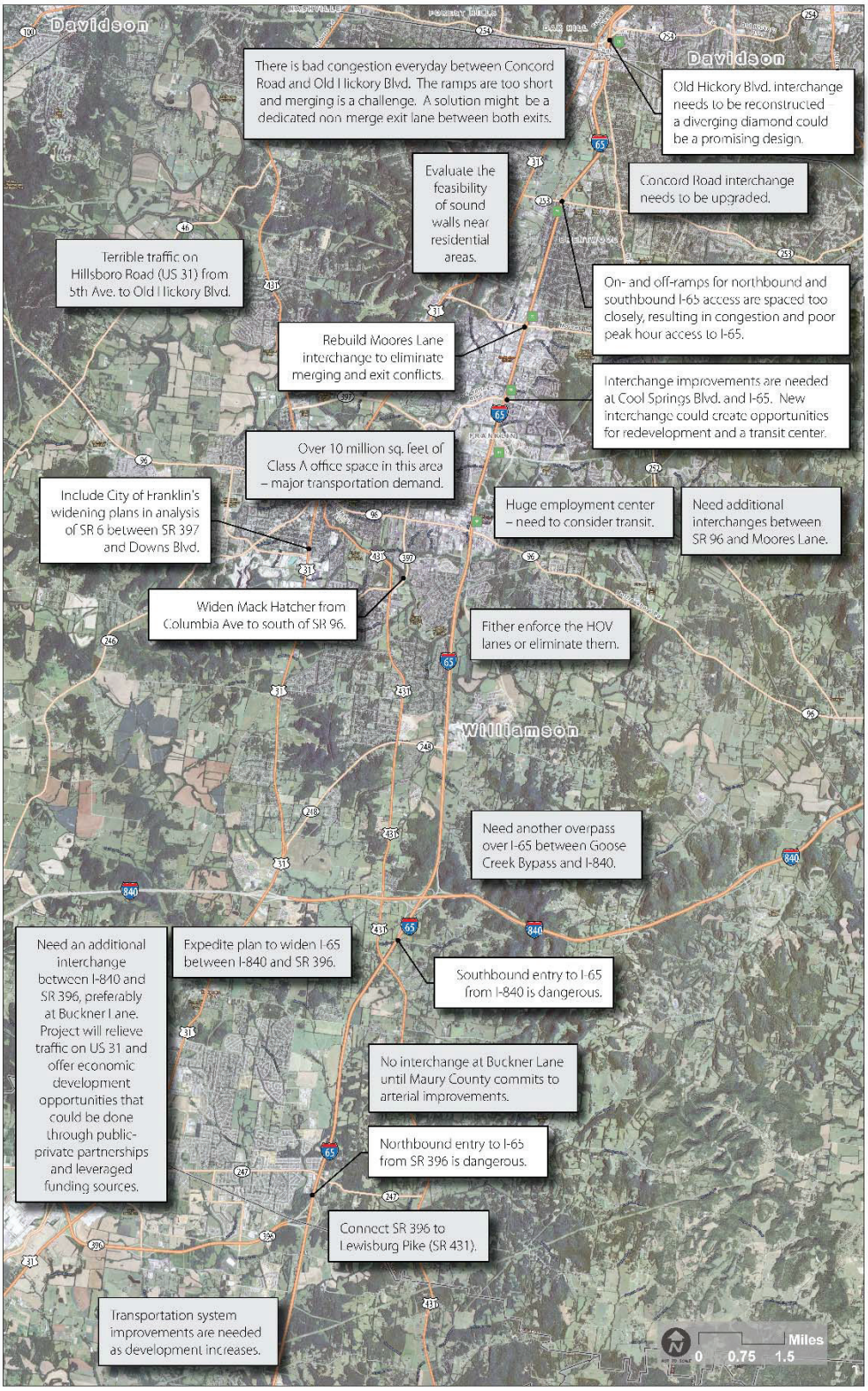
Meeting attendees were asked to list words or phrases to describe their vision for the I-65 corridor. The "Wordle" below highlights key words and phrases based on the number of times they were mentioned. The words and phrases will be used in the coming months to guide the development of the draft vision statement for the corridor and the study's recommendations.

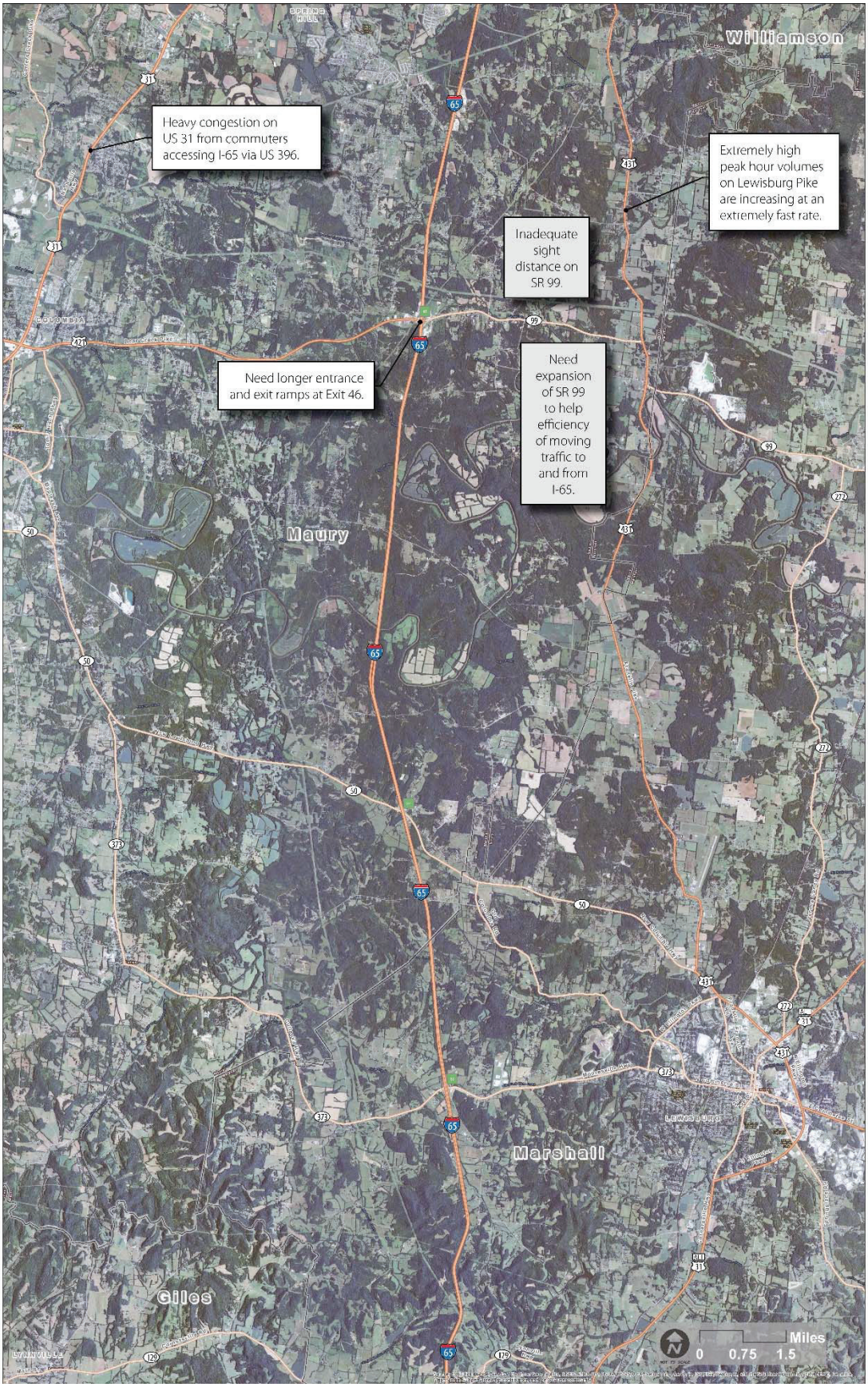


Mapping Exercise – Issues and Opportunities

Attendees were provided with a series of maps depicting the entire corridor and asked to identify specific issues or opportunities along the corridor. These comments will be used by the project team to refine the identification of existing and future deficiencies and the development of recommendations for the corridor. The maps on the following pages summarize the comments received. Only maps on which comments were provided are shown.


Sumner
Davidson
Williamson
Daily peak hour congestion on the entire downtown loop is a problem.
Miles
0 0.75 1.5


There is bad congestion everyday between Concord Road and Old Hickory Blvd. The ramps are too short and merging is a challenge. A solution might be a dedicated non merge exit lane between both exits.
Old Hickory Blvd. interchange needs to be reconstructed – a diverging diamond could be a promising design.
Evaluate the feasibility of sound walls near residential areas.
Concord Road interchange needs to be upgraded.
Terrible traffic on Hillsboro Road (US 31) from 5th Ave. to Old Hickory Blvd.
On- and off-ramps for northbound and southbound I-65 access are spaced too closely, resulting in congestion and poor peak hour access to I-65.
Rebuild Moores Lane interchange to eliminate merging and exit conflicts.
Interchange improvements are needed at Cool Springs Blvd. and I-65. New interchange could create opportunities for redevelopment and a transit center.
Over 10 million sq. feet of Class A office space in this area – major transportation demand.
Include City of Franklin's widening plans in analysis of SR 6 between SR 397 and Downs Blvd.
Huge employment center – need to consider transit.
Need additional interchanges between SR 96 and Moores Lane.
Widen Mack Hatcher from Columbia Ave to south of SR 96.
Fither enforce the HOV lanes or eliminate them.
Need another overpass over I-65 between Goose Creek Bypass and I-840.
Need an additional interchange between I-840 and SR 396, preferably at Buckner Lane. Project will relieve traffic on US 31 and offer economic development opportunities that could be done through public-private partnerships and leveraged funding sources.
Expedite plan to widen I-65 between I-840 and SR 396.
Southbound entry to I-65 from I-840 is dangerous.
No interchange at Buckner Lane until Maury County commits to arterial improvements.
Northbound entry to I-65 from SR 396 is dangerous.
Connect SR 396 to Lewisburg Pike (SR 431).
Transportation system improvements are needed as development increases.
Davidson
Williamson
Miles
0 0.75 1.5


Heavy congestion on US 31 from commuters accessing I-65 via US 396.
Extremely high peak hour volumes on Lewisburg Pike are increasing at an extremely fast rate.
Inadequate sight distance on SR 99.
Need longer entrance and exit ramps at Exit 46.
Need expansion of SR 99 to help efficiency of moving traffic to and from I-65.
Williamson
Maury
Marshall
Giles
Miles
0
0.75
1.5

I-65 Multimodal Corridor Study
Second Round of Public Workshops
Public Workshop #2: Brentwood

The Tennessee Department of Transportation (TDOT) conducted a second round of public workshops for the I-65 Multimodal Corridor Study. The second of these three workshops was held on June 20, 2017, at The Brentwood Library in Brentwood, Tennessee. The workshop had 20 attendees sign in and was held from 5:30 PM to 7:00 PM.

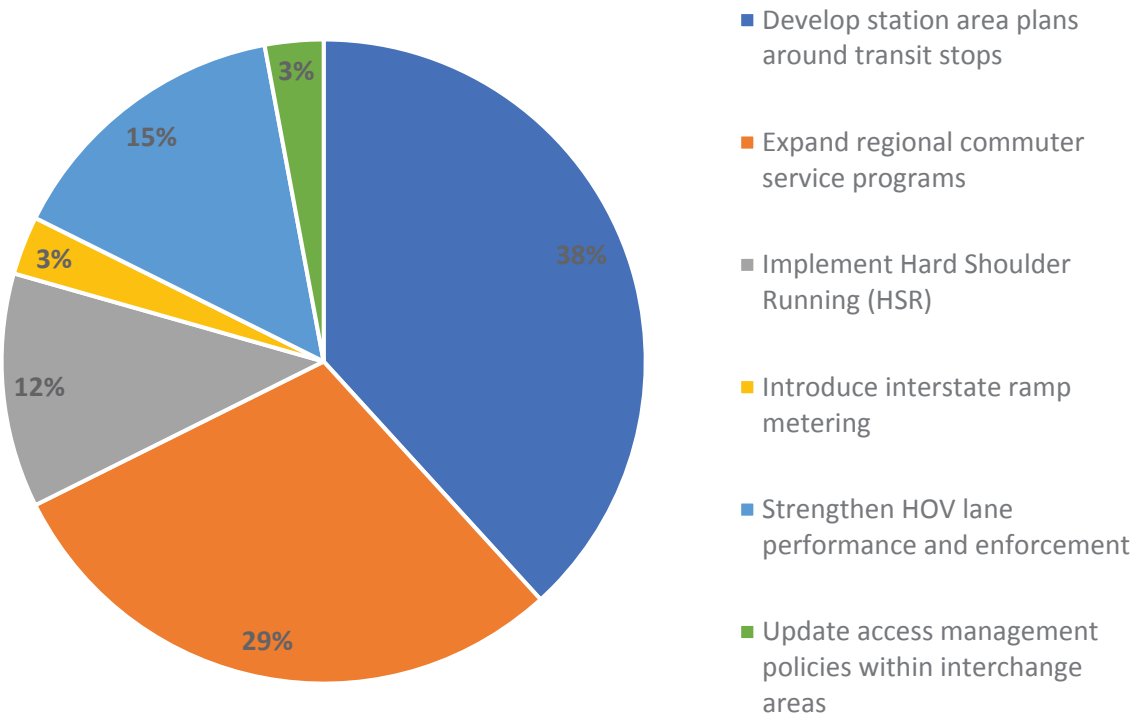
The goal of the second round of public workshops was to give the public a brief summary of the major deficiencies and needs identified for the corridor, as well as present the Phase 1 suite of projects, programs, and policies recommended for the corridor. The Phase 1 projects were modeled using the Statewide Travel Demand Model (STDM); these results were presented against the STDM run that only included the Existing and Committed projects for the project area. The public workshop focused on informing the public of the results, asking for additional deficiencies, needs and project recommendations, and identifying additional non-construction policies, programs and strategies that could be used to improve travel conditions within the project area.

Dot Board – Additional Policies, Programs and Strategies

In this activity, the public was asked to express preferences for six (6) non-construction related policies, programs and strategies that could improve conditions along the corridor. These items were explained by the project team during the formal presentation, and project staff were on hand to answer any additional questions that attendees might have had. Respondents were given six dot stickers and told to consider where they would like to investment, or a lack thereof, toward implementation of each category. Dots could be allocated in any way the respondents chose, e.g. all of them could be used on one category, they could be spread equally, or distributed in any other way. The policies, programs and strategies are listed below (in the order they appeared on the board), along with the number of dots each received. Figure 1 shows the percentage breakdown of all responses received.

- Develop station area plans around existing and future transit stations/stops – Emphasizing transit-oriented, mixed-use, and pedestrian/bicycle-friendly development (13)
- Expand regional commuter service programs – Providing additional trip planning information, ridesharing resources, and transit incentives or benefit (10)
- Implement Hard Shoulder Running (HSR) – Opening interstate shoulders in selected areas for general traffic use during peak hours (4)
- Introduce interstate ramp metering – Managing the flow of vehicles entering the interstate in congested areas using a traffic signal on the ramp (1)
- Strengthen High Occupancy Vehicle (HOV) lane performance and enforcement – Improving access points and separation, expanding violation detection strategies, and increasing penalties (5)
- Update access management policies within interchange areas – Controlling the frequency and location of street intersections and driveways on interchange area crossroads (1)

Figure 1 - Percentage Breakdown of Responses



Mapping Exercise – Phase 2 Projects, Programs and Strategies

Attendees were also provided with five (5) 22 in. by 34 in. maps that depicted the entire I-65 corridor from the Kentucky state line to the Alabama state line. The maps depicted all of the Phase 1 projects discussed in the presentation. Attendees were asked to suggest additional projects, programs or strategies they would like to see examined in Phase 2 of the analysis. A summary of the feedback received is included below.

Corridors

- Generally, top priority should be correcting the merging movements that occur at system-to-system and highway interchanges.

Interchanges

- The Old Hickory Boulevard interchange causes congestion both on and off the freeway.
- TDOT should consider the impact a new interchange would have on the Old Hickory Boulevard and Concord Road interchanges.
- The Trinity Road interchange with I-65 should be studied.

Other

- SR-96 in Triune – the four-way stop should be evaluated; another intersection type may be more appropriate given current and future growth in the area.
- TDOT should consider bold, non-traditional capacity solutions, such as a double decker freeway.

I-65 Multimodal Corridor Study
Second Round of Public Workshops
Public Workshop #1: Goodlettsville

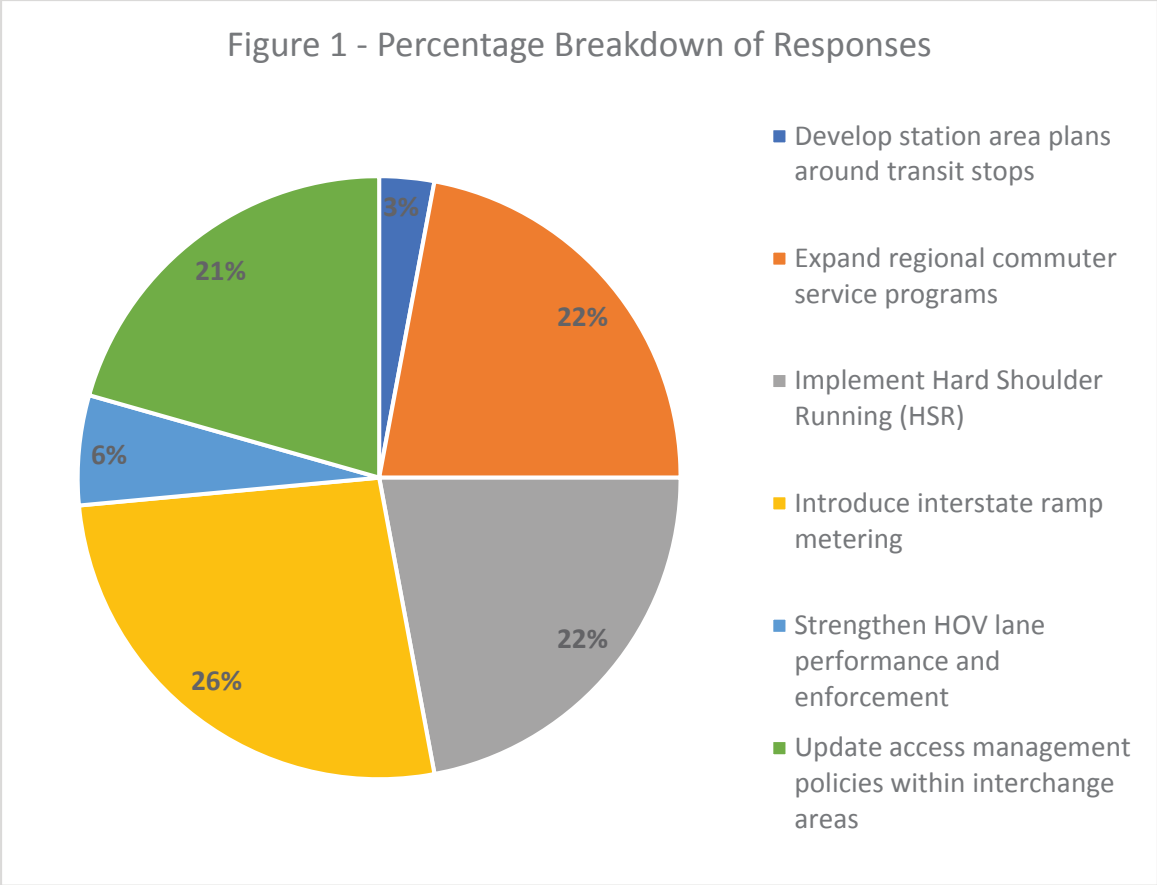
The Tennessee Department of Transportation (TDOT) conducted a second round of public workshops for the I-65 Multimodal Corridor Study. The first of these three workshops was held on June 12, 2017, at the Delmas Long Community Center in Goodlettsville, Tennessee. The workshop had XX attendees sign in and was held from 5:30 PM to 7:00 PM.

The goal of the second round of public workshops was to give the public a brief summary of the major deficiencies and needs identified for the corridor, as well as present the Phase 1 suite of projects, programs, and policies recommended for the corridor. The Phase 1 projects were modeled using the Statewide Travel Demand Model (STDM); these results were presented against the STDM run that only included the Existing and Committed projects for the project area. The public workshop focused on informing the public of the results, asking for additional deficiencies, needs and project recommendations, and identifying additional non-construction policies, programs and strategies that could be used to improve travel conditions within the project area.

Dot Board – Additional Policies, Programs and Strategies

In this activity, the public was asked to express preferences for six (6) non-construction related policies, programs and strategies that could improve conditions along the corridor. These items were explained by the project team during the formal presentation, and project staff were on hand to answer any additional questions that attendees might have had. Respondents were given six dot stickers and told to consider where they would like to investment, or a lack thereof, toward implementation of each category. Dots could be allocated in any way the respondents chose, e.g. all of them could be used on one category, they could be spread equally, or distributed in any other way. The policies, programs and strategies are listed below (in the order they appeared on the board), along with the number of dots each received. Figure 1 shows the percentage breakdown of all responses received.

- Develop station area plans around existing and future transit stations/stops – Emphasizing transit-oriented, mixed-use, and pedestrian/bicycle-friendly development (2)
- Expand regional commuter service programs – Providing additional trip planning information, ridesharing resources, and transit incentives or benefit (15)
- Implement Hard Shoulder Running (HSR) – Opening interstate shoulders in selected areas for general traffic use during peak hours (15)
- Introduce interstate ramp metering – Managing the flow of vehicles entering the interstate in congested areas using a traffic signal on the ramp (18)
- Strengthen High Occupancy Vehicle (HOV) lane performance and enforcement – Improving access points and separation, expanding violation detection strategies, and increasing penalties (4)
- Update access management policies within interchange areas – Controlling the frequency and location of street intersections and driveways on interchange area crossroads (14)



Mapping Exercise – Phase 2 Projects, Programs and Strategies

Attendees were also provided with five (5) 22 in. by 34 in. maps that depicted the entire I-65 corridor from the Kentucky state line to the Alabama state line. The maps depicted all of the Phase 1 projects discussed in the presentation. Attendees were asked to suggest additional projects, programs or strategies they would like to see examined in Phase 2 of the analysis. A summary of the feedback received is included below.

Corridors

- SR 257 near Exit 104 has narrow shoulders and substandard horizontal geometries.

Interchanges

- Exit 104 has ramp queuing problems that often cause congestion on I-65.
- Exit 98 interchange needs to be improved. A ramp providing a direct connection to US-41 is suggested.
- A new interchange at I-65 and New Hall Road is recommended.
- Need flyovers to connect Trinity Lane directly to I-24.

Transit

- Commuter train service from downtown Nashville to Sumner County.
- Dedicated lanes for transit would help transit times for commuters using the service.
- Exit 98 needs a bus stop and complementary carpool/park-and-ride lot.

Other

- Truck traffic needs to be diverted off of I-65 during peak hours.
- Vietnam Veterans Parkway exit at Center Point Road needs to light to manage traffic exiting in the afternoon.
- HOV lanes should be enforced 24/7 and reversible depending on peak hour traffic.
- The Fern Street overpass is a psychological choke point. People slow down because of the proximity of the bedrock to the travel lanes.

I-65 Multimodal Corridor Study
Second Round of Public Workshops
Public Workshop #3: Spring Hill

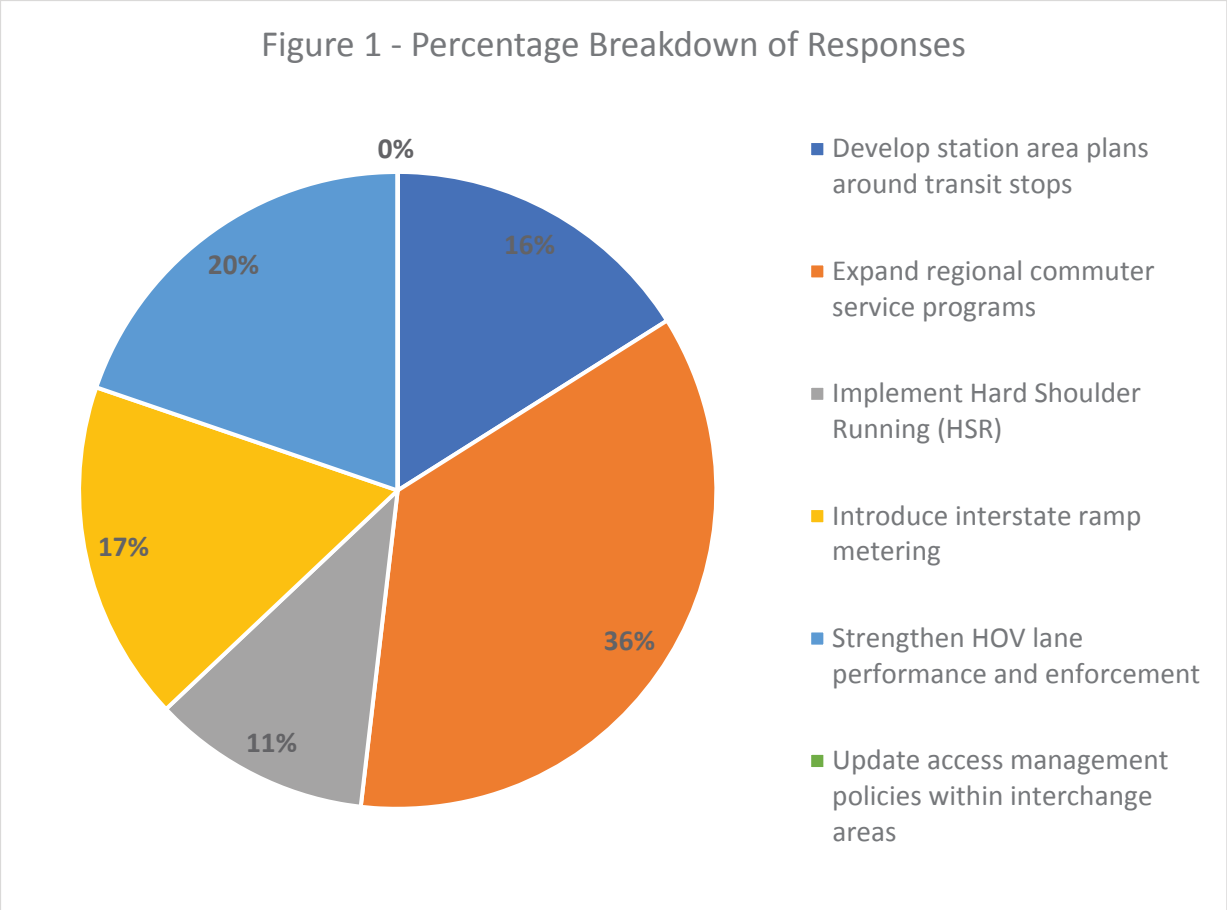
The Tennessee Department of Transportation (TDOT) conducted a second round of public workshops for the I-65 Multimodal Corridor Study. The third of these three workshops was held on June 22, 2017, at Spring Hill City Hall in Spring Hill, Tennessee. The workshop had 39 attendees sign in and was held from 5:30 PM to 7:00 PM.

The goal of the second round of public workshops was to give the public a brief summary of the major deficiencies and needs identified for the corridor, as well as present the Phase 1 suite of projects, programs, and policies recommended for the corridor. The Phase 1 projects were modeled using the Statewide Travel Demand Model (STDM); these results were presented against the STDM run that only included the Existing and Committed projects for the project area. The public workshop focused on informing the public of the results, asking for additional deficiencies, needs and project recommendations, and identifying additional non-construction policies, programs and strategies that could be used to improve travel conditions within the project area.

Dot Board – Additional Policies, Programs and Strategies

In this activity, the public was asked to express preferences for six (6) non-construction related policies, programs and strategies that could improve conditions along the corridor. These items were explained by the project team during the formal presentation, and project staff were on hand to answer any additional questions that attendees might have had. Respondents were given six dot stickers and told to consider where they would like to investment, or a lack thereof, toward implementation of each category. Dots could be allocated in any way the respondents chose, e.g. all of them could be used on one category, they could be spread equally, or distributed in any other way. The policies, programs and strategies are listed below (in the order they appeared on the board), along with the number of dots each received. Figure 1 shows the percentage breakdown of all responses received.

- Develop station area plans around existing and future transit stations/stops – Emphasizing transit-oriented, mixed-use, and pedestrian/bicycle-friendly development (13)
- Expand regional commuter service programs – Providing additional trip planning information, ridesharing resources, and transit incentives or benefit (29)
- Implement Hard Shoulder Running (HSR) – Opening interstate shoulders in selected areas for general traffic use during peak hours (9)
- Introduce interstate ramp metering – Managing the flow of vehicles entering the interstate in congested areas using a traffic signal on the ramp (14)
- Strengthen High Occupancy Vehicle (HOV) lane performance and enforcement – Improving access points and separation, expanding violation detection strategies, and increasing penalties (16)
- Update access management policies within interchange areas – Controlling the frequency and location of street intersections and driveways on interchange area crossroads (0)



Mapping Exercise – Phase 2 Projects, Programs and Strategies

Attendees were also provided with five (5) 22 in. by 34 in. maps that depicted the entire I-65 corridor from the Kentucky state line to the Alabama state line. The maps depicted all of the Phase 1 projects discussed in the presentation. Attendees were asked to suggest additional projects, programs or strategies they would like to see examined in Phase 2 of the analysis. A summary of the feedback received is included below.

<u>Corridors</u>

- The I-65 widening project between I-840 and SR-396 should be a top priority.
- I-65 should be further widened to the south between SR-396 and US-412.
- US-412/SR-99 should be widened between US-31 in Columbia and US-431.
- Make Music Circle East two-way between Division and Demonbreun for access to i-65 without having to use Demonbreun.

Interchanges

- Traffic signals are needed at the Port Royal Road interchange with Saturn Parkway.

Transit

- Work out a deal with CSX for commuter rail transit service from Nashville to Chapel Hill/Spring Hill.
- A bold solution such as elevated rail along the highway is needed (e.g. rail system in Mexico City).
- Buy the right-of-way for transit now and identify the routes. All projects should include space or plan for transit even if implementation is some time in the future.

Other

- Dynamic or variable lane assignments depending on peak hour traffic.
- Dedicated park-and-ride lots with dedicated HOV lanes connecting to them directly (e.g. Highway 59 north of Houston).


EXIT 80
SOUTH
65
Huntsville
1 1/4 MILES
440
Memphis
Knoxville
1 1/4 MILES
HAMILTON AV
AVERITT



Prepared for the Tennessee
Department of Transportation by:



GRESHAM
SMITH AND
PARTNERS