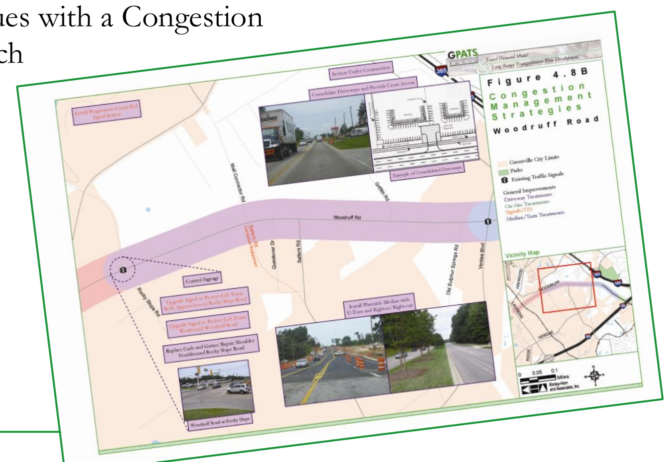
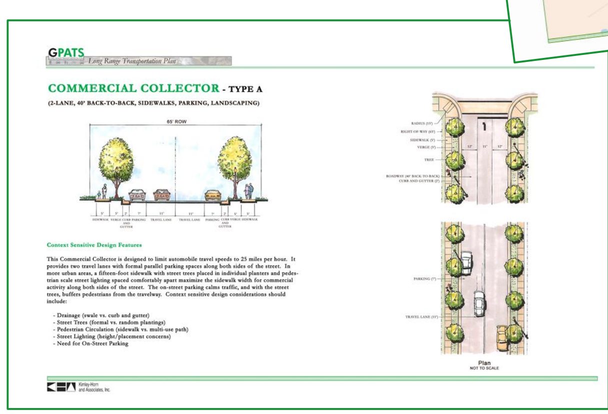
Introduction

In the GPATS area, the expanding economy signals new population growth. For the 20-year period ending in 2000, population in Greenville and Pickens Counties grew from 367,205 to 490,373 (33.5%). By 2020, the population is expected to increase to 614,140 (25.2%). While this growth reflects the region's success on several fronts, increasing population and employment forces the region's leaders to make tough decisions as they try to keep up with additional travel demand.

This Future Highway Element builds on the information presented in previous chapters to examine future conditions under a variety of conditions. The chapter begins by presenting the street and highway recommendations and describing how these projects will improve system-wide congestion. An evaluation matrix presented in **Chapter 5 - Social and Environmental Screening** summarizes some of the potential impacts the street and highway recommendations could have on various social, cultural, and environmental resources found in the GPATS region.

The future highway chapter continues with a Congestion Management Program Update, which provides a systematic process to evaluate and minimize system-wide congestion. Following an overview of access management and specific strategies for the Woodruff Road corridor, the chapter concludes with a summary of complete streets and a series of recommended cross sections.





Street and Highway Recommendations

Street and highway recommendations for the GPATS region are presented in four categories – Funded Plan, Vision Plan, Road Diet Projects, and Intersection Projects. The list of roadway projects includes recommendations that emerged during discussions with area stakeholders, local officials, the Transportation Plan Advisory Group (TPAG), and the general public. Following a brief cumulative description of these projects, future travel conditions are described and compared.

Funded Plan

With the combination of increased demand due to continued growth and limited constructability due to various natural and man-made barriers, street and highway projects should maximize the functionality of the existing roadway network. The recommendations detailed in **Table 4.1** represent the financially-constrained project list for the *GPATS Long Range Transportation Plan*. Estimated cost of funded plan projects totals $246.5 million, including $229.9 million in Guideshare (TIP and LRTP) funding, $15.1 million for Federal earmarks, and $1.5 million for ACOG funding. Guideshare funded projects ($229.9 million) include:

- LRTP Guideshare Funded Corridor Projects - $169.8 million
- TIP Guideshare Funded Corridor Projects - $26.7 million
- Intersection Projects - $30.4 million
- TIP Guideshare Funded Right-of-Way Acquisition - $1.5 million

Vision Plan

The Funded Plan project list is expanded to include additional projects not targeted for funding in the 2030 plan. These projects have been identified by stakeholders, local officials, the TPAG, and the general public as worthy for future funding consideration. Like the Funded Plan, the projects include a variety of new construction, widening, and existing improvement projects categorized into high, medium, low, and vision priorities. Estimated project cost by priority includes:

- High Priority - 4 projects - $28.9 million
- Medium Priority - 11 projects - $80.9 million
- Low Priority - 33 projects - $263.1 million

These projects are detailed in **Table 4.2**. The Funded and Vision projects are shown in **Figures 4.1A to 4.1D**.

Table 4.1: Street and Highway Improvement Projects

Priority	County	Project Name	Termini	Project Scope	Notes	Bicycle facilities	Sidewalk	Length (Miles)	Est. Project Cost (Mil)	Cumulative Cost (Mil)
High	Greenville	N. Buncombe St./SC 101	Wade Hampton (US 29) to Locust Hill (SC 290)	5 lane		Bike Lane		0.51	$3.9	$3.9
High	Greenville	Roper Mountain Road	Garlington Road to Feaster Road	4 lane with median	Existing commercial, highest traffic volumes in corridor	Bike Lane	Both sides	0.60	$5.6	$9.5
High	Greenville	SC 14	Bethel Road to Five Forks Rd (SC 296)	5 lane		Wide outside lane	Both sides	0.19	$1.5	$11.0
High	Pickens	US 123	SC 93 to SC 8	6 lane with median	Restripe existing 72' roadway, access management		Existing	1.96	$1.0	$12.0
High	Greenville	Woodruff Road	Scuffletown Road to Bennetts Bridge (SC 296)	5 lane		Wide outside lane	Both sides	0.58	$4.5	$16.5
High	Greenville	Roper Mountain Road Ext	Pelham Rd to Roper Mountain Rd	3 lane		Bike Lane	One side	0.95	$7.3	$23.8
High	Greenville	Roper Mountain Road	Roper Mtn Ext to Garlington Road	Three lane		Bike Lane	One side	1.79	$11.8	$35.6
High	Greenville	Butler Road	Bridges Rd to Main Street (US 276)	4 lane	Minimize community impacts	Bike Lane Miller Rd	Both sides	1.60	$12.3	$47.9
High	Greenville	Salters Rd	Sulfur Springs Rd to Verdae Blvd.	4 lane with median		Bike Lane	Both sides	0.42	$2.9	$50.8
High	Greenville	Butler Road	Mauldin HS to Bridges Rd	5 lane	Improve Bridges Road approaches	Bike Lane	Both sides	0.31	$2.4	$53.2
High	Greenville	Batesville Road	The Parkway to Pelham Rd	3 lane	Retain existing I-85 overpass (future new interchange)	Wide outside lane	One side	1.90	$8.6	$61.8
High	Greenville	Salters Rd	Millennium Pkwy. to Sulfur Springs Rd	4 lane with median, new I-85 overpass	Landscaped median	Bike Lane	Both sides	0.30	$5.4	$67.2
High	Greenville	Miller Road	Woodruff Rd to Old Mill Rd	Improved 2 lane	Left turn lanes at major intersections	Bike Lane	One side	2.55	$6.2	$73.4
High	Pickens	US 123	SC 93 to SC 153	6 lane divided	No Right of Way needed	4' paved shoulder	West of Prince Perry	2.13	$14.9	$88.3
Medium	Greenville	Hudson Road	Pelham Rd to Devenger Rd	3 lane	Fit within existing 60' Right of Way		One side	1.19	$5.4	$93.6
Medium	Pickens	Powdersville Road	SC 153 to US 123	Improved 2 lane	Left turn lanes at major intersections	Bike Lane	One side	3.26	$14.7	$108.3
Medium	Greenville	Batesville Road	SC 14 to Anderson Ridge	4 lane with median	Realign to west of Wesley UM Church	Wide outside lane	Commercial area	1.25	$13.8	$122.0
Medium	Pickens	Saluda Dam/Olive	SC 8 to Prince Perry	3 lane		Bike Lane	One side	3.91	$17.6	$139.6
Medium	Pickens	US 178	Edgemont Ave to Carolina Drive	3 lane		Wide outside lane	Both sides	0.24	$1.1	$140.7
Medium	Greenville	Forrester Drive	Bi-Lo Drive to Millenuium Parkway	4 lane with median		Bike Lane	Both sides	1.32	$2.6	$143.4
Medium	Greenville	Pelham St Ext	SC 14 to I-385 Frontage Road	New 2 lane Secondary		Bike lane	One Side	0.80	$10.0	$153.4
Medium	Greenville	East Washington St Ext	US 276 to Lowndes Hill Rd	New 2 lane Secondary		Bike lane	One Side	1.04	$4.7	$158.0
Medium	Greenville	Garlington Road	Woodruff Rd to to Roper Mountain Rd	Multilane	Assymetrical four lane (add one southbound lane)	Wide outside lane	One side	1.30	$5.9	$163.9
Medium	Anderson, Greenville	SC 153	I-85 to I-185	4 lane divided		2' shoulder		1.13	$10.6	$174.5
ACOG funds	Pickens	Farrs Bridge Road	Hamburg Road to SC 135	LT lanes at Jim Hunt Rd and Jameson Rd	Left turn lanes at major intersections	Existing 2' shoulder		4.11	$0.8	$175.3
Earmarked	Greenville	West Georgia Road	Neely Ferry Rd. to E. Standing Springs Rd.	LT lanes McCall Rd, realign Stenhouse		2' Paved Shoulder		0.98	$1.5	$176.8
Low	Pickens	SC 153 Ext	Prince Perry to Saluda Dam	New 2 lane Primary		2' shoulder		1.33	$6.0	$182.7
Low	Greenville	Valley View Drive	SC 14 to I-385 Frontage	2 lane Secondary		2' shoulder		0.86	$3.9	$186.6
ACOG funds	Pickens	Farrs Bridge Road	Groce Road to Hamburg Road	LT lanes at Alex Rd (two locations)		2' Paved Shoulder	Future	3.46	$0.8	$187.4
Low	Pickens	SC 153 Ext	US 123 to Prince Perry	New 2 lane Primary		2' shoulder		1.48	$10.8	$198.2
Low	Pickens	LEC Road Ext.	McDaniel Ave to Secona Rd	New 2 lane Secondary		Wide outside lane	One Side	0.31	$1.4	$199.6
Earmarked	Greenville	Fairforest Way	US 276 to Mauldin Road	Widen and Reconstruct to 4 lane with median		Bike Lanes	Both sides	2.10	$10.6	$210.2
Earmarked	Greenville	West Georgia Road	E. Standing Springs to Rocky Creek Rd.	LT lanes N. Moore, Barker, Calgary	Left turn lanes at major intersections	2' Paved Shoulder		1.34	$1.5	$211.7
Earmarked	Greenville	West Georgia Road	Rivereen Way to Fork Shoals Road	LT lanes Sullivan, Holcombe, Longstaff	Left turn lanes at major intersections	2' Paved Shoulder		1.03	$1.5	$213.2
								TOTAL	$213.2	

Long Range Plan Total Cost (millions)		
$	169.8	LRTP Guideshare Funded Corridor Projects (excluding TIP)
$	21.7	LRTP Guideshare Funded Intersection Projects (excluding TIP)
$	26.7	TIP Guideshare Funded Corridor Projects
$	9.7	TIP Guideshare Funded Intersection Projects
$	2.0	TIP Guideshare Funded ROW Acquisition (Batesville Rd.)
$	**229.9**	**Guideshare Subtotal**
$	1.5	TIP ACOG Funded Projects
$	15.1	TIP Federal Earmarked Project Funding
$	**55.0**	**TIP Subtotal**
$	**246.5**	**LRTP Grand Total**

Long Range Plan Funding (millions)	
Guideshare	229.90
Federal Earmarks	15.10
State Earmark	-
ACOG	1.50
Total	**246.50**

Alternative Summary of Total Cost		
Corridor Projects		
$	169.8	LRTP Guideshare Funded Corridor Projects (excluding TIP)
$	26.7	TIP Guideshare Funded Corridor Projects
$	1.5	TIP ACOG Funded Projects
$	15.1	TIP Federal Earmarked Project Funding
$	*213.2*	*Subtotal, Corridor Projects*
Intersection and Interchange Projects		
$	21.7	LRTP Guideshare Funded Intersection Projects (excluding TIP)
$	8.7	TIP Guideshare Funded Intersection Projects
$	3.0	TIP Guideshare Funded ROW Acquisition (SC 153 and Batesville Rd.)
$	33.3	*Subtotal, Intersection Projects*
Funding Sources		
$	229.9	Guideshare
$	1.5	ACOG Funding
$	15.1	Federal Earmarks
$	246.5	*Total Funding*
$	**55.0**	**TIP Subtotal**
$	**246.5**	**LRTP Grand Total**

Funds By County		
Greenville	133.63	62.7%
Pickens	68.92	32.3%
Anderson, Greenvil	10.62	5.0%
Total	213.17	100%

Table 4.2: Unfunded Vision Plan - Street and Highway Improvement Projects

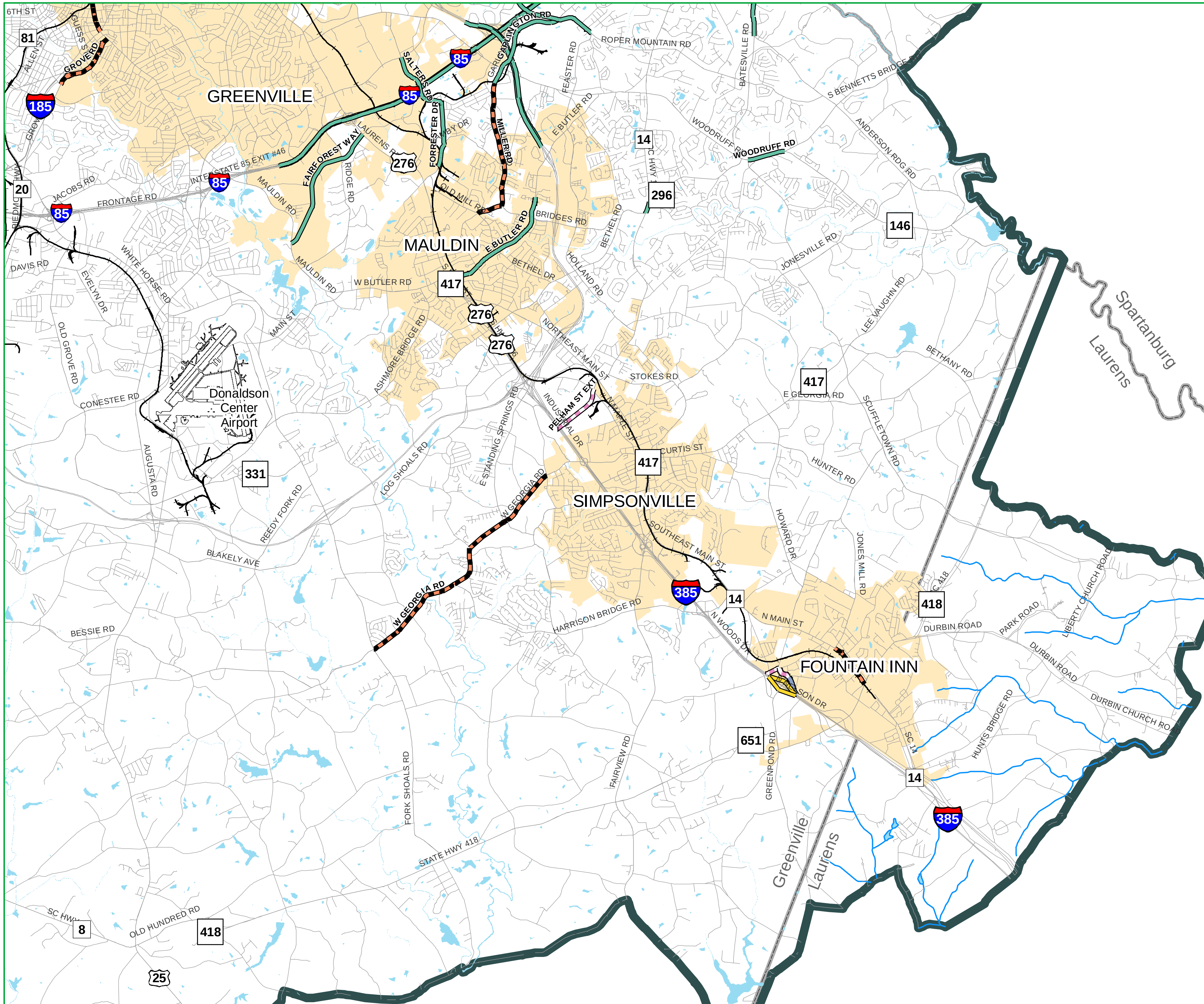
Final Recommended Projects **9/12/2007**

Priority or Funding Source	County	Project Name	Route Number(s)	Termini	Project Scope	Bicycle facilities	Sidewalk	Length (Miles)	Est. Project Cost (Mil)
High	Greenville	Park Woodruff Ext	new	Carolina Point to Miller Rd	New 2 lane Secondary	Bike lane	Both Sides	0.60	$2.7
High	Greenville	Grove Road	SC 20	White Horse Rd. (US 25) to Faris Rd.	3 lane and 5 lane	Bike Lane	One side	0.90	$4.1
High	Greenville	Verdae Point Drive	new	Verdae to Carolina Point	New 2 lane Secondary	Bike lane	Both Sides	0.90	$9.5
High	Pickens	SC 8	SC 8	St Paul Rd to SC 135	3 lane	Wide outside lane	One side	2.80	$12.6
Medium	Greenville	Woodruff Road	SC 146	Woodruff Industrial to Smith Hines	7 lane	Wide outside lane	Both sides	1.43	$11.4
Medium	Pickens	Blacksnake/Adger/135	S-73/186	SC 93 to SC 8	Improved 2 lane			2.40	$5.8
Medium	Greenville	Woodruff Road	SC 146	Bennetts Bridge (SC 296) to Lee Vaughn (SC 417)	Improved 2 lane	2' Paved Shoulder		2.60	$2.6
Medium	Greenville	Conestee Road	S-221	Mauldin Rd to Fork Shoals	3 lane	Bike Lane (Greenway)	One side	1.00	$4.5
Medium	Greenville	Fairview Street	S-418	N. Nelson to SC 14	3 lane	Wide outside lane	One side	1.40	$5.5
Medium	Pickens	Brushy Creek Road	S-29	US 123 to Laurel Drive	3 lane	Wide outside lane	One side	0.60	$2.7
Medium	Greenville	Bridges Road	S-941	Butler Road to I-385	4 lane	Bike Lane	One side	0.40	$2.8
Medium	Anderson	SC 153	SC 153	Three Bridges Road to I-85	6 lane divided			1.70	$11.9
Medium	Anderson, Greenville	SC 86	SC 86	SC 20 to SC 81	Improved 2 lane	2' Paved Shoulder	Urban only	5.00	$12.1
Medium	Greenville	Pine Knoll/Waddell	S-165	Rutherford Rd to Wade Hampton Blvd	Improved 2 lane		Future	1.50	$3.6
Medium	Greenville	Bennetts Bridge Road	SC 296	Woodruff to Brockman McClimon	4 lane with median	Wide Outside Lane	Future	3.00	$18.0
Low	Greenville	Fairview Road	S-55	Harrison Bridge to SC 418	Improved 2 lane	2' Paved Shoulder	Future	2.90	$7.0
Low	Pickens	Farrs Bridge Road	SC 183	Groce Road to Hamburg Road	4 lane with median	2' Paved Shoulder	Future	3.50	$21.0
Low	Greenville	Boiling Springs Road	S-447	Pelham to Phillips	Improved 2 lane		One side	1.00	$2.4
Low	Pickens	US 178	US 178	Carolina Drive to US 123	3 lane	2' Paved Shoulder	One side	1.40	$5.6
Low	Pickens	Prince Perry Road	S-135	US 123 to Saluda Dam Rd	3 lane	Wide Outside Lane	One side	1.60	$7.2
Low	Pickens	Farrs Bridge Road	SC 183	Hamburg Road to SC 135	Improved 2 lane	Existing 2' shoulder		4.00	$9.6
Low	Anderson, Pickens	SC 8 US 178 Connector	new	SC 8 to US 178	New 2 lane Primary	2' shoulder		6.00	$27.0
Low	Greenville	St. Mark Road	S-261	Wade Hampton to SC 290	Improved 2 lane	2' Paved Shoulder	One side	2.00	$8.0
Low	Greenville	Roper Mountain Road	S-548	Feaster Rd to SC 14	Improved 2 lane	Bike Lane		0.90	$2.2
Low	Greenville	Batesville Road	S-164	Anderson Ridge to Woodruff	3 lane	2' Paved Shoulder		1.90	$8.6
Low	Greenville	Butler Road	S-107	Holland to Woodruff	3 lane	Wide Outside Lane	One side	0.50	$2.3
Low	Greenville	Ben Hamby Ext	new	Pelham to Batesville	New 4 lane Parkway	Wide outside lane	Both Sides	0.60	$2.7
Low	Pickens	Brushy Creek Road	S-29	Crestview Drive to St. Paul Road	Improved 2 lane	2' Paved Shoulder		2.50	$6.0
Low	Greenville	Howard Drive Ext	new	SC 417 to Jonesville Rd	New 2 lane Secondary	2' shoulder		1.20	$5.4
Low	Anderson, Greenville	Anderson Road	SC 81	Near US 25 to SC 153	4 lane with median	Wide outside lane	Commercial areas	1.9	$11.4
Low	Greenville	SC 101	SC 101	SC 290 to Milford Church	Widen to 3 lanes	2' shoulder		2.6	$10.4
Low	Greenville	West Georgia	S-543	College St to I-385 frontage	2 lane, b/l and s/w	Wide outside lane	Both Sides	0.8	$3.2
Low	Greenville	SC 290	SC 290	SC 101 to SC 253	Widen to 3 lanes	Bike Lane		6.1	$24.4
Low	Greenville	Ashmore Bridge Rd	S-48	Butler Road to Fork Shoals	Improved 2 lane	Bike Lane		3.6	$9.0
Low	Greenville	Garlington Rd	S-546	Roper Mtn to Honbarrier	Improved 2 lane	Wide outside lane		1.9	$4.8
Low	Greenville	Bridges Road	S-941	Butler Road to Holland Road	4 lanes	Bike Lane	One side	0.7	$4.2
Low	Greenville	East Georgia	SC 417	Hunter Rd to Lee Vaughn Rd	4 lane with median	Bike Lane	Both Sides	1.0	$6.0
Low	Greenville	Rocky Creek Rd/Harrison Bridge	S-453	West Georgia to Fairview Rd	Improved 2 lane	Wide outside lane	One side	3.2	$8.0
Low	Greenville	Scuffletown Road	S-145	Woodruff to Jonesville	Improved 2 lane	Bike Lane		2.0	$5.0
Low	Anderson	SC 81	SC 81	End of existing 5L to Old Williamston Road	5 lanes	Bike Lane	Both Sides	2.3	$13.8
Low	Greenville	SC 253	SC 253	Lynn Rd to Jackson Grove Rd	5 lanes	2' shoulder		0.2	$1.2
Low	Greenville	Anderson Ridge	County Rd	Roper Mtn to SC 296	5 lanes	2' shoulder		0.3	$1.8
Low	Greenville	SC 253	SC 253	Reid School to State Park	5 lanes	2' shoulder		0.5	$3.0
Low	Greenville	Fork Shoals Road	S-50	Ashmore Bridge to US 25	3 lane/5 lane	Bike Lane		2.9	$14.5
Low	Greenville	Fork Shoals Road	S-50	West Georgia to Ashmore Bridge	3 lane	Bike Lane		3.9	$15.6
Low	Greenville	N Rutherford Rd	S-171	Wade Hampton to SC 290	Improved 2 lane	2' shoulder		1.5	$3.8
Low	Pickens	LEC Road	S-90	McDaniel Ave to SC 8	3 lanes	2' shoulder	One side	0.7	$2.8
Low	Greenville	Hammett Bridge	S-94	Suber to Buncombe	3 lane	2' shoulder		1.3	$5.4

GPATS Long Range Transportation Plan

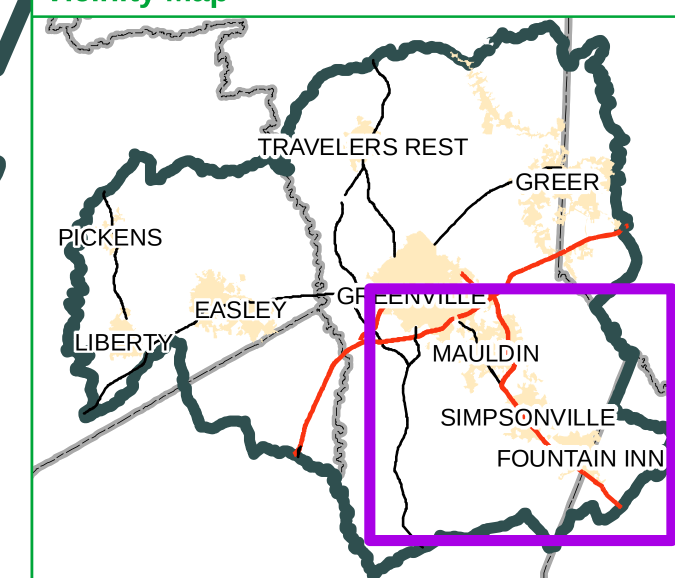
Figure 4.1A

Recommended Street and Highway Projects



Study Area
Municipalities
Counties
Operational/Design Improvement
Widen Existing
Realignment
New Location
New Interchange
Other Street
Railroad

Vicinity Map



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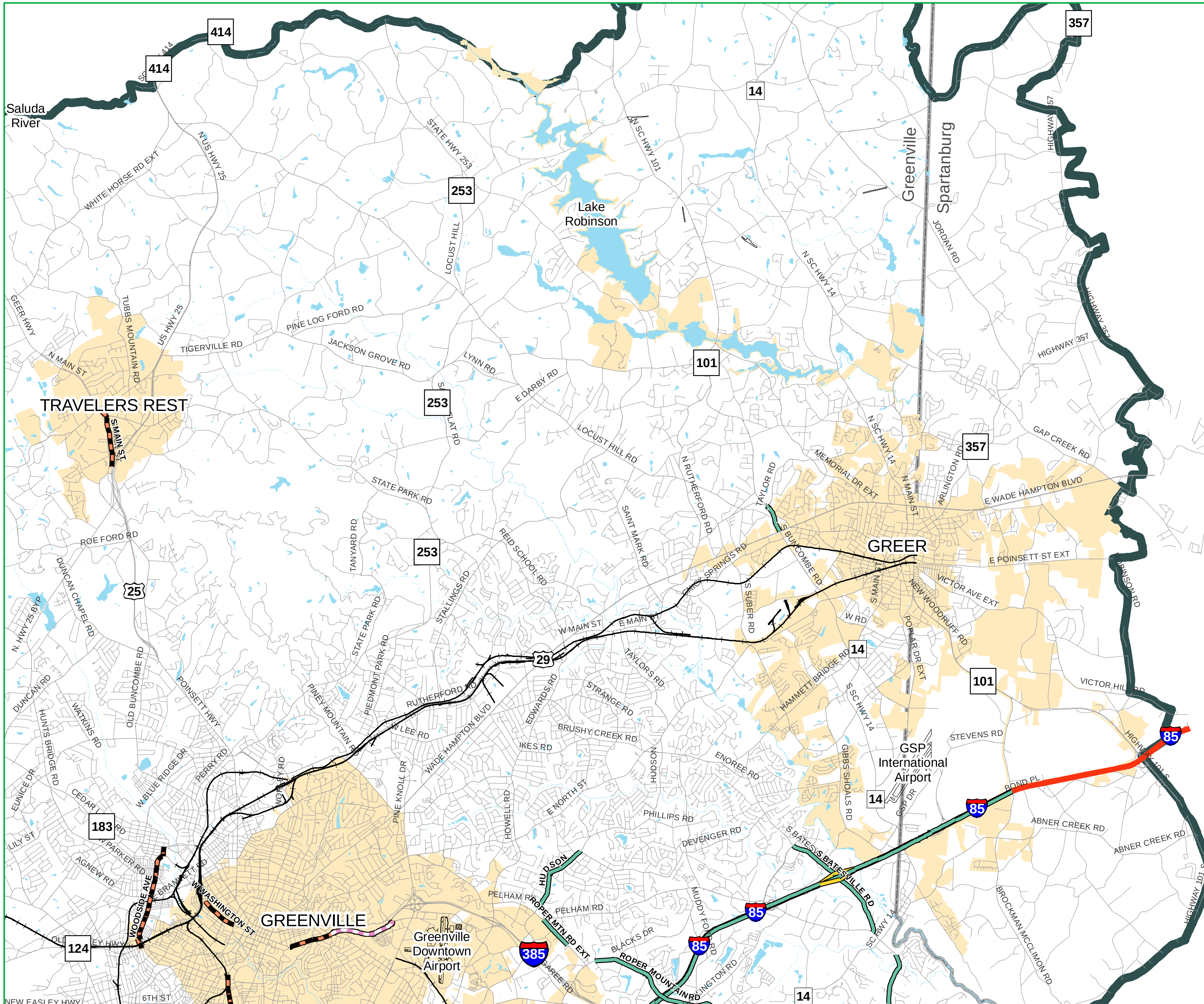
GPATS
LONG RANGE TRANSPORTATION PLAN

Long Range Transportation Plan

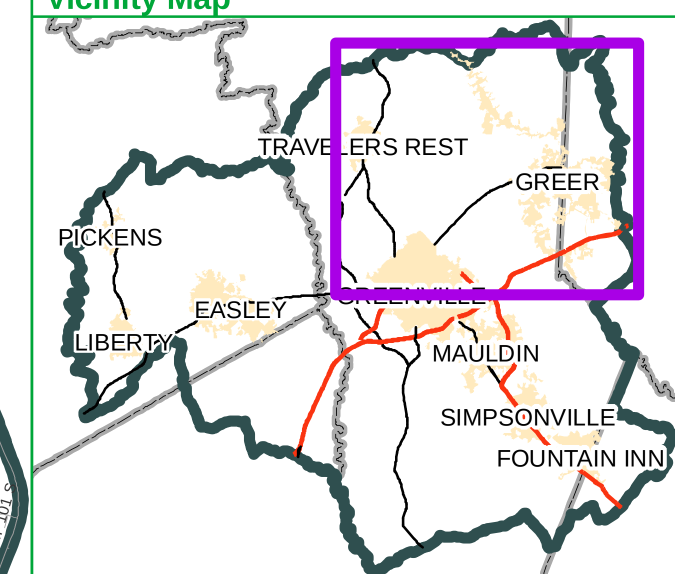
Figure 4.1B

Recommended Street and Highway Projects



- Study Area
- Municipalities
- Counties
- Operational / Design Improvement
- Widen Existing
- Realignment
- New Location
- New Interchange
- Other Street
- Railroad

Vicinity Map



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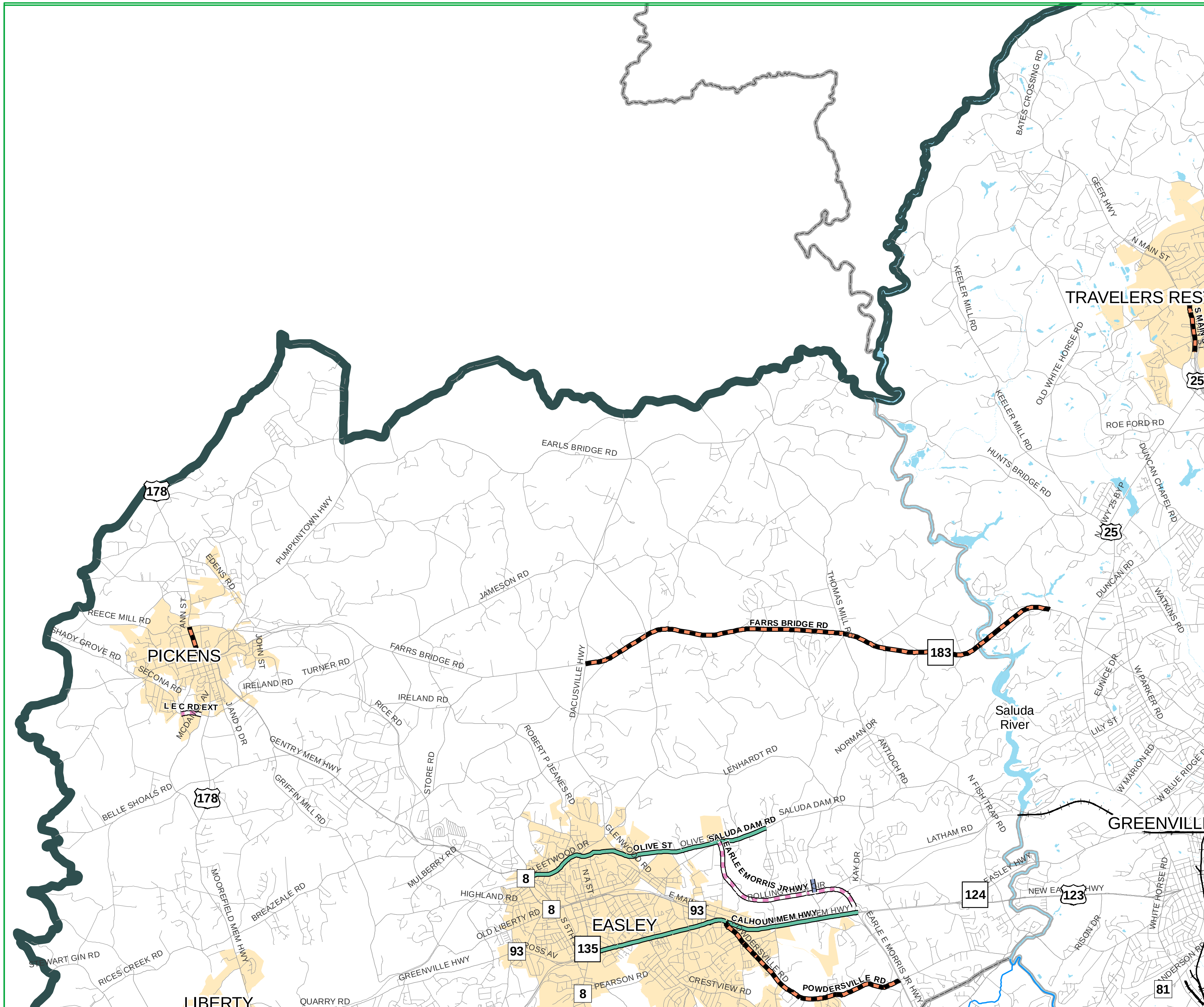
GPATS Long Range Transportation Plan

Figure 4.1C

Recommended Street and Highway Projects

- Study Area
- Municipalities
- Counties
- Operational / Design Improvement
- Widen Existing
- Realignment
- New Location
- New Interchange
- Other Street
- Railroad



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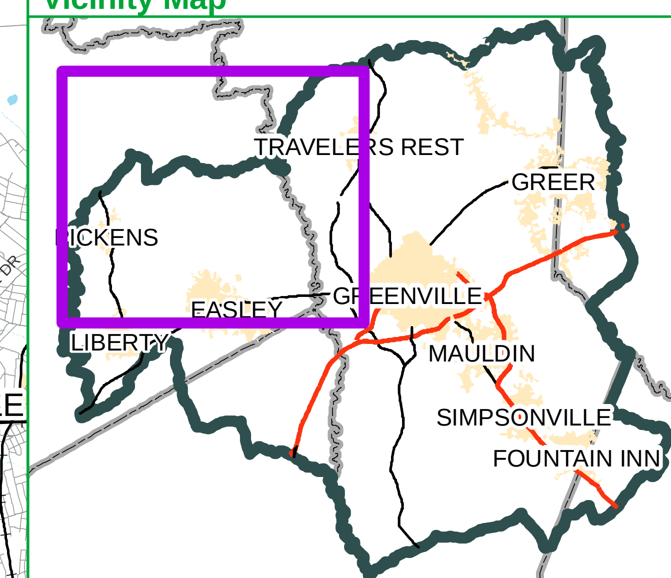

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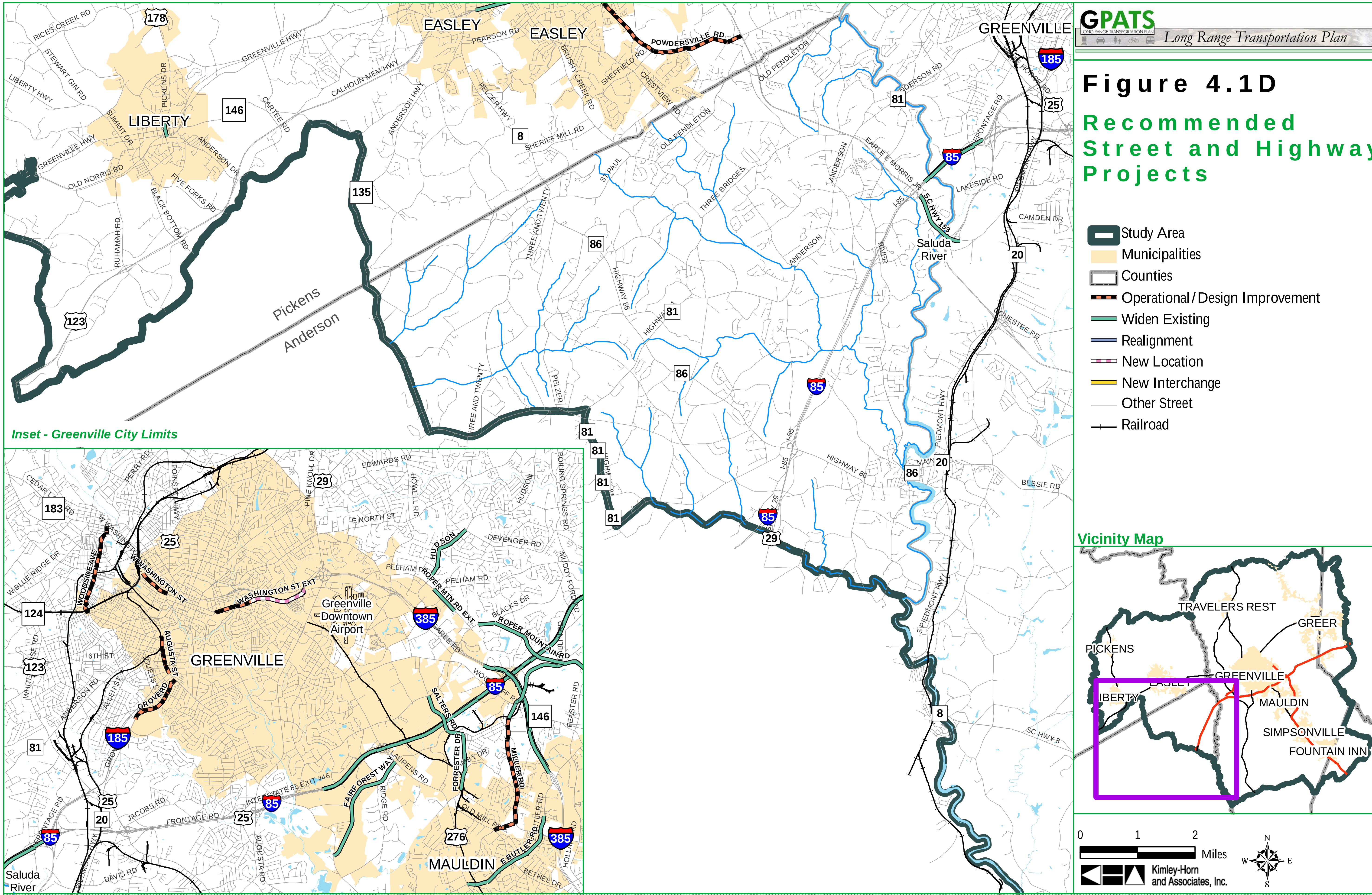
Figure 4.1D Recommended Street and Highway Projects



Road Diet Projects

A road diet narrows the width of a road or lane to improve the transportation system as a whole. Often, road diet projects are implemented as part of a larger effort to convert an automobile-oriented corridor into a complete street. **Table 4.3** describes several road diet projects recommended as part of *GPATS Long Range Transportation Plan*.

Intersection Projects

For many of the region's congested corridors, inefficient or unsafe intersections add unnecessary delay to motorists. Many of these intersections also create safety concerns for pedestrians and bicyclists, and in some cases, contribute to delays for transit vehicles. The *GPATS Long Range Transportation Plan* recommends improvements to 60 intersection projects as summarized in **Table 4.4**. Funding for these projects comes from a variety of sources.

Table 4.3: Road Diet Projects

Priority	Project Name	Termini	Project Scope	Bicycle Accommodations	Sidewalk
High	East Washington St.	McBee to US 276	Road Diet 3 lane	Bike lane	Add curb ramps
High	SC 14/Main St. FI	SC 418 to Quillen Drive	Road Diet 3 lane		Add curb ramps
Medium	Augusta St.	Vardry St. to Church St.	Road Diet 3 lane	Bike lane	Add curb ramps
Medium	Grove Road	Henrydale Ave. to Augusta Road	Road Diet 3 lane	Bike lane	Add curb ramps
Low	US 276	McElhaney to US 25	Road Diet 3 lane	Bike lane	Add curb ramps
Low	Smythe St./Woodside Ave.	SC 183 to SC 124	Road Diet 3 lane	Bike lane	Add curb ramps
Possible	West Washington St.	Butler Ave. to Norfolk Southern RR	Road Diet 3 lane	Bike lane	Add curb ramps
Possible	Ann Street (Pickens)	Main St. to Jones St.	Road Diet 3 lane	Bike lane	Add curb ramps

Table 4.4: Intersection Projects

Project Name	Action	County
Farrs Bridge (SC 183)/Hunts Bridge/Sulphur Springs	Study	Greenville
Farrs Bridge (SC 183)/ BlueFlame	TIP	Pickens
Wade Hampton (US 29) and Suber	TIP	Greenville
Locust Hill (SC 290) and Mountain View (SC 253)	TIP	Greenville
Woodruff (SC 146) and Bennetts Bridge (SC 296)	TIP	Greenville
Reid School and Edwards Mill	Study	Greenville
Wade Hampton and SC 101	Study	Greenville
Brushy Creek and Strange	TIP	Greenville
Brushy Creek and Pearson	TIP	Pickens
Brushy Creek and Crestview	Study	Pickens
Jewel St (SC 183) and Jones	TIP	Pickens
Main St (SC 93) and Pickens St (US 178)	TIP Corridor Project	Pickens
Farrs Bridge (SC 183) and Hamburg	Study	Pickens
SC 418 and Fairview Rd	Funded by CTC	Greenville
SC 14 and Loma St.	Study	Greenville
Blue Ridge (SC 253) and Perry	Study	Greenville
Locust Hill (SC 290) and N Rutherford	LRTP	Greenville
Ann St. (US 178) and Jones St.	TIP	Pickens
SC 8 and St. Paul Rd./Three and Twenty Rd	Funded by CTC	Anderson
Farrs Bridge (SC 183) and Jameson	TIP Corridor Project	Pickens
Wade Hampton (US 29) and Gap Creek Rd	LRTP	Spartanburg
Main St. (Greer) and Brushy Creek	LRTP	Greenville
Harrison Bridge and Neely Ferry	Funded by CTC	Greenville

Project Name	Action	County
Blue Ridge (SC 253) and N Franklin	LRTP	Greenville
SC 101 and Fews Chapel	TIP	Greenville
SC 14 and Taylor	Funded by CTC	Greenville
Sandy Flat (SC 253) and Jackson Grove	LRTP	Greenville
Lee Vaughn (SC 417) and Scuffletown	LRTP	Greenville
State Park (SC 253) and Altamont	LRTP	Greenville
SC 418 and Fork Shoals	LRTP	Greenville
Main Street (SC 93) and Pendleton St	LRTP	Pickens
5th St. and 2nd St.	LRTP	Pickens
Moorefield Memorial (US 178) and Mauldin Lake	LRTP	Pickens
Main (Liberty) and Summit	LRTP	Pickens
Moorefield Memorial (US 178) and Rices Creek	LRTP	Pickens
Saluda Dam and Prince Perry	LRTP	Pickens
Ashmore Bridge and Fowler Circle	LRTP	Greenville
Main Street (SC 14) and Howard Dr	LRTP	Greenville
Buncombe and Brushy Creek	LRTP	Greenville
Fork Shoals and Conestee	LRTP	Greenville
Butler and Murray	Corridor Project	Greenville
Mauldin and Fairforest	Corridor Project	Greenville
SC 8 and Garrison	LRTP	Greenville
State Park and E Mountain Creek	LRTP	Greenville
Tigerville and Jackson Grove	LRTP	Greenville
SC 20 and Main St (SC 86)	LRTP	Greenville

Project Name	Action	County
Liberty St (SC 93) and Ross Rd.	LRTP	Pickens
Moorefield Memorial (US 178) and LEC Rd	LRTP	Pickens
Moorefield Memorial (US 178) and Belle Shoals	LRTP	Pickens
Batesville Road at Roper Mountain Road	LRTP	Greenville
Batesville Road at Anderson Ridge Road	Corridor Project	Greenville
Three Bridges Road at Powdersville Main	LRTP	Anderson
SC 81 at Circle Road	LRTP	Anderson
New Easley Highway (US 123) at Rison Road	LRTP	Greenville
Locust Hill (SC 290) at Sandy Flat (SC 253)	LRTP	Greenville
Farrs Bridge (SC 183)and Dacusville Highway	LRTP	Pickens
Bethel and Bridges	TIP	Greenville
Bethel and Tanner	TIP	Greenville
Woodruff (SC 146) at I-85	TIP	Greenville
Laurens Rd. (US 276) at I-85	LRTP	Greenville

Summary of Intersection Projects	Funding	# of Projects	Unit Cost
TIP Projects -- GPATS Intersection Funds	$8,657,400	12	$721,450
Included in TIP Corridor Projects	$0	2	-
Included in LRTP Corridor Projects	$0	3	-
LRTP Intersection Projects	$21,675,900	32	$677,372
Traffic Engineering Study (study funded in UPWP)	$0	7	-
Funded by CTC	$0	4	-
Total	$30,333,300	60	

Future Travel Conditions

Future travel conditions along the region's roadways can be examined under a variety of conditions. Existing Plus Committed (E+C) Conditions show congestion if only those projects which are underway or already have funds appropriated to them are added to existing roadway facilities. The Funded Plan conditions adds to the committed projects all projects slated for funding in the GPATS Long Range Transportation Plan. Finally, the Vision Plan conditions include all recommended projects regardless of funding allocation.

2030 Existing Plus Committed Conditions

Prior to developing the funded and vision plan projects, future congestion levels should be analyzed based on adding only committed projects to the existing transportation network. As shown in **Figure 4.2**, many roadways will operate at level of service E or F if only currently funded projects are constructed.

2030 Funded Plan Conditions

Despite the improvements provided by the committed projects, facilities in the GPATS region are projected to be congested in 2030. The funded plan (or LRTP projects) includes a list of high priority projects that should address areas of most concern. **Figure 4.3** displays the level of service if these financially constrained projects are constructed. As the map indicates, congestion will improve throughout the region, particularly in the I-85 corridor north of Greenville.

2030 Vision Plan Conditions

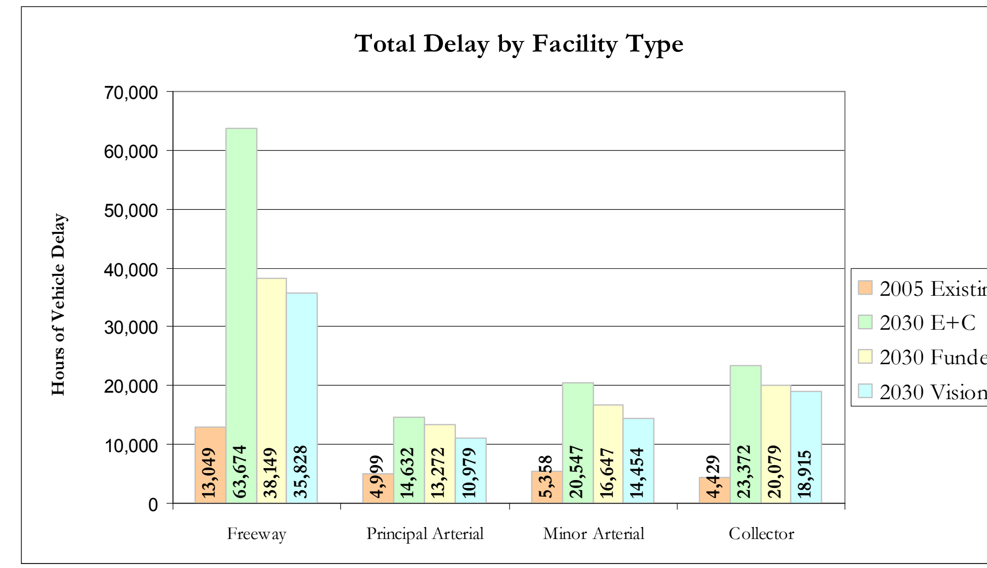
The Vision Plan builds on the financially constrained project list by adding a wish list of projects. The Vision Plan conditions map shows how the committed projects, funded projects, and wish list projects address deficiencies. Vision projects are intended to address deficiencies in the system once committed projects are completed. As expected, the Vision Plan provides the most improvements to the region's congested roadways. **Figure 4.4** illustrates level of service for 2030 following the construction of the vision projects.

Scenario Comparison

As shown in the table and bar graph to the right, a comparison of existing conditions with these future travel conditions reveals how the transportation network will fare in 2030 given different levels of project implementation. As expected, the total vehicle miles traveled (VMT) does not differ significantly from one scenario to another. Likewise, the three future conditions do not vary significantly in regards to total vehicle hours traveled (VHT).

However, delay is significantly reduced as projects are introduced to the 2030 E+C network. The graph shows how total delay by facility type is affected by the three scenarios. For each facility type, vehicle delay lowers as Funded and Vision Plan projects are added.

Measures-of-Effectiveness Summary			
	Vehicle Miles Traveled	Vehicle Hours Traveled	Delay (hours)
2030 E+C	19,105,740	429,477	125,156
2030 Funded	19,105,944	427,107	91,357
2030 Vision	19,093,899	426,337	83,239



Interstate Priorities

Table 4.5 lists the interstate highway priorities. These projects likely will be funding through a combination of federal, state, and local sources. Further study will be required to determine the positive and negative impacts of each project and prioritize them appropriately. Ultimately, SCDOT will determine state funding priority for interstate projects.

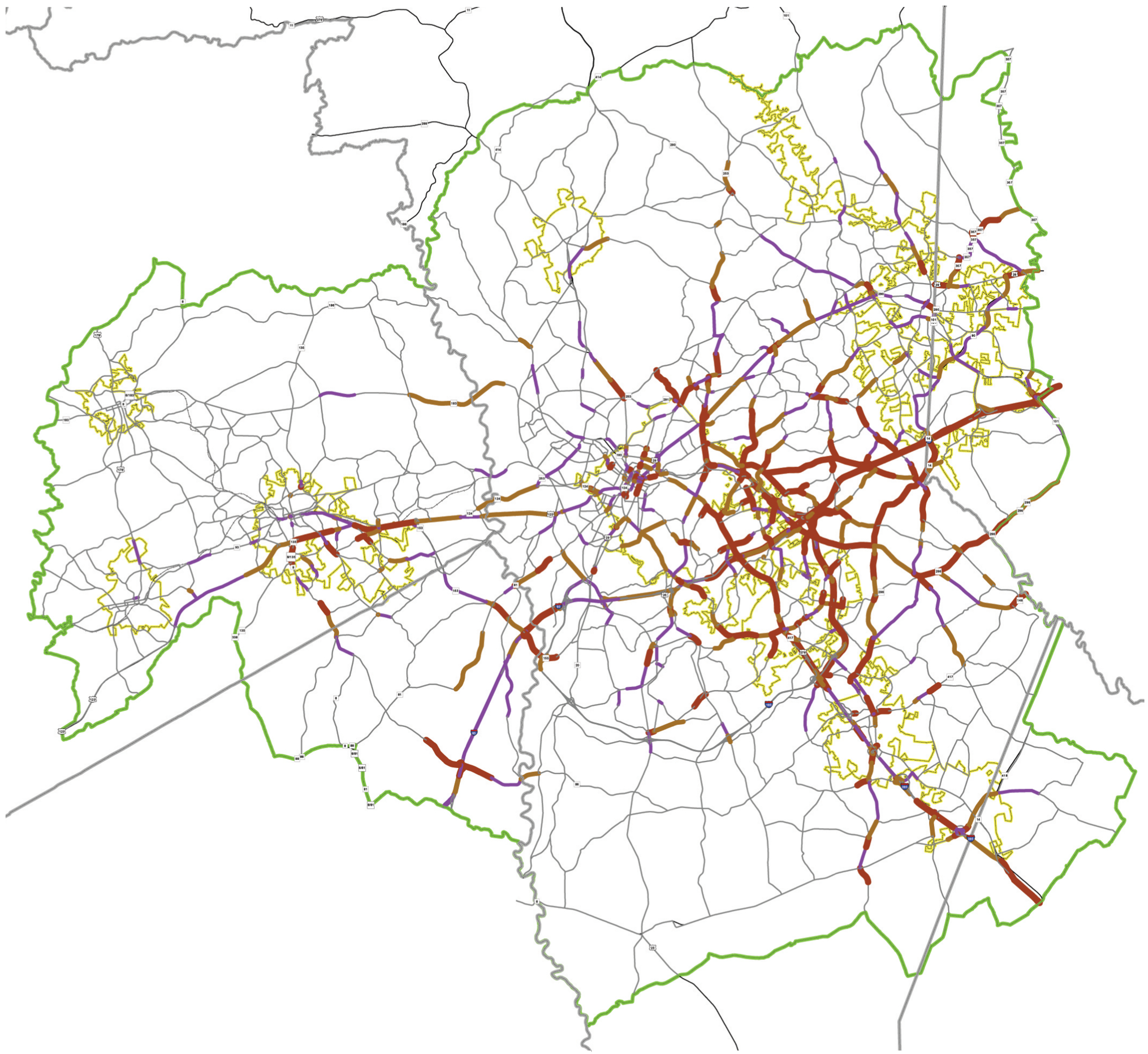
Table 4.5 - Miles of Interstate Widening Assumed (2008 to 2030)

Route	Section	Length (miles)	Cost/Mile (million $)	Total Cost (million $)
I-85	Reedy River to GSP Drive, widen to eight lanes	$10.3	$19.5	$200.9
I-85	GSP Drive to SC 101, widen to eight lanes	$3.1	$19.5	-
I-85	I-185 to SC 153, add one southbound lane	$1.0	$10.0	$10.0
I-85	New Interchange at Batesville Road	-	-	$30.0
I-85	Modify US 276 interchange, partial cloverleaf	-	-	$2.0
I-85	Upgrade Woodruff Road Interchange, single point urban	-	-	$25.0
I-385	Upgrade Woodruff Road Interchange, single point urban	-	-	$25.0
I-385	Upgrade Fairview Street Interchange	-	-	$20.0
I-385	I-85 to Butler Road, widen to six lanes	$2.9	$12.0	$34.8
Total		$17.3		$347.7

GPATS Long Range Transportation Plan

Figure 4.2

Future Level of Service
(No Changes)



2030 Existing Plus Committed Network

Level of Service

- A
- B
- C
- D
- E
- F
- County Boundaries
- Municipal Boundaries
- GPATS Boundary

0 1 2 4 Miles

N W E S

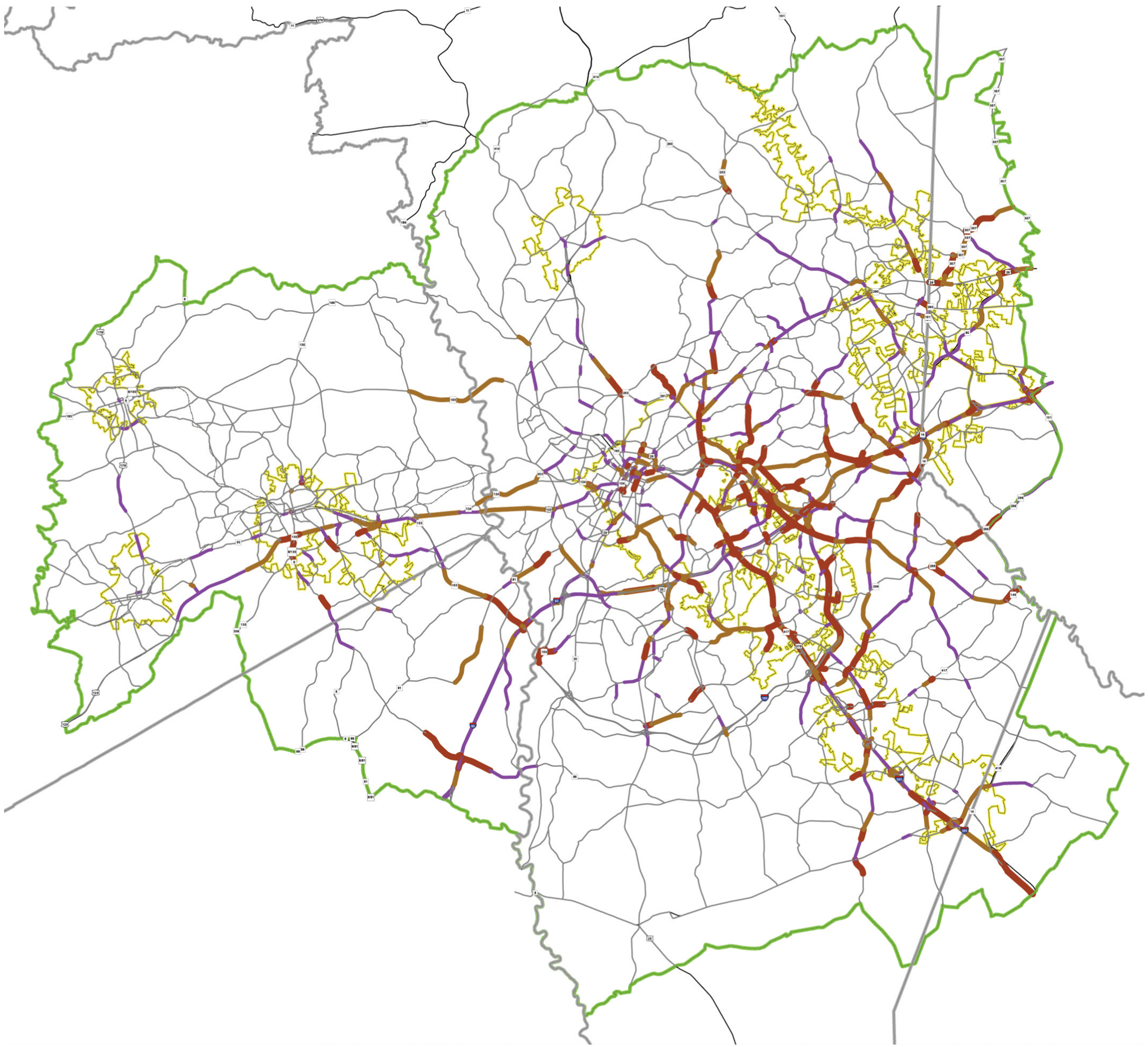
Kimley-Horn and Associates, Inc.

GPATS Long Range Transportation Plan

Long Range Transportation Plan

Figure 4.3

Future Level of Service
(with Long Range Plan Projects)



2030 Long Range Plan Network

Level of Service

- A
- B
- C
- D
- E
- F
- County Boundaries
- Municipal Boundaries
- GPATS Boundary

0 1 2 4 Miles

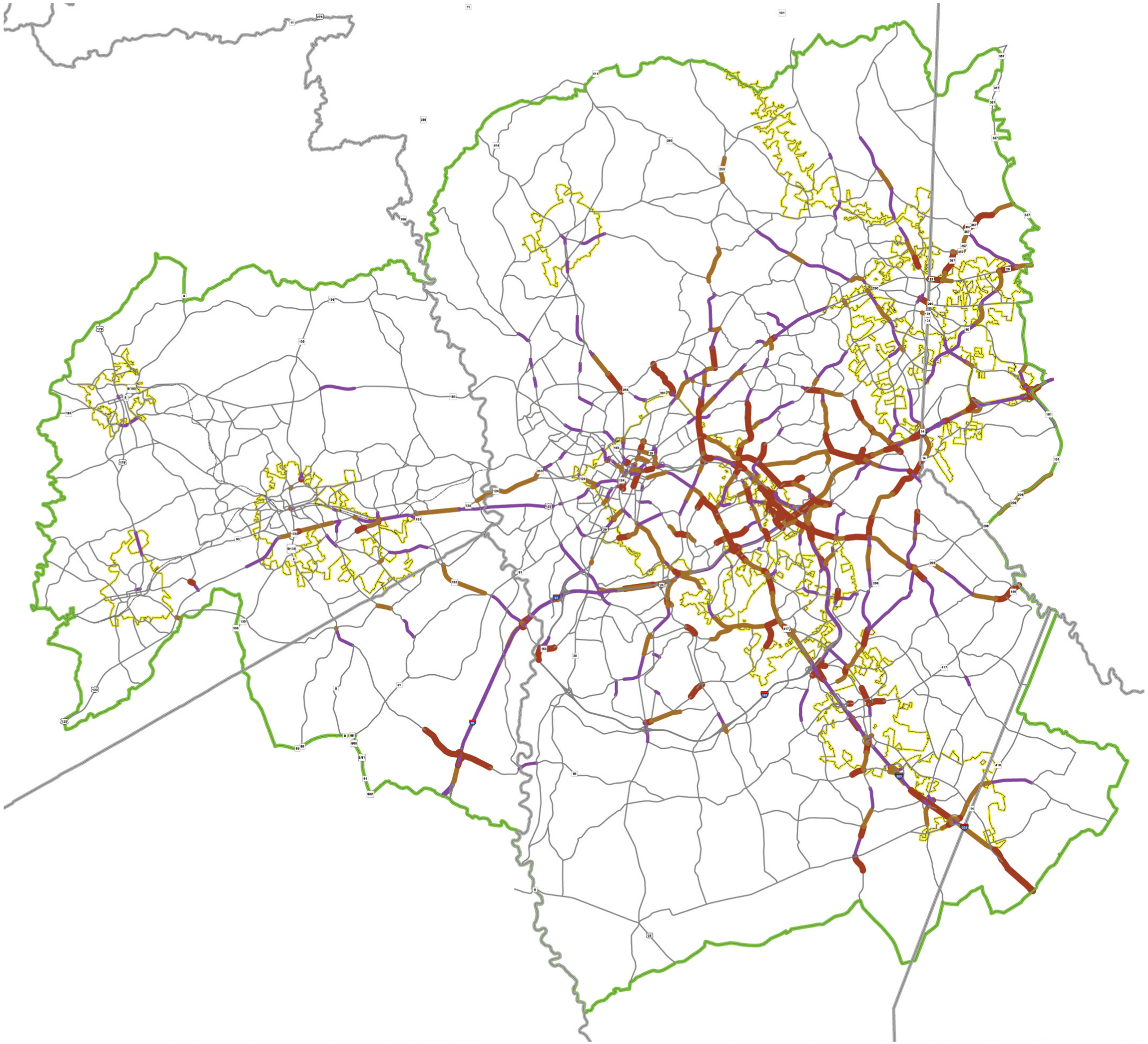
N W E S

Kimley-Horn and Associates, Inc.

GPATS Long Range Transportation Plan

Figure 4.4

Future Level of Service
(with Long Range and Vision Plan Projects)



2030 Long Range and Vision Plan Network

Level of Service

- A
- B
- C
- D
- E
- F
- County Boundaries
- Municipal Boundaries
- GPATS Boundary

0 1 2 4 Miles

Kimley-Horn and Associates, Inc.

Congestion Management Program Update

As noted in Chapter 3, congestion is a continuing concern for this developing region. Previous efforts to address this issue include the *2000 Congestion Management System (CMS) Report* prepared for the GPATS region. To establish a basic understanding of the true nature of local congestion, this report relied heavily on Global Positioning System (GPS) field measurement of travel time and delay. Data for thirty-three routes was collected, processed, and summarized to provide the primary measures of congestion.

In the congestion management update prepared during the long range transportation plan development process, a new strategy was implemented. While field measurement can provide excellent information about the extent, duration, and intensity of travel congestion, it is not feasible to collect data on all facilities. To obtain a regional perspective on congested corridors and rankings, the update to the congestion management program relied heavily on the concurrent effort to update, expand, and enhance the region's travel demand forecasting model. Regional facilities were aggregated, evaluated, and ranked for congestion intensity and extent. After ranking, a systematic field monitoring plan was developed to target a portion of the most congested facilities. This process allowed all roads to be screened for the likelihood of congestion, and more detailed field measurement was applied to the areas of most concern.

Federal Requirements

The Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) was signed into law on August 10, 2005. In a provision similar to the earlier reauthorizations acts, ISTEA and TEA-21, SAFETEA-LU requires metropolitan planning organizations serving a transportation management area (TMA) to have "a process that provides for effective management and operation" to address congestion management (Section 450.316 of 23 CFR Part 450, Statewide Planning, Metropolitan Transportation Planning and Programming). Previous to SAFETEA-LU, the congestion management process (CMP) was referred to as congestion management system (CMS). SAFETEA-LU includes specific references to the need to provide for "effective integrated management and operation of the multimodal transportation system" (Section 450.320 of 23 CFR Part 450, Statewide Planning).

A CMP is a required part of the metropolitan planning process as defined in 23 CFR 450.320. Guidelines for CMP development are provided in 23 CFR 500.109, including the main intent of the program: "An effective CMS is a systematic process for managing congestion that provides information on transportation system performance and on alternative strategies for alleviating congestion and enhancing the mobility of persons and goods to levels that meet State and local needs."

The basic elements of a CMP include:

- Methodology descriptions
- Measures of effectiveness (MOE) definitions
- System analysis for identifying congested facilities
- Evaluation of appropriate and cost-effective mitigation strategies
- Implementation schedule for the mitigation strategies
- Maintenance and effectiveness plan

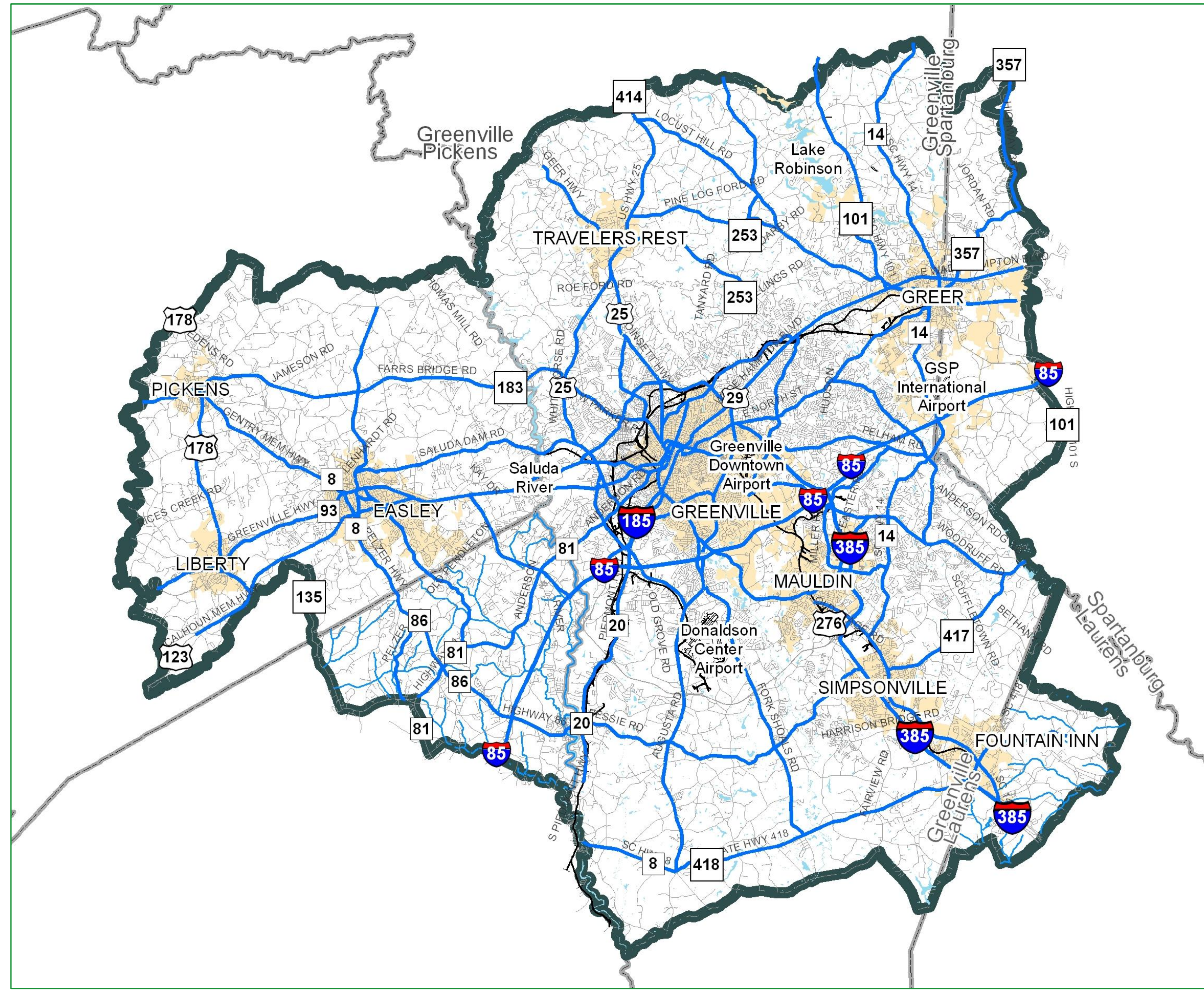
The regulations also indicate that existing data sources should be used as much as possible to avoid additional financial burden. Transit and other modal performance measures also are expected to be included in the CMP.

Congestion Monitoring Network (CMN)

Typically, the congestion monitoring network (CMN) represents the set of roads and transit routes evaluated for regionally significant congestion. The basis for the Greenville area CMN was the updated travel demand forecasting model network for the local area and the set of 14 primary transit routes. To help with the evaluation process, the CMN was divided further into facilities representing major regional roads where regionally significant congestion was possible. The image to the right shows in blue the congestion monitoring network for the *GPATS Long Range Transportation Plan*.

The identification of facilities was designed to take advantage of the strengths inherent in the travel demand model. Travel demand models provide link-level performance statistics that should only be used in aggregation within a route. Travel demand model links are elements of routes and corridors where regional travel flows are modeled and calibrated. For the use of the model in the Greenville CMP, individual links were aggregated into logical CMP facilities representing a single roadway. For example, the model included 59 links for White Horse Road from Augusta Road in the south to US 276 in the north. By aggregating these links into a single facility, the combined values portrayed a more accurate view of existing baseline conditions than if they were compared individually.

For consistency, CMN road facilities were created by aggregating the links of a roadway with homogenous characteristics regarding regional connectivity and transportation system purpose. A total of 54 CMN facilities were defined from the model to represent the major regional roadways in the Greenville area.



Congestion Measures

In order to evaluate the performance of roads and prioritize improvement projects, four characteristics of road congestion were considered during the CMP update process. These characteristics included intensity, extent, duration, and reliability (consistency).

Congestion Intensity

Congestion intensity typically is recognized as the average delay experienced by travelers. Measures of intensity usually are developed using a baseline of free-flow conditions. The most common measure of congestion intensity is volume to capacity (v/c) ratio, although average vehicle delay in minutes can also be used. Other cities are starting to use a more logical measure called the Travel Time Index (TTI). This measure compares actual travel times along a route to free-flow travel times along the same route. For examples, in Atlanta, any facility with a TTI greater than 1.4 is considered congested. TTI is a measure that better represents the experience of a driver. Intensity also could be measured in the delay experienced by a single vehicle.

Congestion Extent

Congestion extent takes the measure of intensity and expands it to the number of travelers affected. This measure helps to differentiate between a 10-minute delay affecting 1,000 vehicles and an 8-minute delay affecting 50,000 vehicles. When prioritizing facilities requiring improvements, the measure of congestion extent can be a valuable consideration. Typically, congestion extent is measured in hours of delay.

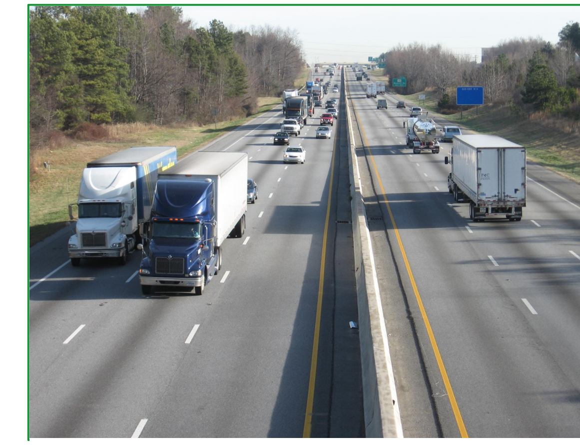
Congestion Duration

Congestion duration represents the length of time that a facility operates under congested conditions. Some facilities may experience short bursts of severe delay, while others have much longer periods of time where delay occurs. While this measure is not used as often in the evaluation of CNMs, it is considered helpful in evaluating mitigation strategies (e.g., determining if signal timing improvements could alleviate congestion as well as improvement to expand to the roadway's capacity). Duration typically is measured in minutes.

Reliability

Congestion reliability refers to the variability of congestion along a facility. Driver surveys have shown that unexpected delays are considered much worse that recurrent "reliable" congestion because of the impact to scheduled activities. Facilities with high crash rates or facilities serving major events can sometimes be unreliable. Measures of reliability are difficult to collect without extensive monitoring systems. Repetitive data collection across many days can give estimates of travel time variability.

Travel demand model networks can typically estimate congestion intensity and congestion extent. If time-of-day modeling is available, congestion duration also can be estimated. For this CMP, congestion measures relied on the intensity (TTI) and the extent (hours of delay). Measures of duration and reliability were not attainable without additional modeling or field data collection.



I-85

CMN Facility Ranking

Each CMN facility in the Greenville area was ranked using measures of congestion intensity and congestion extent. Without time-of-day or variability data, measures of duration and reliability were not used to rank facilities. Both intensity and extent were ranked and combined to generate a composite score. **Figure 4.5** shows the intensity performance measure, while **Figure 4.6** shows the extent of congestion. Both maps show the data for roadways that has been normalized along the length of each section. **Table 4.6** and **Figure 4.7** show the top twenty congested facilities for the Greenville area using the composite score as a final ranking.

Table 4.6 – Top 20 Congested Facilities

CMP Facility Name	Intensity	Extent (Hours of Delay)	Adjusted Intensity	Adjusted Extent	Length (Miles)	Intensity Rank	Extent Rank	Composite Rank
Haywood-Howell	4.39	121714.03	0.68	18783	6.48	1	2	3
Pleasantburg	3.38	135331.76	0.52	20788	6.51	2	1	3
Pelham	3.34	88445.59	0.44	11668	7.58	4	3	7
Woodruff	4.37	135501.75	0.37	11591	11.69	8	4	12
Butler-Mauldin	4.01	78642.99	0.44	8539	9.21	5	9	14
I-385 (I-85 to US 276)	4.88	120047.71	0.37	9178	13.08	9	7	16
US 29	5.32	169894.24	0.30	9561	17.77	13	6	19
Batesville-Old Spartanburg	3.86	41091.51	0.46	4939	8.32	3	17	20
Main (Rutherford Rd to River St)	1.08	15266.78	0.40	5592	2.73	7	14	21
I-85 (Staunton Bridge Rd to I-385)	4.91	171204.67	0.26	8954	19.12	18	8	26
I-85 (I-385 to SC 101)	4.24	198442.42	0.22	10390	19.10	21	5	26
SC 153	1.57	40392.26	0.28	7162	5.64	14	12	26
SC 14	3.13	49573.14	0.34	5342	9.28	11	16	27
Washington-Faris	1.97	27240.59	0.35	4838	5.63	10	18	28
US 123	5.51	156387.06	0.26	7479	20.91	17	11	28
W. Blueridge/N. Pleasantburg	2.02	44819.86	0.27	5905	7.59	15	13	28
I-385 (E. North St to I-85)	2.99	97596.02	0.25	8243	11.84	19	10	29
Bridges-Miller-Garlington	3.17	26811.2	0.40	3347	8.01	6	24	30
Rutherford	1.67	34268.49	0.27	5439	6.30	16	15	31
North Brushy Creek	3.62	57672.26	0.30	4786	12.05	12	19	31

The fields in **Table 4.6** include the following:

- **CMP Network** – The unique name given a CMP facility
- **Intensity** – The average per capita delay in minutes associated with traveling this facility.
- **Extent (Hours of Delay)** – The total delay in minutes for all vehicles traveling this facility during a day
- **Adjusted Intensity** – The total delay per mile to normalize by length
- **Adjusted Extent** – The total delay per mile for all vehicles traveling this facility during the day
- **Length** – The one-way length of the facility in miles
- **Intensity Rank** – The ranking value using Adjusted Intensity
- **Extent Rank** – The ranking value using Adjusted Extent
- **Composite Rank** – The final ranking value (sum of Intensity and Extent Ranks)

The Greenville regional travel demand model outputs tend to provide only a limited assessment of traffic operations commonly associated with specific intersections or link level delay and congestion. The regional viewpoint generated by the model, however, provided a starting point to focus on congestion problems. The results shown in **Figure 4.7** indicate the worst congestion in the region occurs east and southeast of downtown Greenville, as well as in centers along the I-85 corridor. Additionally, US 29 and US 123 experience significant levels of congestion due to their role as the primary highways that link Greenville to other communities in the region such as Clemson, Greer, Easley, and Spartanburg.

In order to refine the facilities further, field data needs to be collected and evaluated. Field data (e.g., hourly traffic counts, travel time, and delay data) would determine if the forecasted delays are experienced by Greenville drivers. The field data also would identify operational flaws that could be improved without capacity expansion through modifications such as signal timing improvements or turn bay additions.

Figure 4.5 - Congestion Intensity

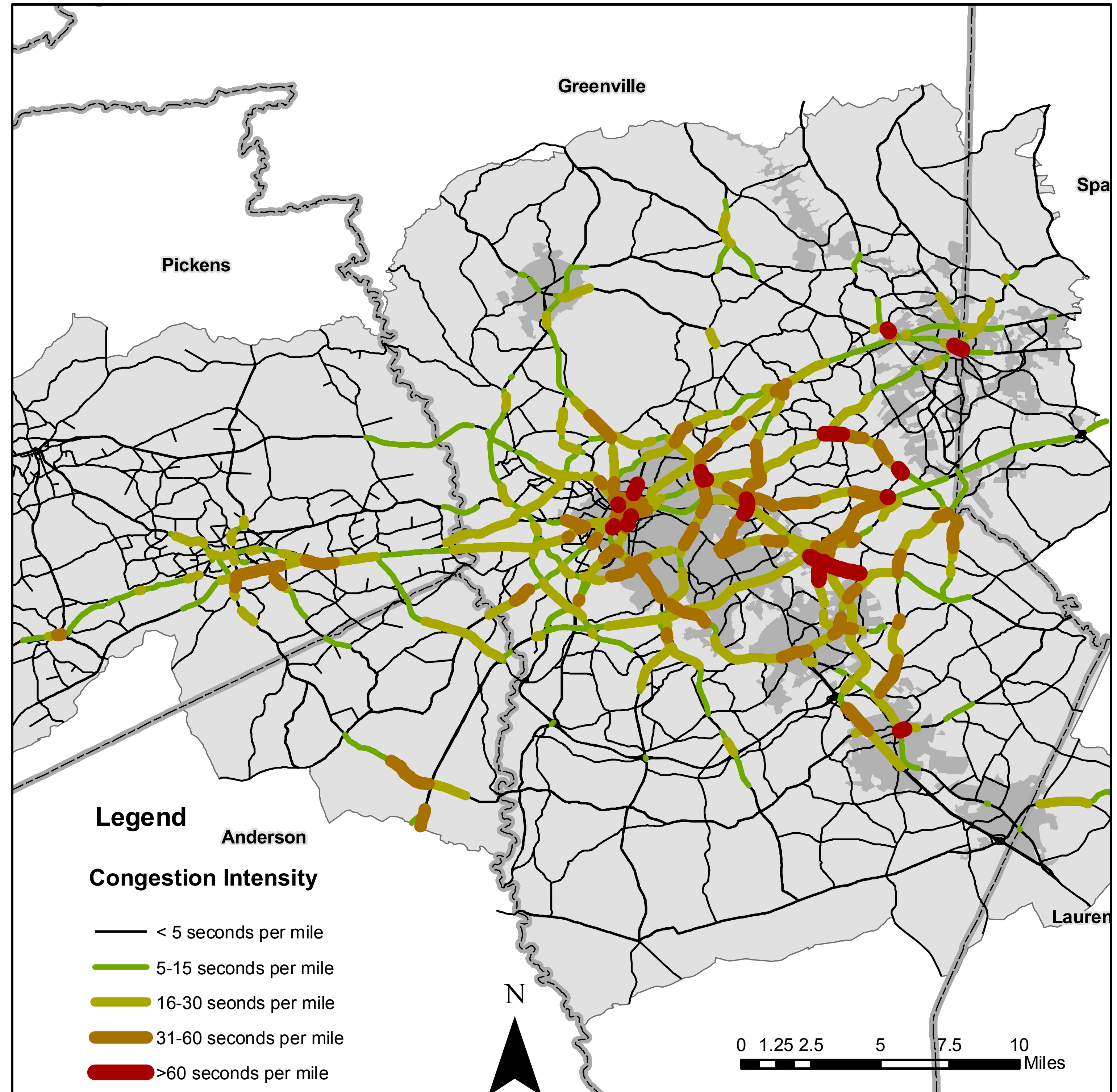


Figure 4.6 - Congestion per Mile

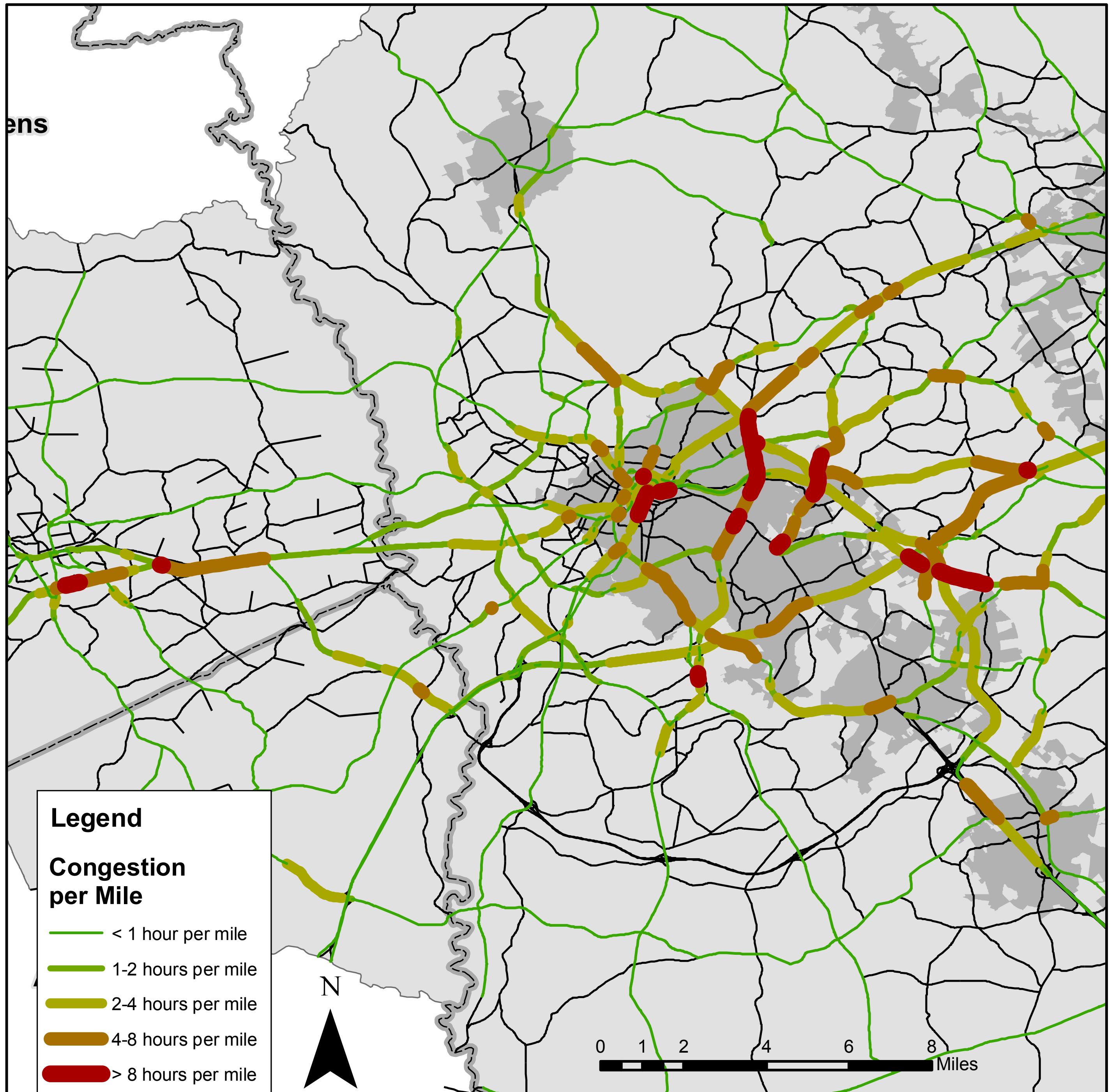
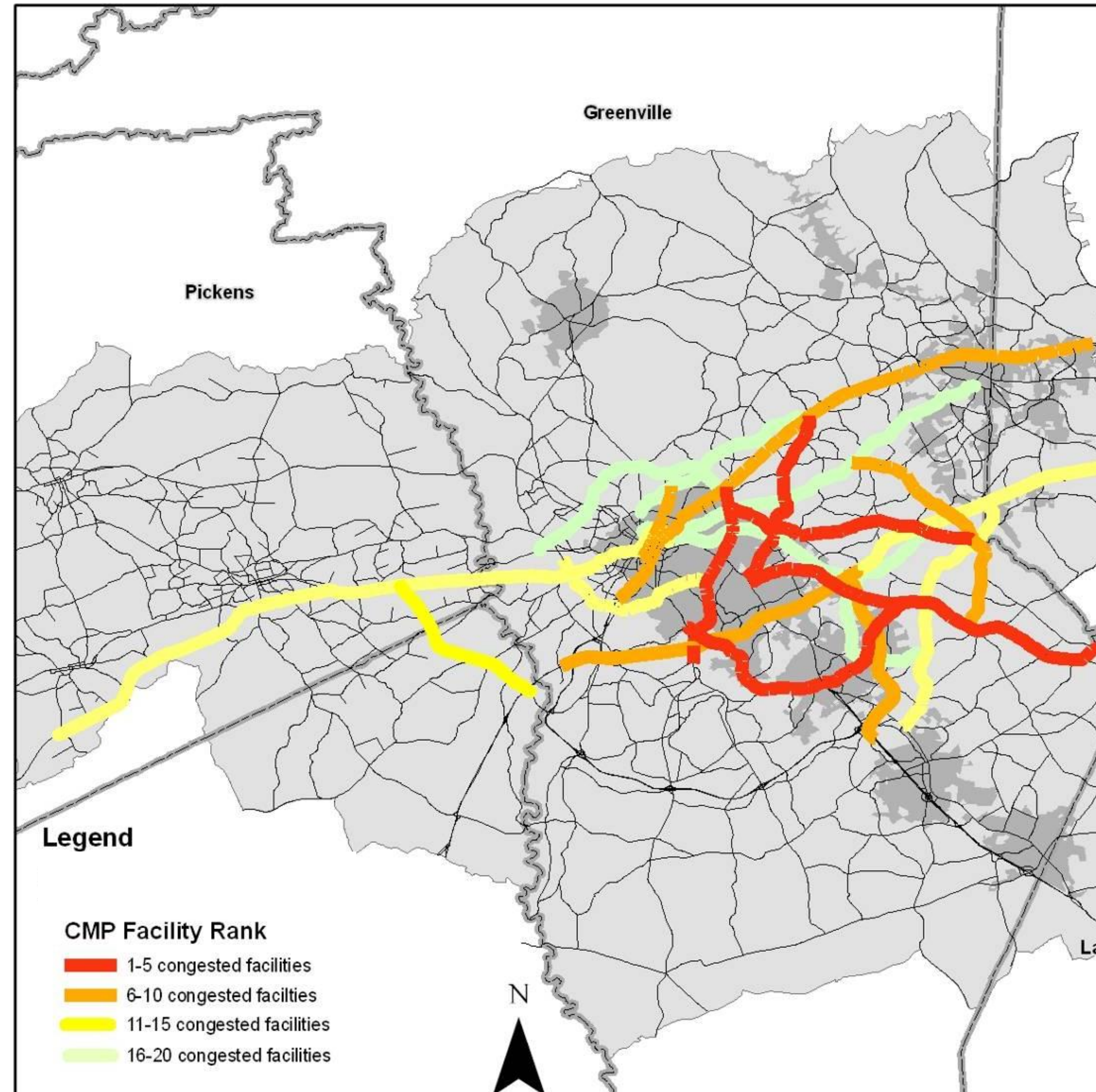


Figure 4.7 – Top 20 Congested Facilities



CMN Monitoring Plan

Field data collection can be an expensive and time consuming effort. Further, the anticipated funding for the Greenville area will not likely support full data collection for all of the area's CMN facilities in a single year. A balanced monitoring plan, however, can use the initial CMN facility ranking to prioritize data collection. Those facilities identified as the most congested from a regional accessibility standpoint (model driven) should be prioritized as budgets allow. One efficient and cost-effective method for collecting travel time and delay data is with GPS-equipped probe vehicles.

Should the Greenville area pursue a probe vehicle sampling strategy for data collection, repetitive runs across the entire length of the CMN facility must be designed to capture recurrent congestion conditions in the peak periods. A total of 12-16 "runs" per direction over two or more days should be evenly distributed throughout the peak period and include second-by-second data logging.

Collecting detailed travel time and delay data with a second-by-second GPS device also can provide accurate speeds that can be evaluated at the link or route level. Further, this data can quickly illuminate the causes of congestion by identifying the specific locations and times. With a robust sampling strategy, the duration of congestion can also be determined. It is recommended that GPATS collect probe vehicle data for 15 to 20 routes each year. The selected routes should consist of the top 20 congested facilities identified in **Table 4.6**.

Incidents, events, and weather can be significant contributors to congestion. Only focusing on recurrent congestion can miss important congestion experiences. It is recommended that efforts be made by GPATS to collect and monitor incident data through evaluations of crash statistics by location and time. Identifying high accident locations and implementing mitigation strategies will reduce congestion resulting from unexpected events. Accident rates during peak periods could also be a factor in ranking facilities. Additionally, special events throughout the region should be evaluated for congestion impacts. An easy method for mitigating these events is through news media sources providing dates of expected delays and suggested alternatives.

Congestion Mitigation Strategies

The recent CMP legislation recommends that short-term and innovative mitigation measures be explored that focus on the specific issues facing congestion. Regional congestion management strategies such as travel demand management and transportation system management are still important to the plan. CMP strategies, however, should focus on the specific conditions of the facility that can be addressed to provide congestion relief, such as signal timing, turn restrictions, capacity expansion, or operational changes.

At this level of analysis, it is appropriate to categorize the most congested facilities based on the feasibility of certain mitigation strategies. At the same time, mitigation solutions should be ranked based on the suitability and potential benefit to each CMP facility. Appropriate strategies for congestion improvements can be assessed by considering the type of facility, its role in regional connectivity, surrounding land use density, modal choices in the area, and the proximity to major activity centers.

The following mitigation strategies should be considered as congestion in Greenville is addressed:

- Travel demand management (TDM)
  - Establish carpool/vanpool programs
  - Encourage development along transit corridors
  - Encourage mixed use development
  - Enhance bicycle and pedestrian facilities
  - Enhance modal connectivity
  - Establish parking restrictions
  - Encourage teleworking and flex-time
- Travel system management (TSM)
  - Expand capacity
  - Expand transit system
  - Improve transit operational
  - Improve incident response
  - Enhance traffic signals
  - Improve intersection
  - Improve interchange
  - Implement advanced monitoring systems
  - Add HOV lanes

While each of these concepts has the potential to reduce congestion, they will do so at different levels. TDM solutions are more related to long-term management of demand, while TSM strategies typically are more short-term solutions. Given the federal guidance, short-term solutions should be given priority. Long-term impacts, however, should not be ignored for the sake of temporary relief. These recommendations are conceptual, and it should be noted that each facility or corridor has specific conditions that should be considered to determine the most appropriate solutions. Specific mitigation strategies should not be implemented without more detailed field data collection and professional assessment.

It is recommended that the next step of monitoring be conducted on the top 15 to 20 facilities to refine the specific issues causing congestion. **Table 4.7** lists the top congested facilities and the prioritized list of TDM and TSM strategies possibly applicable.

Throughout these facilities, signal timing and intersection improvements appear to be the most feasible approaches to arterial congestion, particularly near the heavy commercial areas east of Greenville. Freeway congestion may be mitigated most quickly through methods of identifying and removing incidents during peak conditions.

Next Steps and Summary of Recommendations

The next steps for developing a comprehensive Congestion Management Process for Greenville is to define how the congestion facility ranking will be used in project prioritization. In parallel, field data should be collected on the most congested facilities. This data should be used not only to validate that congestion exists and it is significant, but also to provide a source of information for determining specific mitigation possibilities. A summary of the recommendations include:

- Adopt strategy for inclusion of congestion ranking into the planning process
- Develop facility congestion ranking for future year
- Collect field data on top 15 to 20 facilities annually
- Evaluate high accident locations occurring under peak conditions
- Evaluate field data to assist in determining specific short-term mitigation strategies

Table 4.7 - Mitigation Strategies

			Travel Demand Management (TDM)							Transportation System Management (TSM)								
Facility	**Rank**	**Description (major connections)**	Carpool Programs	Encourage Development along Transit Corridors	Encourage Mixed Use Development	Bike / Ped Facility Enhancement	Modal Connectivity Improvements	Parking Restrictions	Encourage Teleworking anf Flex-Time	Capacity Expansion	Transit System Expansion	Transit Operational Improvements	Incident Response	Traffic signal enhancements	Intersection Improvements	Interchange Improvements	Advanced Monitoring Systems	HOV Lane additions
HaywoodHowell	1	Mix of dense commercial activty on southern half and residential on northern half (I-385, US29)	8		5	6					7	4		3	1	2		
Pleasantburg	2	Dense comercial activity along the entire length (I-85, I-385, US 29)	6	5	4							3		1	2			
Pelham	3	Mix of dense commercial activty on both ends and moderate residential density throughout (I-85, I-385)		6	7	8					4	5		2	3	1		
Woodruff	4	Dense commercial activity along the entire length (I-38, I-85)		7	8	9				6	3	4		1	2	5		
ButlerMauldin	5	Mix of industrial, commercial, and high density residential (I-85, I-385, Woodruff)		5	4	7	8			2	3	7		1	6			
I385-2	6	Key east side freeway (Airport, I-85, I-185, major external node)	4						5				2				1	3
US29	7	Major arterial with moderate commercial activity for entire length (Greenville, I85)		3	4		5		6			2	7	1				
BatesvilleOldSpartanburg	8	Mostly residential except dense industrial / commerical near I-85	5		4				2					1	3			
MainSt	9	Main artery through downtown Greenville			4	3		2	6					1	5			
I85-2	10	Major interstate freeway through region	4										2				1	3
I85-3	11	Major interstate freeway through region	4										2				1	3
EarlEMorris	12	Arterial with light residential and moderate commercial near I-85 (US 123, I-85)	5		4				5					1	2			
SCHwy141	13	Main artery through downtown Greer, industrial in the south and residential in the north (I-85, Greer, US 29)			3		6	4	5					1	2			
WashingtonFaris	14	Minor arterial that acts as a bypass for dowtown Greenville (US 123, I-185)		8	7			6	5	3		4		1	2			
US123	15	Major arterial connecting Easley and Greenville	6	7	5			4		3				1	2			
WBlueridgeNPleasantburg	16	Minor arterial that acts as a bypass for dowtown Greenville (US 123, US 29)	5	6	4					3				1	2			
I385-3	17	Freeway connecting Greenville to I-85 at all points east and north	4						5				2				1	3
BridgesToGarlington	18	Minor arterial acting as alternative route through congested I85 / I-385 area		3	4		5				7	6		1	2			
Rutherford	19	Arterial with light industrial, light commercial and residential (Greenville, US 29)		7	6		5				4	3		1	2			
NorthBrushyCreek	20	Arterial connecting Greenville and Gree through residential and light commercial areas	4		5		4				3			2	1			

Access Management

As the region's most traveled corridors continue to attract commercial development, protecting the through capacity becomes essential for the efficiency of the transportation system and continued economic growth. Access management balances the needs of motorists using a roadway and the needs of adjacent property owners who depend on access to the roadway. The Federal Highway Administration Committee on Access Management defines access management as the "control of access along surface streets – primarily arterials and major collectors" by restricting the location, spacing, and design of direct access to the roadway. Such measures are even more critical given the shortage of funds for transportation projects. A proper balance requires cooperation between government agencies and private land owners

A corridor with poor access management affects motorists in a variety of ways, including longer commute times, lower fuel efficiency, and higher vehicle emissions. Poor access management also impacts the livability and economic vitality of commercial corridors, ultimately discouraging potential customers. The warning signs of a corridor in need of improved access management include higher frequency of crashes between motorists, pedestrians, and cyclists, worsening traffic congestion, more spillover cut-through traffic on adjacent residential streets, and a decline in commercial investment along the corridor. Access management has wide-ranging benefits to a variety of users. These benefits are summarized in **Table 4.8**.

Table 4.8 - Benefits of Corridor Access Management

User	Benefit
Motorists	▪ Fewer delays and reduced travel times ▪ Safer traveling conditions
Bicyclists	▪ Safer traveling conditions ▪ More predictable motorist movements ▪ More options in a connected street network
Pedestrians	▪ Fewer access points and median refuges increases safety ▪ More pleasant walking environment
Transit Users	▪ Fewer delays and reduced travel times ▪ Safer, more convenient trips to and from transit stops in a connected street and sidewalk network
Freight	▪ Fewer delays and reduced travel times lower cost of delivering goods and services
Business Owners	▪ More efficient roadway system serves local and regional customers ▪ More pleasant roadway corridor attracts customers ▪ Improved corridor aesthetics ▪ Stable property values
Government Agencies	▪ Lower costs to achieve transportation goals and objectives ▪ Protection of long-term investment in transportation infrastructure
Communities	▪ More attractive, efficient roadways without the need for constant road widening

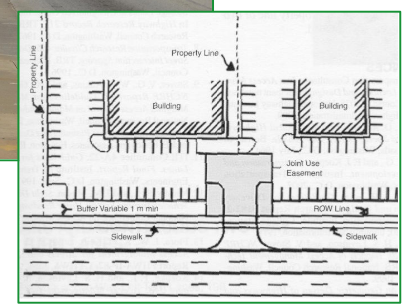
Access Management Strategy Toolkit

Access management includes a variety of tools to improve corridor operation and should never be considered a one-size fits all solution. In fact, a successful strategy on one section of a corridor can prove ineffective further down the same road. The chosen strategies also must be coordinated with other transportation initiatives to ensure access management does not hinder the intended outcome of those programs.

The toolkit that follows provides a general overview of various strategies available to alleviate congestion. The toolkit offers to local engineering and planning officials strategies as well as an overview of their application and use. The access management program should support the efficient and safe use of the corridors for all transportation modes. Regular evaluation must be a part of the program.

Driveway Treatments

Number of Driveways



In many cases, new development occurs adjacent to an existing site or adjacent to another new development. In these cases, driveway permit applicants should be encouraged to seek cross access easements/agreements from an existing adjacent property or coordinate with an adjacent proposed development to create interconnected internal circulation systems and shared-use external driveways. Approximate construction cost varies and is usually the responsibility of private development.

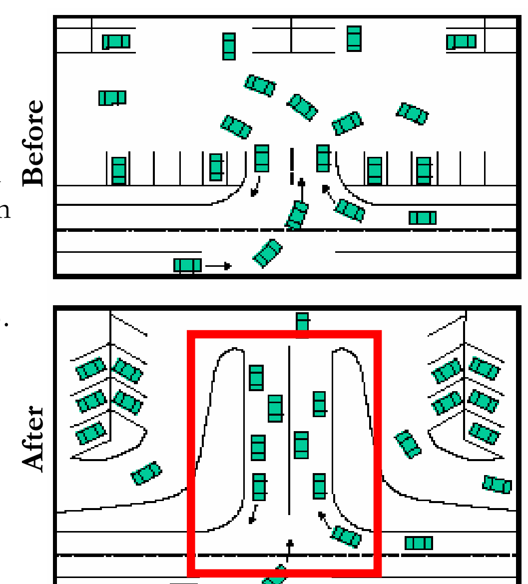
Driveway Placement/Relocation

Driveways located near intersections create operational and safety issues such as blocking intersections and driveways, generating conflict points, causing frequent/unexpected stops in the through travel lanes, and contributing to driver confusion as to where vehicles are turning. Driveways close to intersections should be relocated or closed as appropriate. As a best planning practice, no driveway should be allowed within 100 feet of the nearest intersection.

On-Site Treatments

Improved On-Site Traffic Circulation

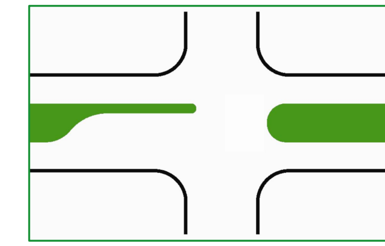
As more businesses establish cross access easements/agreements, on-site traffic circulation should be more of a concern. On-site circulation can be improved by managing the driveway throat length (the distance from the edge of the public street to the first internal site intersection). A minimum of 100 feet provides adequate separation to prevent internal site operations from affecting an adjacent public street and causing spillback problems. Approximate construction cost varies and is usually the responsibility of private development.



Driveway Throat

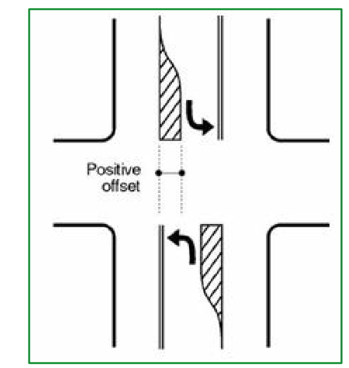
Turn Treatments

Left Turn Storage Bays



Where possible and necessary, exclusive left-turn lanes/bays should be constructed to provide adequate storage space for turning vehicles, exclusive of through traffic. The provision of these bays reduces vehicle delay related to waiting turning vehicles and may also decrease the frequency of rear-end and other collisions attributable to lane blockages. In some cases turn bays/lanes can be constructed within an existing median, in other cases, additional right-of-way is required and construction may be more costly.

Offset Left Turn Treatment



Exclusive left turn lanes at intersections are generally configured to the right of one another, which causes opposing left turning vehicles to block one another's forward visibility. An offset left turn treatment involves shifting the left turn lanes to the left, adjacent to the innermost lane of oncoming through traffic. In cases where permissive left turn phasing is used, this treatment can improve efficiency by reducing crossing and exposure time and distance for left-turning vehicles. In addition, the positive off-set improves sight distance and may improve gap recognition. Where sufficient median width exists, this treatment can be easily retrofit. In case of insufficient right-of-way width, the construction of this treatment can be difficult and costly. Approximate construction cost varies.

Median Treatments

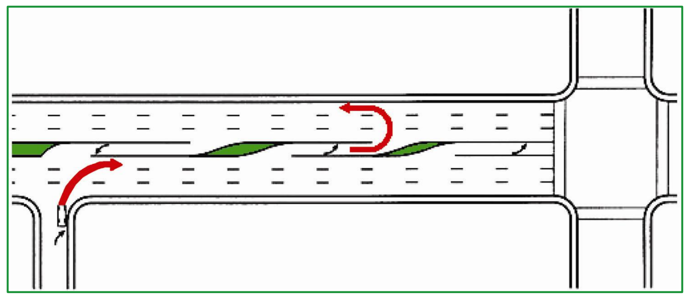
Non-Traversable Median

These features are raised or depressed cross section elements that physically separate opposing traffic flows. Inclusion in a new cross section or retrofit of an existing cross section should be considered for some multi-lane arterials (general) and for multi-lane roadways with high pedestrian volumes, high collision rates, or in locations where aesthetics are a priority.

The advantage of non-traversable medians include increased safety and capacity by separating opposing vehicle flows, providing space for pedestrians to find refuge, and restricting turning movements to locations with appropriate turn lanes. Disadvantages include increased emergency vehicle response time (indirect routes to some destinations), inconvenience, increased travel distance for some movements, and potential opposition from the general public and affected property owners. To overcome some of these disadvantages, sufficient spacing and location of U- and left-turn bays must be identified. Approximate construction cost varies.

Median U-Turn Treatment

These treatments prohibit or prevent minor street left turns at signalized intersections. Instead, these turns are made by first making a right-turn and then making a U-turn at a nearby median opening. These treatments can increase safety and efficiency of roadway corridors with high volumes of through traffic, but should not be used where there is not sufficient space available for the provision of U-turn movements. The location of U-turn bays must consider weaving distance, but also not contribute to excessive travel distance.

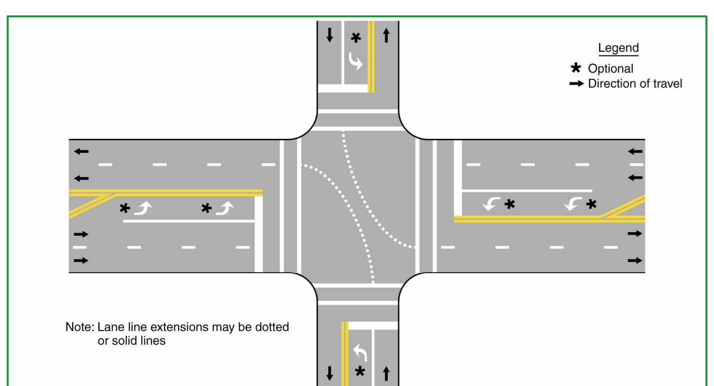


The advantage of median u-turn treatments include reduced delay for major intersection movements, potential for better two-way traffic progression (major and minor street), fewer stops for through traffic, and fewer points of conflict (for pedestrians and vehicles) at intersections. Disadvantages include increased delay for some turning movements, increased travel distance, increased travel time for minor street left turns, and driver confusion. Approximate construction cost is $50,000 - $60,000 per median opening.

Intersection and Minor Street Treatments

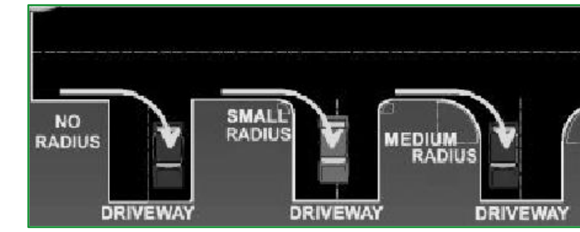
Skip Marks (Dotted Line Markings)

These pavement markings can reduce driver confusion and increase safety by guiding drivers through complex intersections. Intersections that benefit from these lane markings include offset, skewed or multi-legged intersections. Skip marks are also useful at intersections with multiple turn lanes. The dotted line markings extend through the intersection the line markings of approaching roadways. The markings should be designed not to confuse drivers in adjacent or opposing lanes.



Intersection and Driveway Curb Radii

Locations with inadequate curb radii have the potential to necessitate that turning vehicles use opposing travel lanes to complete their turning movement. Inadequate curb radii may cause vehicles to "mount the curb" as they turn a corner and cause damage to the curb and gutter, sidewalk, and any fixed objects located on the corner. This also may endanger pedestrians standing on the corner. Curb radii should be adequately sized for area context and likely vehicular usage.



Minor Street Approach Improvements

At signalized intersections, minor street vehicular volumes and associated delays may require that a disproportionate amount of green time be allocated to the minor street, contributing to higher than desired main street delay. Often, with laneage improvements to the minor street approaches, such as an additional left-turn lane or right-turn lane, signal timing can be re-allocated and optimized.

Intelligent Transportation System

Signalization

The volume of traffic attracted to some side streets or site driveways is more than can be accommodated acceptably under an unsignalized condition. Delays for minor street movements as well as left-turn movements on the main street may create or contribute to undue delays on the major roadway and numerous safety issues. The installation of a traffic signal at appropriate locations can mitigate these types of issues without adversely affecting the operation of the major roadway. Approximate construction cost is $50,000 to $60,000 per signal.

Adaptive Signal Control

This technology involves continuously collecting automated intersection traffic volumes to alter signal timing and phasing to best accommodate actual real time traffic volumes. Adaptive signal control can increase isolated intersection capacity as well as improve overall corridor mobility by up to twenty percent during off-peak periods and ten percent during peak periods. Approximate construction cost is $250,000 per system and $10,000 per intersection in addition to 25% of capital costs in training, etc.

Closed Circuit Television Traffic Monitoring

Closed Circuit Television (CCTV) cameras are primarily used on interstate facilities and major arterials to provide visual traffic volume and flow information to traffic management or monitoring centers. These centers use this information to deploy incident response patrols/equipment and to provide roadway travel delay information to motorists. By having visual roadway information, traffic management centers are able to identify incidents quickly and respond appropriately and efficiently, helping to reduce the effect of incidents on a single location or on multiple roadways. Approximate construction cost is $20,000 per location.

Emergency Vehicle Preemption

This strategy allows an oncoming emergency or other suitably equipped vehicle to change the indication of a traffic signal to green to favor the direction of desired travel. Preemption improves emergency vehicle response time, reduces vehicular lane and roadway blockages, and improves the safety of the responders by stopping conflicting movements. Approximate construction cost is $5,000-$7,000 per intersection plus $2,000 per equipped vehicle.

Dynamic Message Signs (DMS)

The primary purpose of DMS units on freeways is to alert motorists of congestion or an incident on the upcoming segment of a roadway. These signs give general alerts, such as “congestion ahead” or specific details as to the location of the incident or predicted travel time to a particular destination. DMS also informs the traveling public of upcoming problems and expected travel times so that they may mentally prepare. Often, drivers are more patient – and thus less likely to react in anger due to congestion – if they can anticipate how long the delay will be or how far the congestion spreads. Perhaps most importantly, DMS leads to informed drivers, who may choose alternate travel paths during heavy congestion and thereby reduce traffic on the freeway, the likelihood of additional accidents, and the average travel time for the system as a whole. Approximate construction cost is $70,000 for a pedestal-mounted DMS and $160,000 for an overhead structure and overhead-mounted DMS.

Woodruff Road Example

As detailed in Chapter 3, the Woodruff Road corridor near the interchange with I-85 is one of the most congested urban minor arterials in the region. Currently, Woodruff road is a multilane undivided facility lined with some of the region’s busiest commercial developments. Access to shops, restaurants, and businesses is provided by numerous curb-cuts and multiple signals. These conditions have contributed to the congested and dangerous conditions that prompt many locals to avoid the corridor.

The roadway passes through or connects with several existing and proposed developments, and it is located in an area of transition between downtown and the suburbs. For this reason, the Woodruff Road Corridor was selected for a detailed review of existing conditions and access management techniques to preserve the through capacity while balancing the access to adjacent properties. **Figures 4.8A to 4.8C** illustrate the general and specific recommendation described in detail below.

General Recommendations

While different portions of the Woodruff Road corridor have distinctive characteristics, certain conditions exist throughout the corridor. For that reason, the following recommendations could be applied to the entire length of the corridor to ease congestion, reduce driver confusion, and improve safety:

- Install progression-controlled signal system to reduce driver delay and frustration along the corridor
- Install plantable median with u-turn and right-in/right-out treatment

In addition to these corridor-long recommendations, several strategies could be applied to specific segments and ultimately contribute to the function of the entire Woodruff Road corridor.

Specific Recommendations

Recommendation #1 – The short 0.2-mile segment between the grade-separate interchange at I-85 and the signalized intersection at Woodruff Industrial Lane carries more than 30,000 vehicles per day. This section of the corridor provides immediate access to I-85 and links the interstate to Greenville Mall. As shown in **Figure 4.8A**, the following suggestions should improve the function, safety, and character of the segment:

- Control signage at interchange
- Consolidate and move driveways within 75 feet of intersection
- Provide cross access to adjoining parcels

Recommendation #2 – The 0.75-mile segment between Woodruff Industrial Lane and Verdae Boulevard/Roper Mountain Road carries more than 21,000 vehicles per day. The section of the corridor passes in front of the Greenville Mall and several other commercial and industrial properties. Signalization is provided at the intersections with Woodruff Industrial Lane, Green Heron Road, and Verdae Boulevard/Roper Mountain Road. As shown in **Figure 4.8A**, the following suggestions should improve the function and safety of the segment:

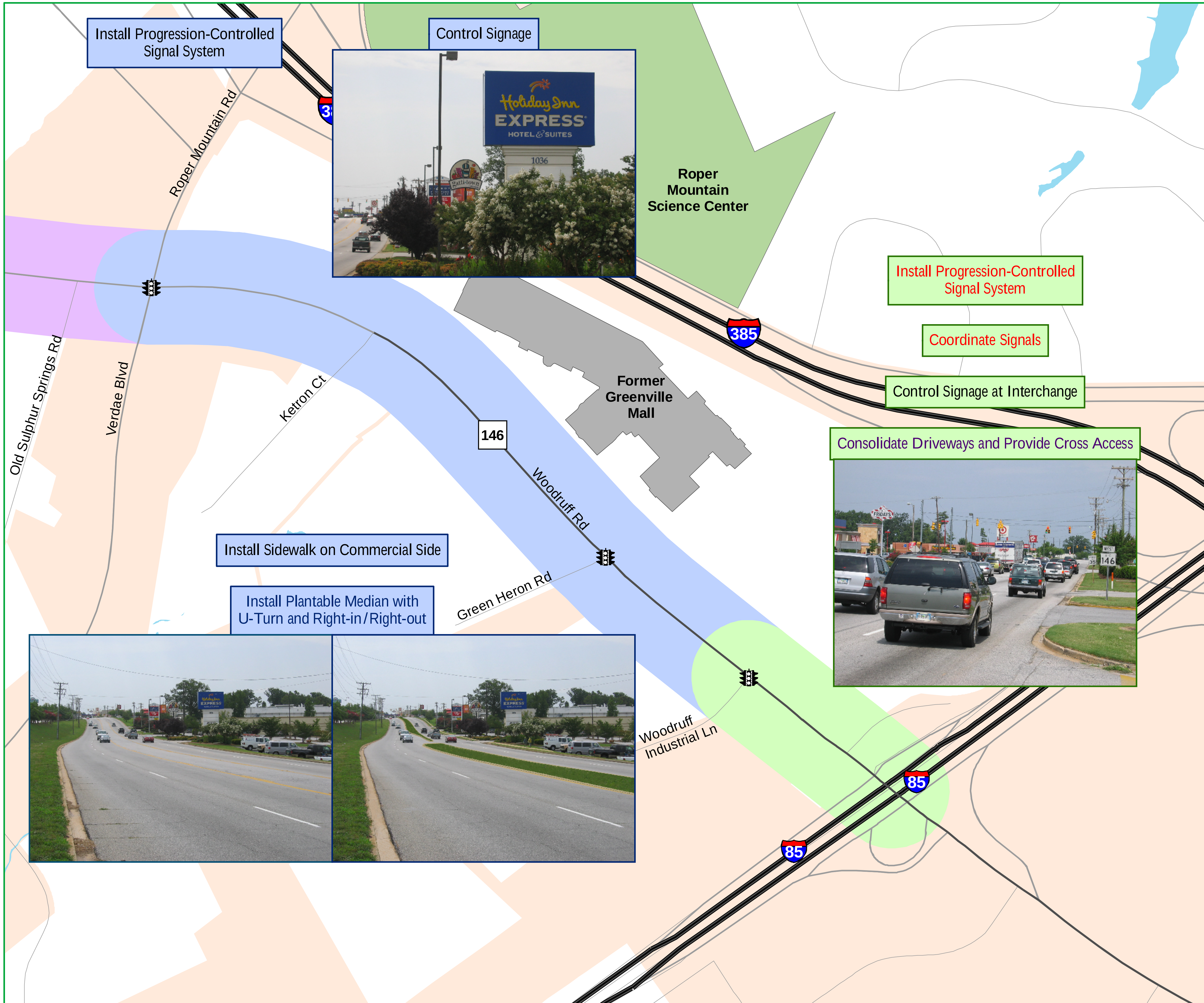
- Control signage along segment
- Install sidewalks adjacent to commercial property

Recommendation #3 – The 1-mile segment between Verdae Boulevard and Rocky Slope Road carries between 9,200 to nearly 12,000 vehicles per day. This section of the corridor is largely undeveloped, though Salters Road connects Verdae Boulevard to this part of Woodruff Road. Signalization is provided at the endpoints of this segment. As shown in **Figure 4.8B**, the following suggestions should improve the function and safety of the segment:

- Consolidate driveways to combine turning movements, increase safety, limit driver confusion, and ease congestion
- Control signage at the Rocky Slope Road intersection
- Upgrade traffic signal at Rocky Slope intersection to protect left turns for both approaches on Rocky Slope Road and westbound Woodruff Road approach
- Replace curb and gutter and repair shoulder on northbound Rocky Slope Road

Recommendation #4 – The 0.85-mile segment between Rocky Slope Road and Laurens Road carries 11,600 vehicles per day. As the western terminus of Woodruff Road, this section of the corridor provides direct connections to Laurens Road, a urban principal arterial. Some commercial property depends on access to this portion of the corridor. As shown in **Figure 4.8C**, the following suggestions should improve the function and safety of the segment:

- Install high-visibility crosswalks with pedestrian countdown signals
- Upgrade traffic signals to protect left turns on northbound Laurens Road approach



GPATS Long Range Transportation Plan

Figure 4.8A

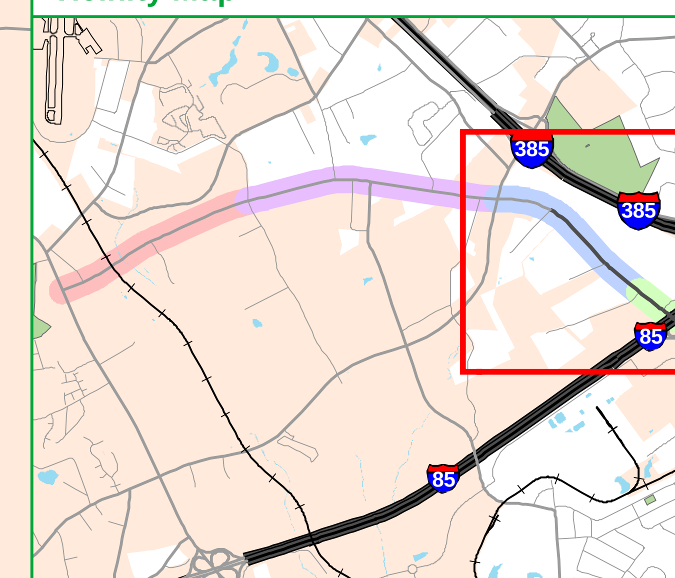
Congestion Management Strategies

Woodruff Road

- Greenville City Limits
- Parks
- Existing Traffic Signal

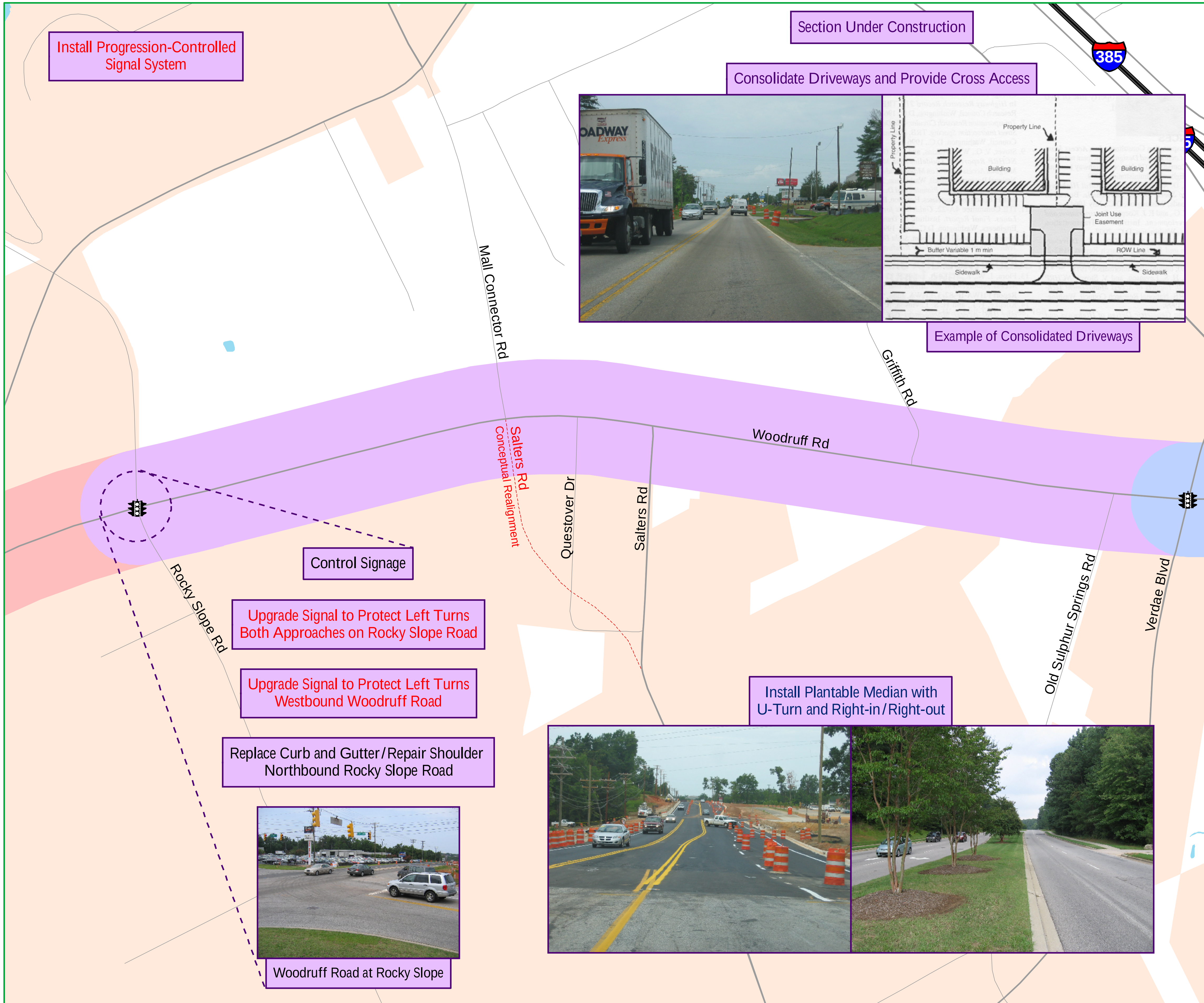
General Improvements
Driveway Treatments
On-Site Treatments
Signals/ITS
Median/Turn Treatments

Vicinity Map



0 0.05 0.1 Miles

Kimley-Horn and Associates, Inc.



GPATS Long Range Transportation Plan

Figure 4.8B

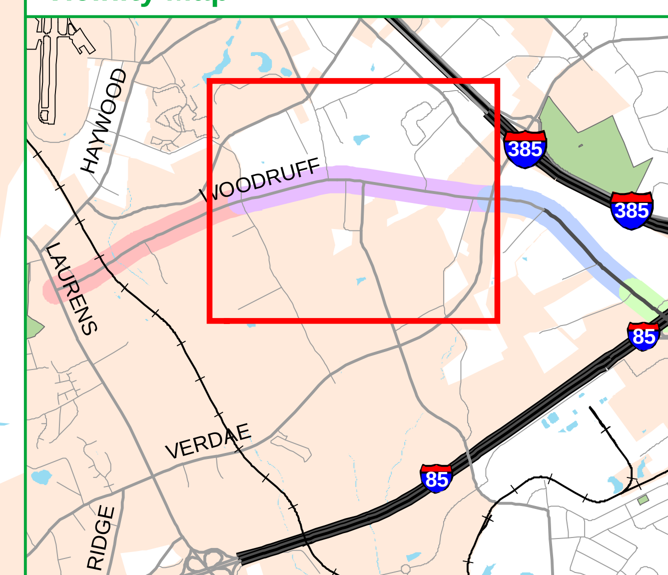
Congestion Management Strategies

Woodruff Road

Greenville City Limits
Parks
Existing Traffic Signals

General Improvements
Driveway Treatments
On-Site Treatments
Signals/ITS
Median/Turn Treatments

Vicinity Map



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GPATS Long Range Transportation Plan

Figure 4.8C

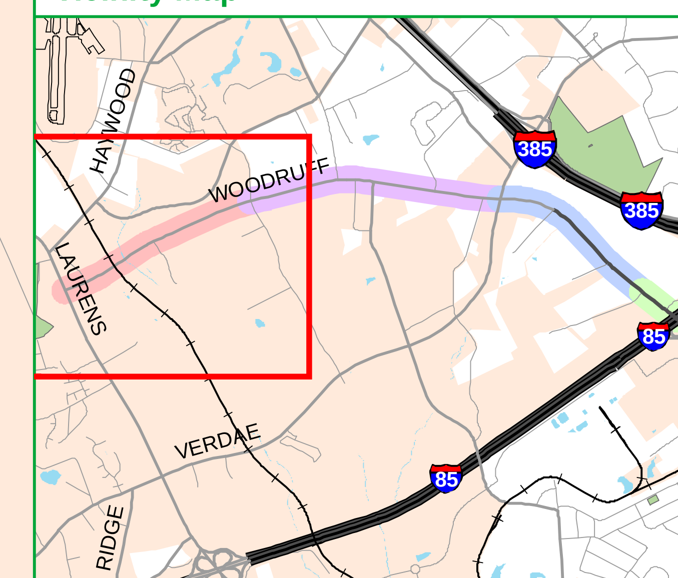
Congestion Management Strategies

Woodruff Road

Greenville City Limits
Parks
Existing Traffic Signals

General Improvements
Driveway Treatments
On-Site Treatments
Signals/ITS
Median/Turn Treatments

Vicinity Map



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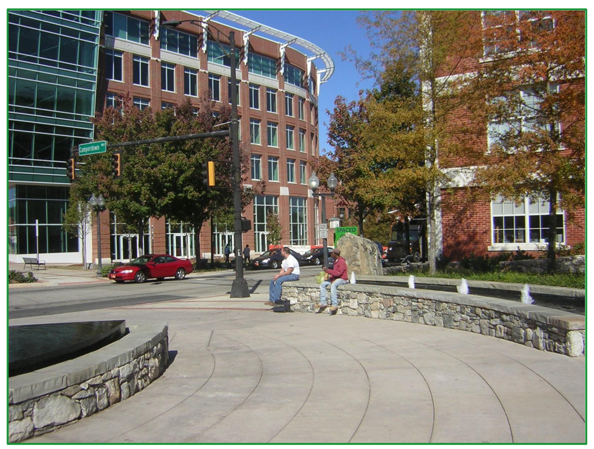
Complete Streets

A Complete Street is a community-oriented street that safely and conveniently accommodates all modes of travel. Such a street allows pedestrians, bicyclists, motorists, and transit users to use the street safely and conveniently regardless of their age or ability to move. The citizens, business owners, and local officials in the GPATS region recognize the importance of a shift away from an automobile-dominated roadway and toward a balance, multi-modal transportation system that respects all users of the roadway and the rights of adjacent land owners. The concepts presented in the section extend to all the elements that follow, including the Pedestrian and Bicycle Element, Transit, and Freight Elements. Complete streets as describe below are divided into four basic zones or realms – context realm, pedestrian realm, travelway realm, and intersection realm. The Future Highway Element concludes with a series of illustrations that show typical cross section and plan views of street of different street types. Together these street designs ensure the needs of all users are accommodated.



Context Realm

The context realm is defined by buildings that frame the major roadway. Guidance for the context realm focuses on four areas of consideration.

Building Form and Massing

High-quality street design should be supplemented with buildings located close to the street that frame the public space enjoyed by pedestrians. In more urban areas, these buildings should be located directly behind the sidewalk, and with stairs, stoops, or awnings, may even encroach into the pedestrian realm to provide visual interest and access to the public space. Suburban environments that must incorporate setbacks for adjacent buildings should limit this distance to 20 feet or less and avoid off-street parking between buildings and the pedestrian realm. Larger setbacks in these suburban areas will diminish the sense of enclosure afforded to the pedestrian and move access to the buildings farther away from the street. In both environments, building heights should measure at least 25% of the corridor width. That is, a 100-foot wide roadway right-of-way should be framed by buildings that are at least 25 feet high on both sides with facades that are at most 20 feet from the edge of right-of-way.

Architectural Elements

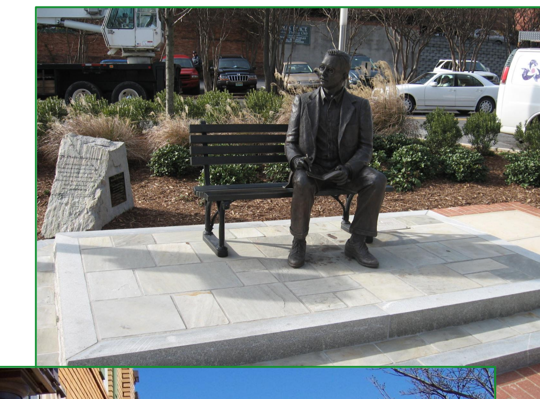
Careful placement and design of buildings adjacent to the major roadway offer opportunities for meaningful interaction between transportation and land use. These opportunities are greatly enhanced when land uses such as restaurants, small shops and boutiques, residential units and offices are located along the pedestrian. Building scale and design details incorporated into individual buildings foster a comfortable, engaging environment focused on the pedestrian. Common building design treatments generally favored in a pedestrian environment include awnings, porches, balconies, stairs, stoops, windows, appropriate lighting, promenades, and opaque windows.

Transit Integration

Areas targeted for high-quality transit service must be supported through land use and zoning policies that sustain transit-oriented development and reflect the benefits of increased access to alternative modes of travel. Policy examples include appropriate densities and intensities for supporting transit use, parking ratios that reflect reduced reliance on the automobile, and setback and design guidelines that result in pedestrian supportive urban design. In addition, potential transit service identified for transportation corridors within the community should take into consideration the land use, density/intensity, and urban design characteristics of the surrounding environment before selecting proposed technologies or finalizing service plans.

Site Design

The complete street is truly integrated into the surrounding environment when the interface between the site and the street is complementary to the pedestrian environment created along the entire corridor. Access to the site should be controlled through a comprehensive access management program to minimize excessive driveways that create undesirable conflicts for traveling pedestrians. Building orientation, further defined by landscape and architectural elements incorporated into the site should reinforce the public space protected between the buildings. Public paths through sites should be provided to shorten blocks longer than 600 feet.

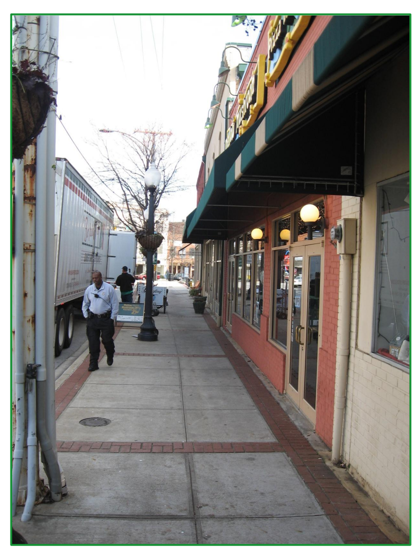


Pedestrian Realm

The pedestrian realm extends between the outside edge of sidewalk and the face-of-curb located along the street. Safety and mobility for pedestrians within this 'public' realm is predicated upon the presence of continuous sidewalks along both sides of the street built to a sufficient width for accommodating different space needs within different environments; such as suburban verses downtown settings. The quality of the pedestrian realm is also greatly enhanced by the presence of high-quality buffers between pedestrians and moving traffic, safe and convenient opportunities to cross the street, and consideration for shade and lighting needs. Each is discussed below.

The pedestrian realm may consist of up to four distinct functional zones – frontage zone, throughway zone, furnishing zone, and edge zone. The frontage zone is located near the back of sidewalk and varies in width to accommodate potential window shoppers, stairs, stoops, planters, marquees, outdoor displays, awnings or café tables. The throughway zone provides clear space for pedestrians to move between destinations and varies in width from 5 to more than 10 feet based on the anticipated demand for unimpeded walking area. The furnishing zone provides an important buffer between pedestrians and moving traffic. It generally measures at least 8 feet wide to accommodate street trees, planting strips, street furniture, utility poles, sign poles, signal and electrical cabinets, phone booths, fire hydrants, bicycle racks or retail kiosks targeted for the pedestrian realm. The edge zone is incorporated into the pedestrian realm concurrent with the presence of on-street parking to allow sufficient room for opening car doors.

Incorporation of one or more of these function zones is generally based upon the context of the surrounding built environment. For example, a more urban, downtown environment will include all four zones in the pedestrian realm and could measure up to 24 feet wide. An equally important link to the pedestrian network that is located in a more suburban setting may omit one or more of the function zones listed above; with an overall minimum width of 10 feet.



Recommended design elements for promoting a healthy pedestrian realm generally focus on one of four areas of concentration: pedestrian mobility, quality buffers, vertical elements, and public open space. Together, these best practices can be implemented in both urban and suburban environments, to varying degrees, for promoting healthy pedestrian environments.

Pedestrian Mobility

The presence of a comprehensive, continuous pedestrian network serves as the foundation for fostering a walkable community that supports active transportation and mode choice. Sidewalks generally provide clear zones of 5 to 10 feet wide to accommodate pedestrian travel. In more urban environments, amenities in the frontage zone and furniture zone will greatly increase the overall width of the corridor as compared to more suburban settings. Mid-block pedestrian crosswalks should be incorporated into the urban fabric as needed to ensure convenient and safe crossing opportunities are provided approximately every 300 feet. As a general rule, mid-block crossings should be considered on two-lane streets with a block length greater than 500 feet when the posted speed limit for the travel lanes does not exceed 40 miles per hour.

Quality Buffers

Lateral separation between pedestrians and moving traffic greatly enhances the character of the pedestrian realm. The amount of separation incorporated into the pedestrian realm may vary between corridors based on the context of the surrounding built environment or on streets with different travel speed and/or traffic volume characteristics. In downtown areas, on-street parking, either parallel or angled, provides sufficient distance (8 to 18 feet) for separating pedestrian and vehicle traffic. Likewise, landscape planting areas at least 5 feet wide incorporated into either urban or suburban environments provide adequate lateral separation for pedestrians. In urban areas, street trees may be placed in tree wells within an overall hardscaping surface instead of using suburban-style grass areas.

Vertical Elements

Vertical elements traditionally incorporated into the pedestrian realm include street trees, pedestrian-scale street lighting, and utilities. Street trees provide necessary shade to pedestrians and soften the character of the surrounding built environment. They should be spaced between 15 and 30 feet apart, be adapted to the local environment, and fit the scale and character of the surrounding area. Pedestrian-scale street lighting incorporated into the pedestrian realm should use metal halide fixtures mounted between 12 and 20 feet high. Utilities should not interfere with pedestrian circulation or block entrances to buildings, curb cuts, or interfere with sight distance triangles. In some cases, burying utilities avoids conflict and clutter caused by utility poles and overhead wires. Relocation of overhead utilities to tall poles on just one side of the roadway is a cost-effective aesthetic alternative to burial of utilities in a duct bank under the road.

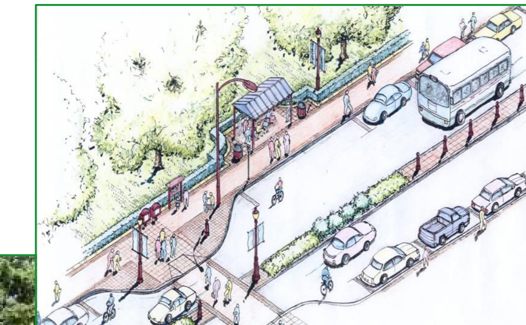
Public Open Space

The pedestrian realm serves a dual purpose within the built environment – acting as both a transportation corridor and a public open space accessible to the entire community. Therefore, specific design elements incorporated into the pedestrian environment should reinforce this area as a public space; including opportunities for visitors to enjoy the unique character of the corridor in both formal and informal seating areas. Public art and/or specialized surfaces and materials introduced into the pedestrian realm are appreciated by slower moving pedestrians. In more urban areas, street furniture and/or outdoor cafes provide opportunities for 'people watching' that foster community ownership in the pedestrian realm. Furthermore, building encroachments in downtown areas, such as stairs and stoops, provide for interesting points of access to the pedestrian realm. Lastly, awnings and canopy trees provide shade which is helpful in the temperate climate of this region.

Travelway Realm

The travelway realm is defined by the edge of pavement, or curb line in more urban areas, that traditionally accommodates the travel or parking lanes needed to provide mobility for bicycles, transit vehicles, and automobiles sharing the transportation corridor. This area also separates the two pedestrian realms defined within the complete street and may provide carefully-designed crossing opportunities between intersections. Recommended design elements incorporated into the travelway realm serve to achieve greater balance between travel modes sharing the corridor and favor design solutions that promote human scale for the street and minimize pedestrian crossing distance. Guidance for the travelway realm focuses on two areas of consideration – modes of travel and medians.

Multimodal Corridors



Balance between travel modes within a transportation corridor provides choice for mobility that could lead to reduced congestion on major roadways and a healthier citizenry. On a complete street, safe and convenient access to the transportation network for bicycles, transit vehicles, and automobiles is afforded within the travelway realm. Travel lanes for automobiles and transit vehicles should measure between 11 and 13 feet wide to manage travel speeds and reinforce the intended character of the street. Parking lanes incorporated into the travelway realm should not exceed 8 feet in width (including the gutter pan) and may be protected by bulb-outs evenly spaced throughout the corridor. Bus stops located along the corridor should be well-designed to include shelters and benches that comfort patrons while waiting for transit service. On-street bicycle lanes (typically 4 to 6 feet wide) should be considered when vehicle speeds range from 30 to 40 miles per hour. Wide outside lanes may be preferred on streets with slower speeds. To avoid situations where citizens with only basic skills may be attracted to a corridor, designated bicycle routes on parallel corridors may be the best option when speeds on the major street exceed 40 mph. According to state law, bicyclists are considered vehicles and are permitted on all corridors except freeways and access-controlled highways.

Median Treatments

Medians are often incorporated into the travelway realm to provide dedicated left turn lanes, opportunities for landscaping, and pedestrian refuge at crossings. They generally vary in width from 10 feet on some collector streets to 16 feet wide on suburban boulevards. The width depends on the intended application of the median and the limitations set forth by the context of the surrounding built environment. Medians also reinforce other access management solutions provided within the travelway to reduce the number of conflict points and maintain the human scale intended for the complete street. In addition to center medians, other access management solutions incorporated into the travelway realm should limit the number of individual driveways along the corridor and avoid the use of right turn deceleration lanes. Together, these improvements will reduce the overall pedestrian crossing distance for the travelway and maximize the safety for pedestrians traveling inside the pedestrian realm.

Intersection Realm

The intersection realm requires careful consideration for the concerns of multiple travel modes that could meet at major intersections within the transportation system. Recommendations for improving the multimodal environment in and around these major intersections focus on two areas of concentration – operations and geometric design.

Operations

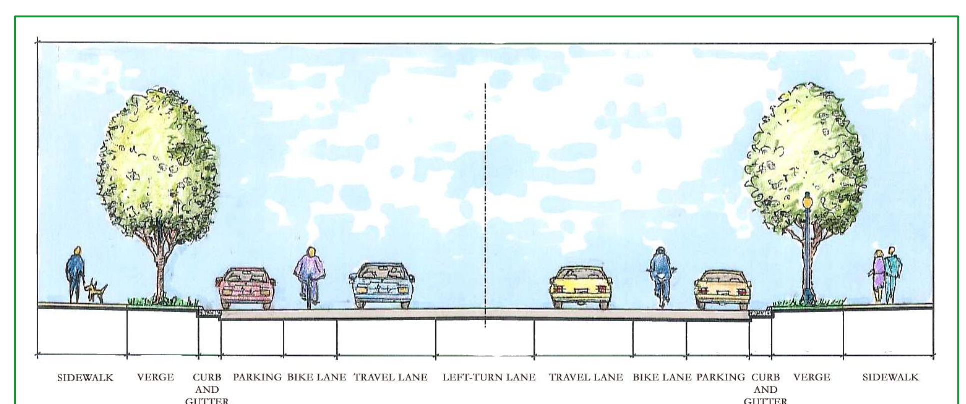
In terms of operations, traffic signals or roundabouts are the most appropriate applications for traffic control devices that could also maintain the pedestrian scale of the street reinforced in the context, pedestrian, and travelway realms. The merits of a traffic signal verses a roundabout for intersection control should be determined on a case-by-case basis by considering issues such as desired speed of traffic, availability of right-of-way, anticipated traffic patterns, and the context of the built environment surrounding the intersection.

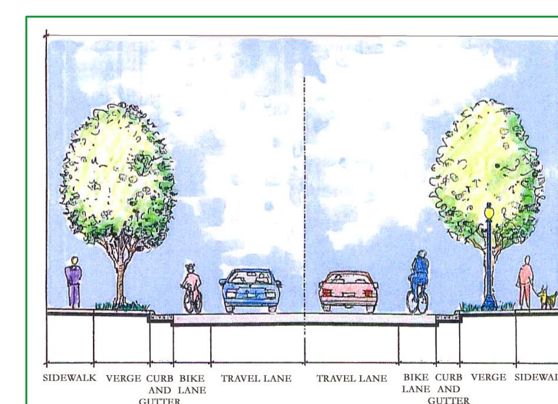
Geometric Design

Geometric considerations for the intersection should reinforce the operational characteristics of the traffic signal or roundabout. At traffic signals, this includes the introduction of curb extensions, or bulb-outs, to shorten pedestrian crossing distance and protect on-street parking near the intersection. Curb return radii designed for signalized intersections should be 15 to 30 feet to control turning speed around corners. At roundabouts, special consideration should be given to entry and exit speeds, pedestrian refuge in the splitter islands, and assigning predictability to the intersection for pedestrians, bicycles, and vehicles. Both intersection treatments may consider special pavement markings to distinguish pedestrian areas or bicycle lanes; although these surfaces need to be stable, firm, and slip resistant. Additional consideration should be given to maintaining adequate sight triangles in the intersection, addressing the treatment of bicycle lanes through the intersection, and compliance with federal requirements per the American with Disabilities Act for crosswalk and curb ramp design.

Recommended Typical Cross Sections

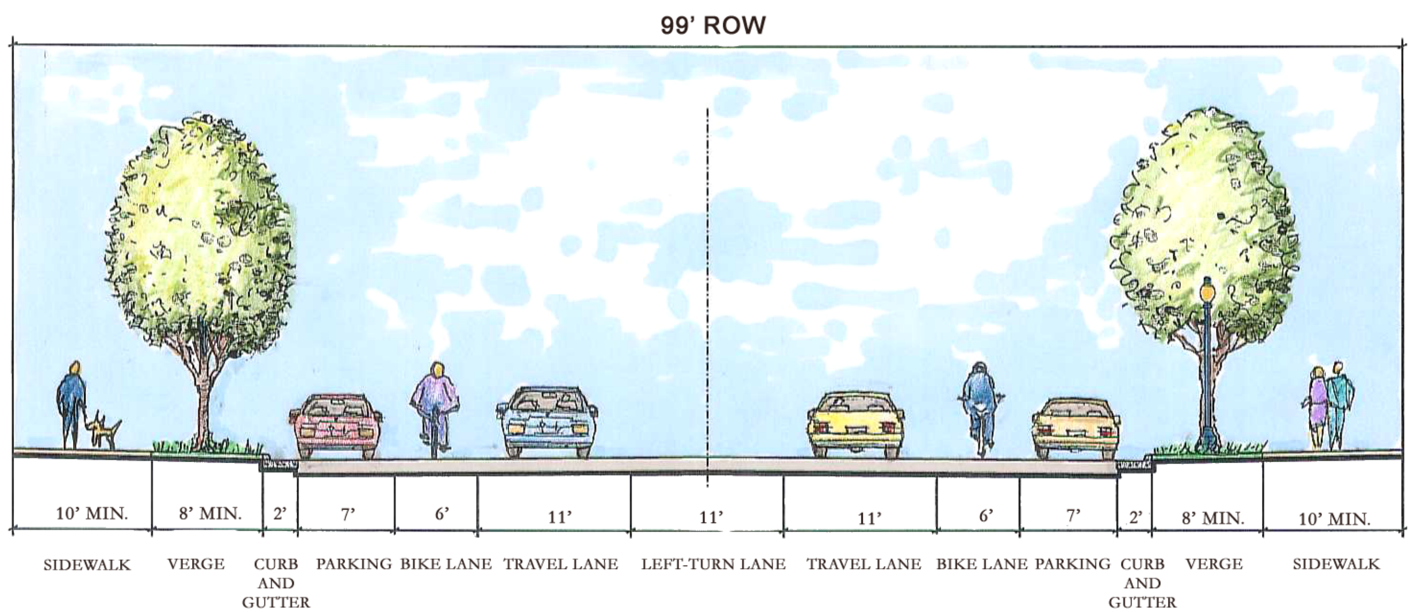
The following pages illustrate typical cross sections and plan views for streets in the GPATS region. The cross sections reflect the concept of community-oriented streets that provide safe and convenient travel for all modes. To create a transportation network that respects the needs of pedestrians, bicyclists, and motorists, certain elements may require designs different from the current norm. The right-of-way width of the recommended cross sections range from 55 feet for residential collectors to 110 feet for suburban boulevards. Within the right-of-way, the sidewalks and verge areas are wider than typically found in the GPATS region today. Likewise, some travel lane widths are narrower than the standard 12 feet now provided by SCDOT. The construction of complete street will require close coordination with local, state, and federal authorities.

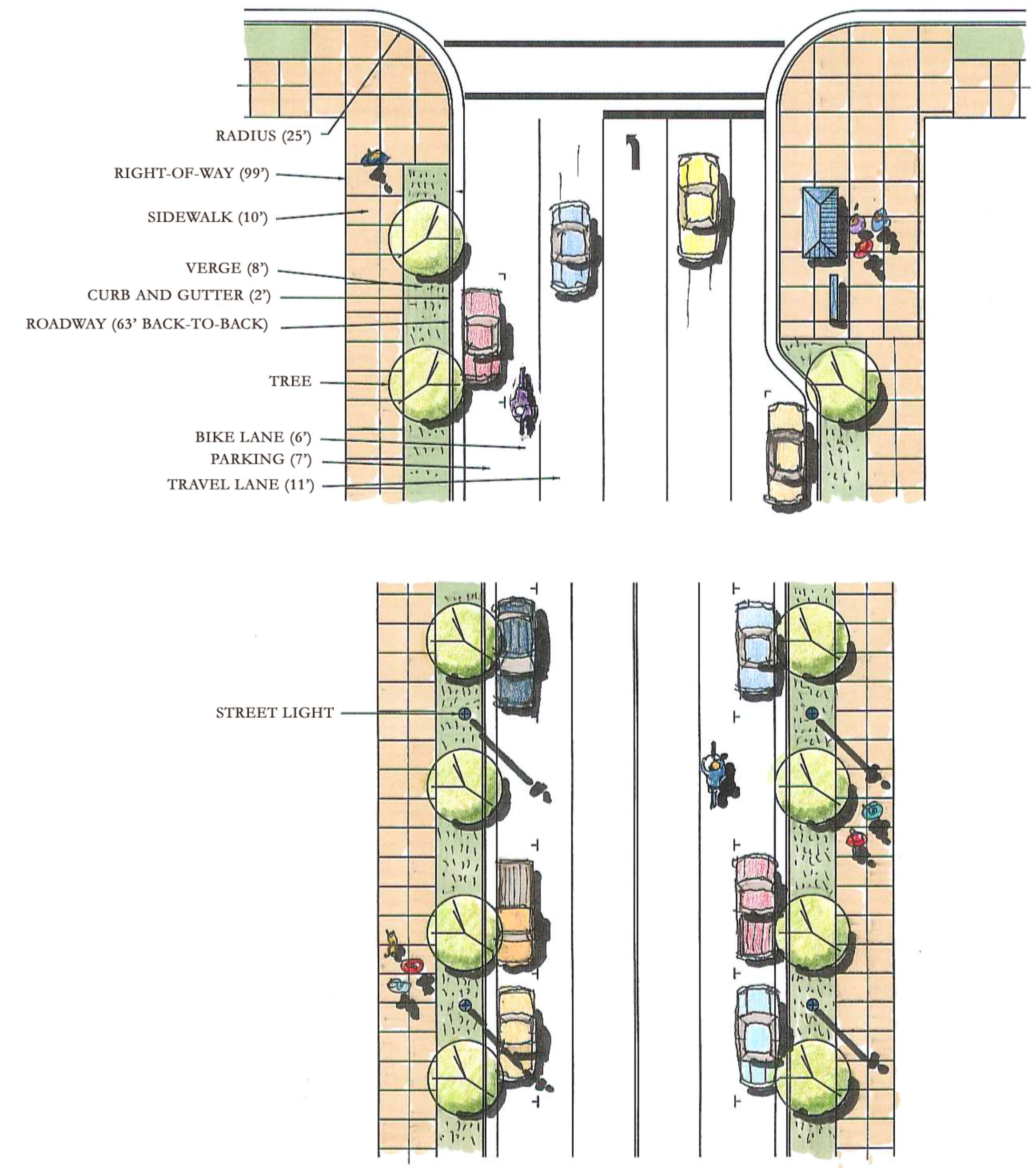




AVENUE

(2-LANE WITH PARKING, LEFT-TURN LANES AND BIKE LANES)





Plan
NOT TO SCALE

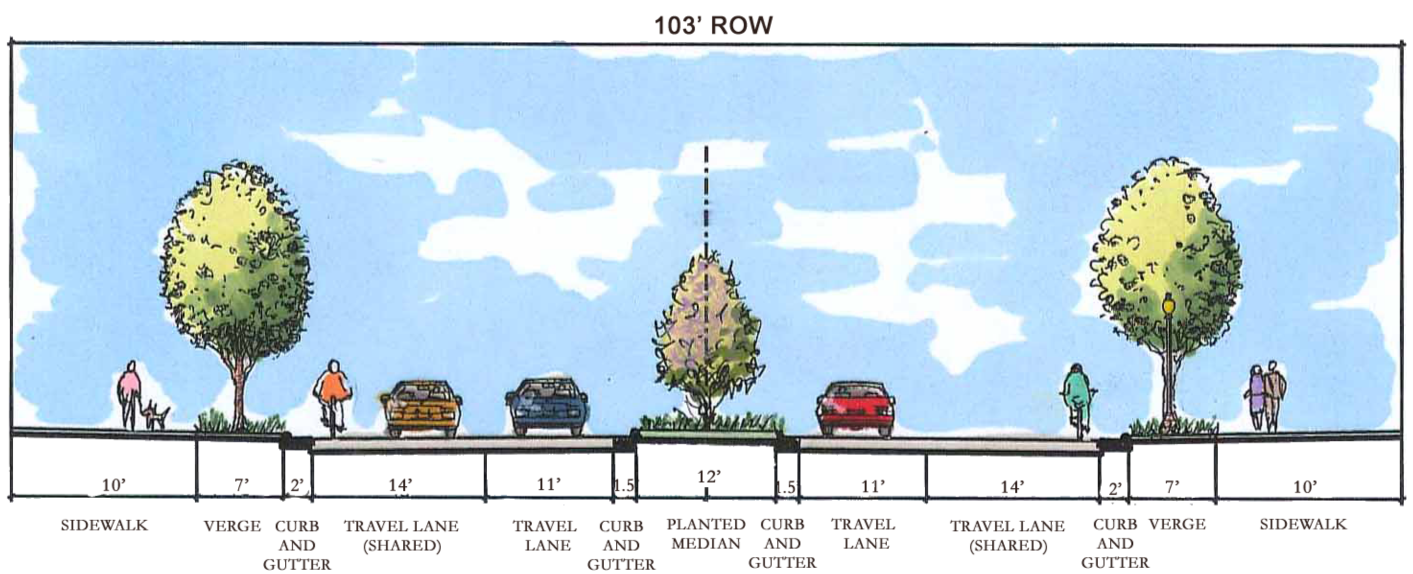
Context Sensitive Design Features

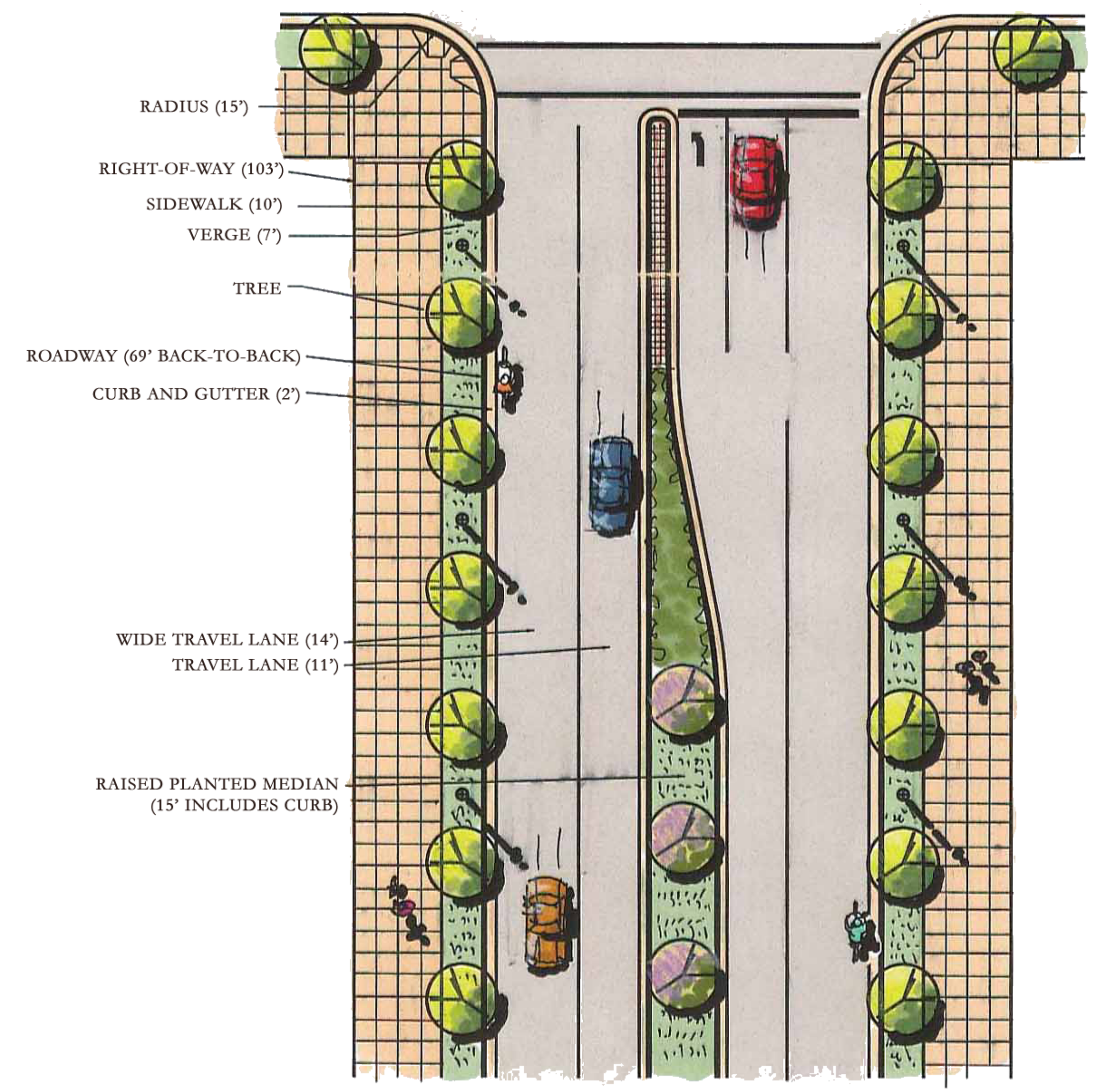
This Avenue is designed to limit automobile travel speeds to 35 miles per hour. It provides two travel lanes and bike lanes. Street trees along both sides of the street provide shade and help soften the built environment. Wide sidewalks are preferred for both sides of the street in more urban areas to encourage outdoor seating and walkability. However, five-foot sidewalks on each side of the street are acceptable in less dense areas. Building setbacks should be limited to encourage a sense of enclosure. Context sensitive design considerations should include:

- Striped Crosswalks at intersections and mid-block crossings
- Drainage (swale vs. curb and gutter)
- Street Trees (formal vs. random plantings)
- Pedestrian Circulation (sidewalks)
- Pedestrian-level Lighting
- On-Street Parking (only where it will be used most of the time)
- No Right Turn Lanes

BOULEVARD

(4-LANE DIVIDED WITH RAISED MEDIAN, WIDE OUTSIDE LANES, SIDEWALKS AND LANDSCAPING)





Plan
NOT TO SCALE

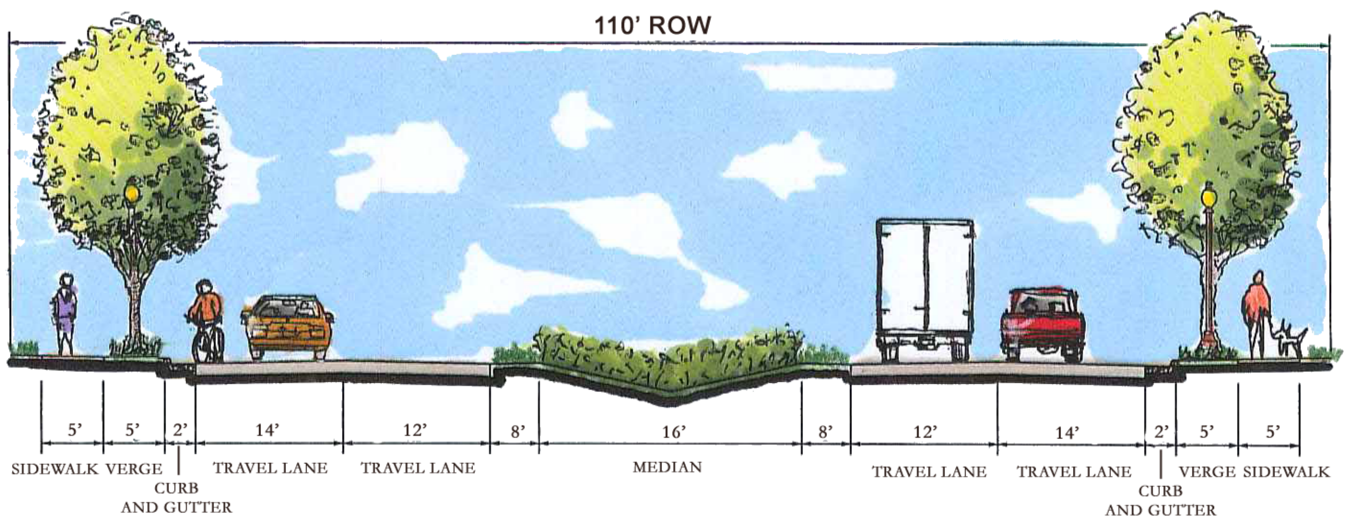
Context Sensitive Design Features

This Boulevard is designed to limit automobile travel speeds to 45 miles per hour. It provides four travel lanes including wide outside lanes to accommodate experienced cyclists. Street trees along both sides of the street provide shade and help soften the built environment. Wide sidewalks are preferred for both sides of the street in more urban areas. However, five-foot sidewalks on both sides of the street are acceptable in less dense areas. Building setbacks should be limited to encourage a sense of enclosure. Context sensitive design considerations should include:

- Plantable Median
- Striped Crosswalks at intersections and mid-block crossings
- Drainage (swale vs. curb and gutter)
- Street Trees (formal vs. random plantings)
- Pedestrian Circulation (sidewalk or multi-use path)
- Pedestrian-level Lighting
- On-Street Parking (only where it will be used most of the time)

SUBURBAN BOULEVARD

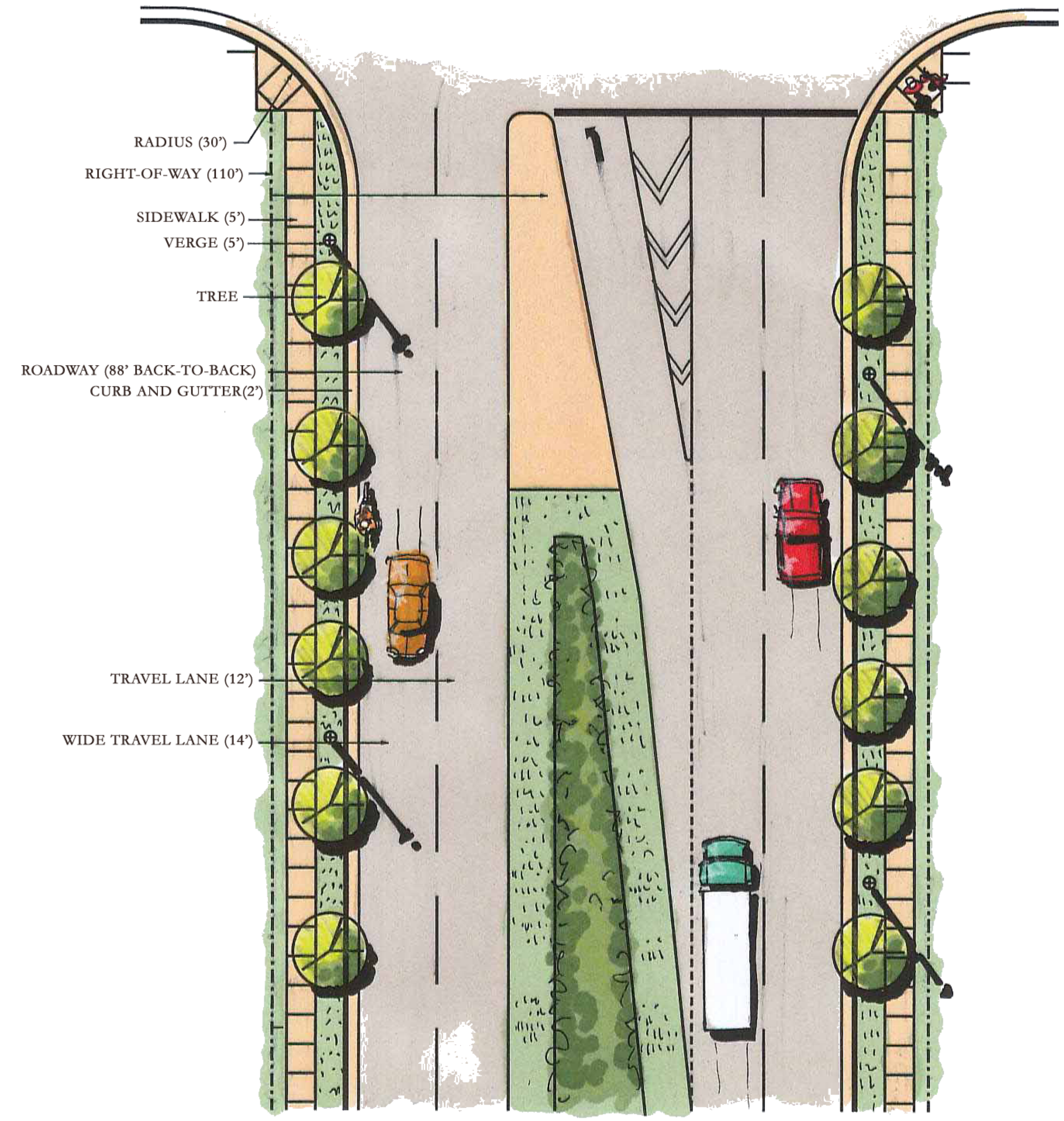
(4-LANE DIVIDED WITH ADVANCED LEFT-TURN, SIDEWALKS, LANDSCAPING)



Context Sensitive Design Features

This Suburban Boulevard is designed to limit automobile travel speeds to 45 miles per hour. It provides four travel lanes including wide outside lanes to accommodate experienced cyclists. Street trees along both sides of the street provide shade and help soften the built environment. Sidewalks are preferred for both sides of the street in suburban areas; however, a ten-foot, multiuse path on one side of the street is acceptable in less dense areas. A natural buffer extends from the back of the sidewalk to the private property line along the entire corridor. Context sensitive design considerations should include:

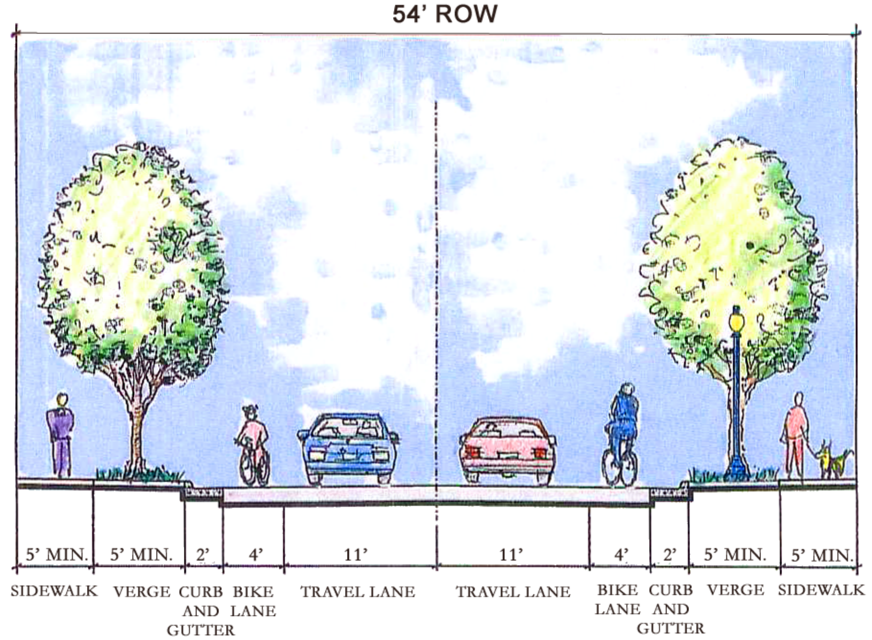
- Plantable Median
- Striped Crosswalks at intersections
- Drainage (swale vs. curb and gutter)
- Street Trees (formal vs. random plantings)
- Pedestrian Circulation (sidewalk or multi-use path)

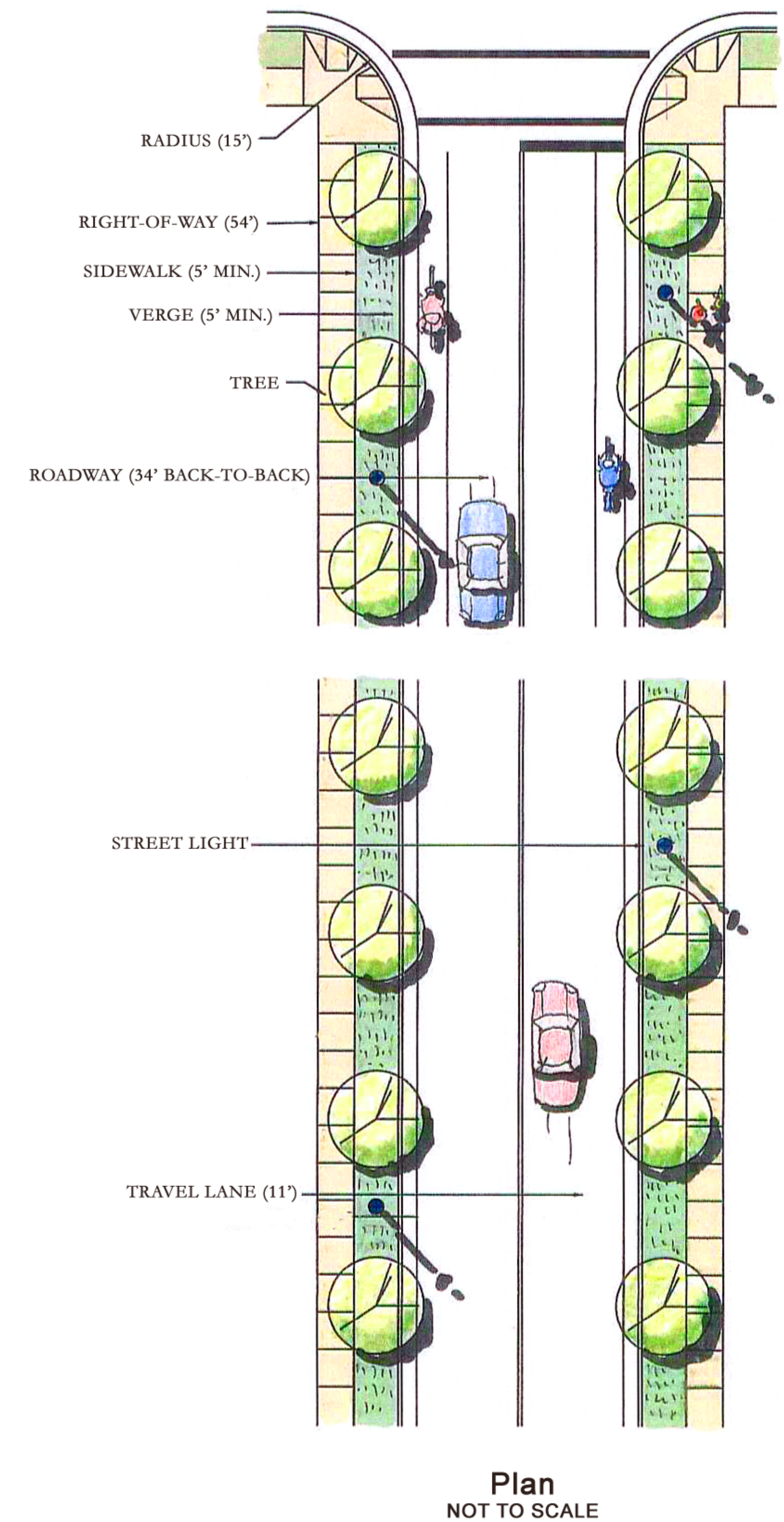


Plan
NOT TO SCALE

RESIDENTIAL COLLECTOR

(2-LANE, 34' BACK-TO-BACK, SIDEWALKS, STRIPED BIKE LANES, LANDSCAPING)





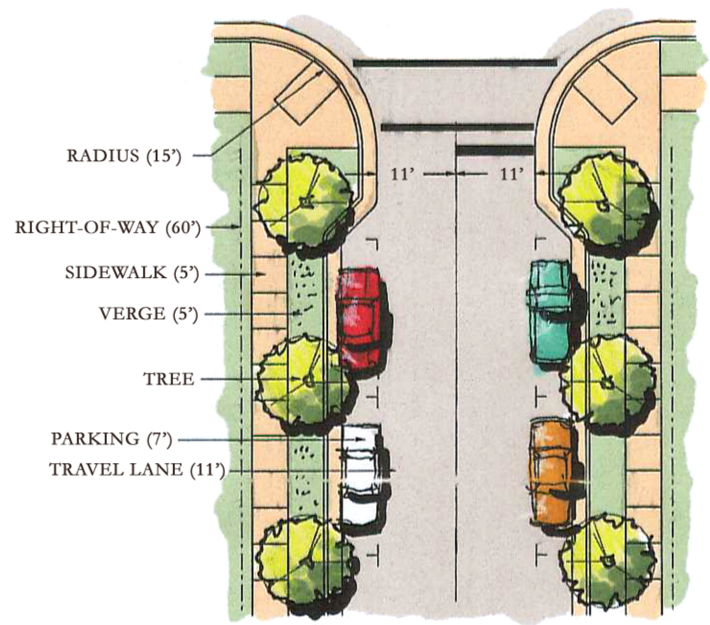
Context Sensitive Design Features

This Residential Collector is designed to limit automobile travel speeds to 25 miles per hour. It provides two travel lanes including striped bike lanes to accommodate all levels of cyclists. Street trees along both sides of the street provide shade and help soften the built environment. Sidewalks are preferred for both sides of the street in more urban areas; however, a ten-foot multiuse path or a five-foot sidewalk on one side of the street is acceptable in less dense areas. A natural buffer extends from the back of the sidewalk to the private property line along the entire corridor. Context sensitive design considerations should include:

- Striped Crosswalks at intersections and mid-block crossings
- Drainage (swale vs. curb and gutter)
- Street Trees (formal vs. random plantings)
- Pedestrian Circulation (sidewalk or multi-use path)
- Pedestrian-level Lighting
- No Right Turn Lanes

RESIDENTIAL INTERSECTION TREATMENTS

(RESIDENTIAL A)



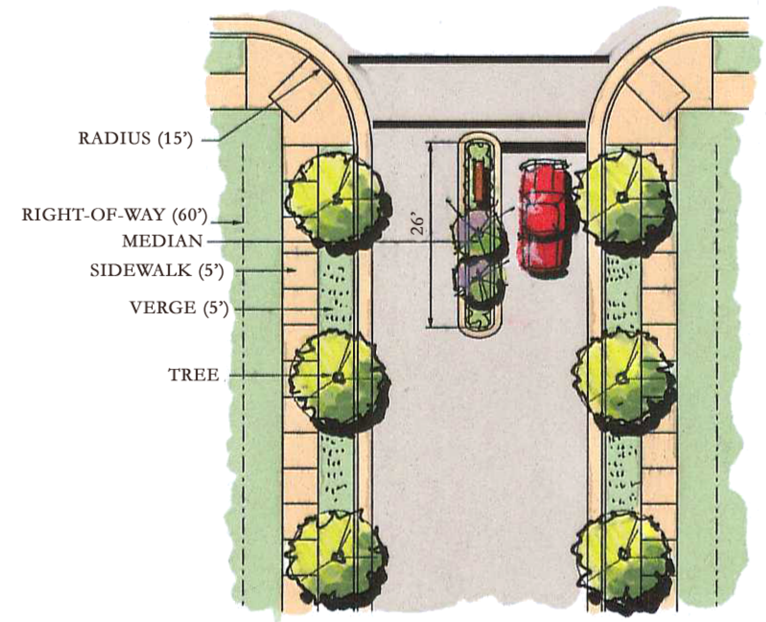
Plan
NOT TO SCALE

Context Sensitive Design Features

Context sensitive design considerations should include:

- On-street Parking (only in high-density residential or transitional areas)
- Intersection Bulb-outs to accommodate safe pedestrian crossing
- Narrow Lanes to encourage traffic calming
- Highly Visible Crosswalks

(RESIDENTIAL B)



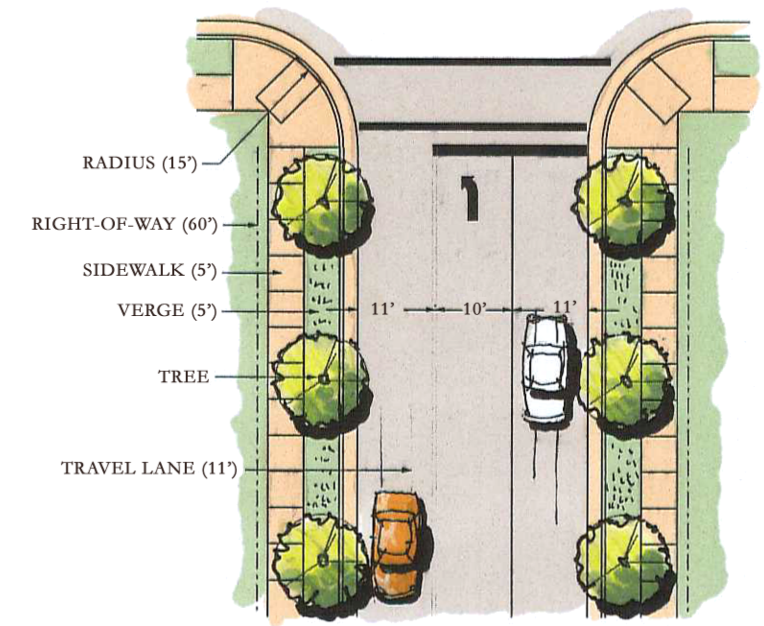
Plan
NOT TO SCALE

Context Sensitive Design Features

Context sensitive design considerations should include:

- Plantable Median Island as a gateway feature to introduce residential area
- Narrow Lanes to encourage traffic calming
- Highly Visible Crosswalks

(RESIDENTIAL C)



Plan
NOT TO SCALE

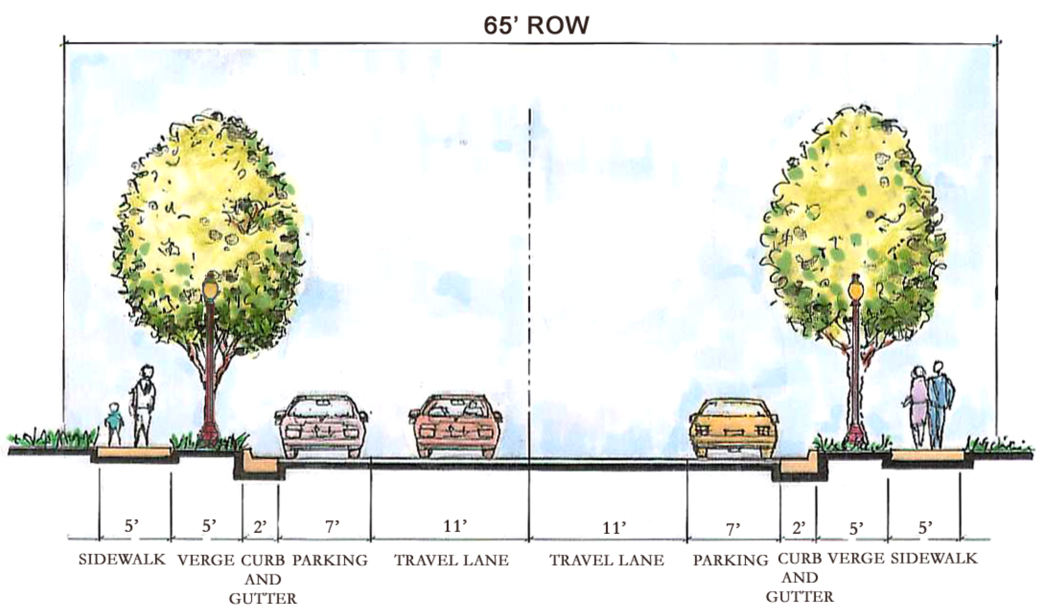
Context Sensitive Design Features

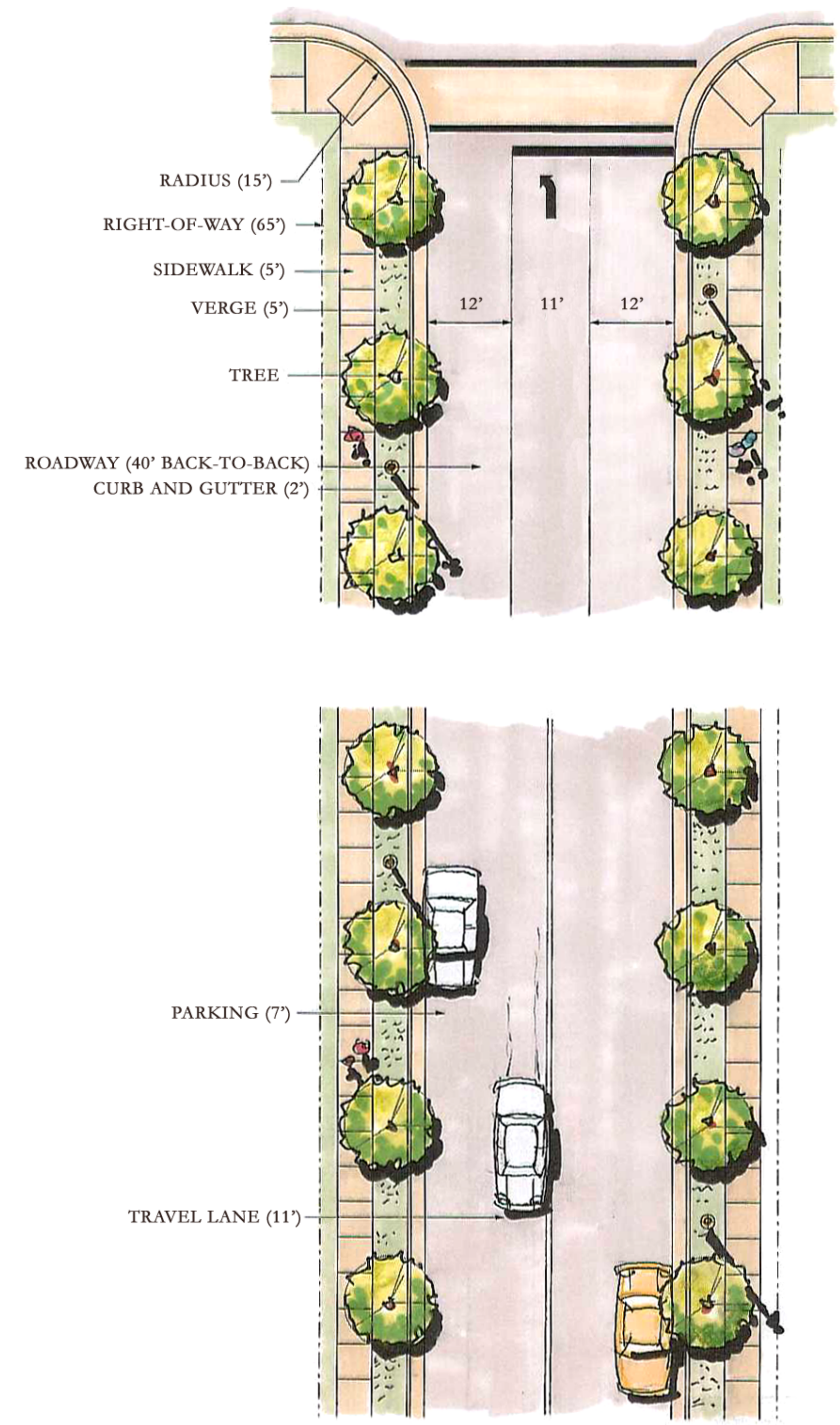
Context sensitive design considerations should include:

- Left-Turn Bay to accommodate a connection to a busy arterial
- Narrow Lanes to encourage traffic calming
- Highly Visible Crosswalks

COMMERCIAL COLLECTOR - TYPE A

(2-LANE, 40' BACK-TO-BACK, SIDEWALKS, PARKING, LANDSCAPING)





Plan
NOT TO SCALE

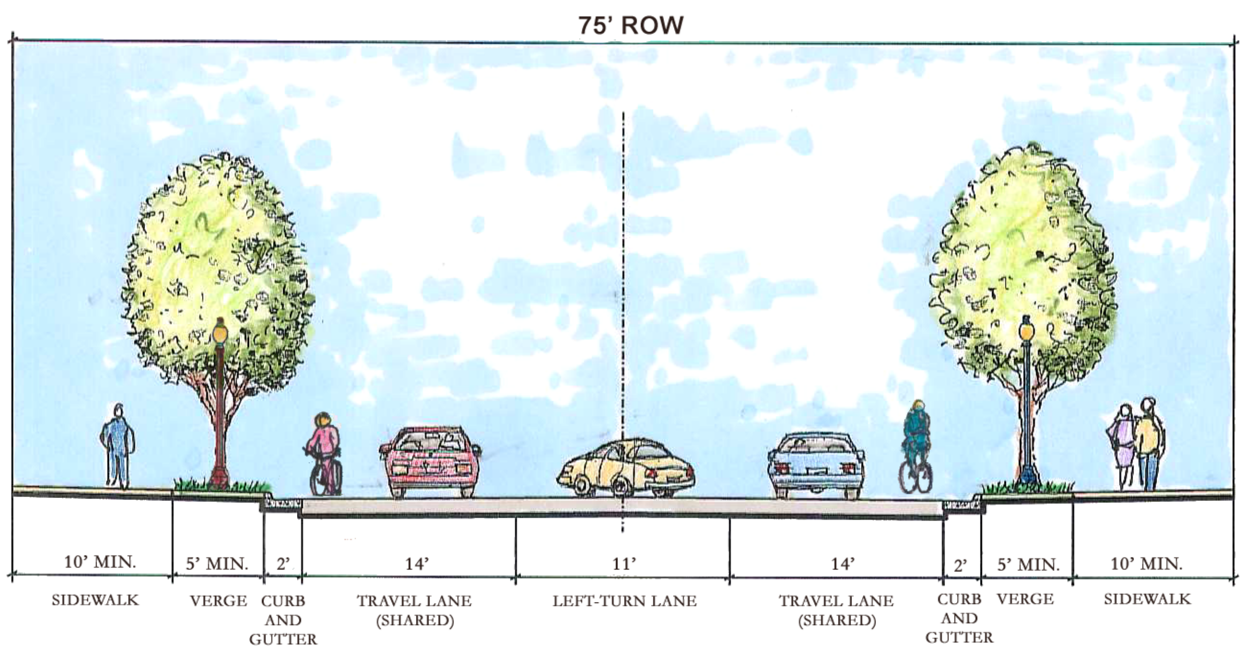
Context Sensitive Design Features

This Commercial Collector is designed to limit automobile travel speeds to 25 miles per hour. It provides two travel lanes with formal parallel parking spaces along both sides of the street. In more urban areas, a fifteen-foot sidewalk with street trees placed in individual planters and pedestrian scale street lighting spaced comfortably apart maximize the sidewalk width for commercial activity along both sides of the street. The on-street parking calms traffic, and with the street trees, buffers pedestrians from the travelway. Context sensitive design considerations should include:

- Drainage (swale vs. curb and gutter)
- Street Trees (formal vs. random plantings)
- Pedestrian Circulation (sidewalk vs. multi-use path)
- Street Lighting (height/placement concerns)
- Need for On-Street Parking

COMMERCIAL COLLECTOR - TYPE B

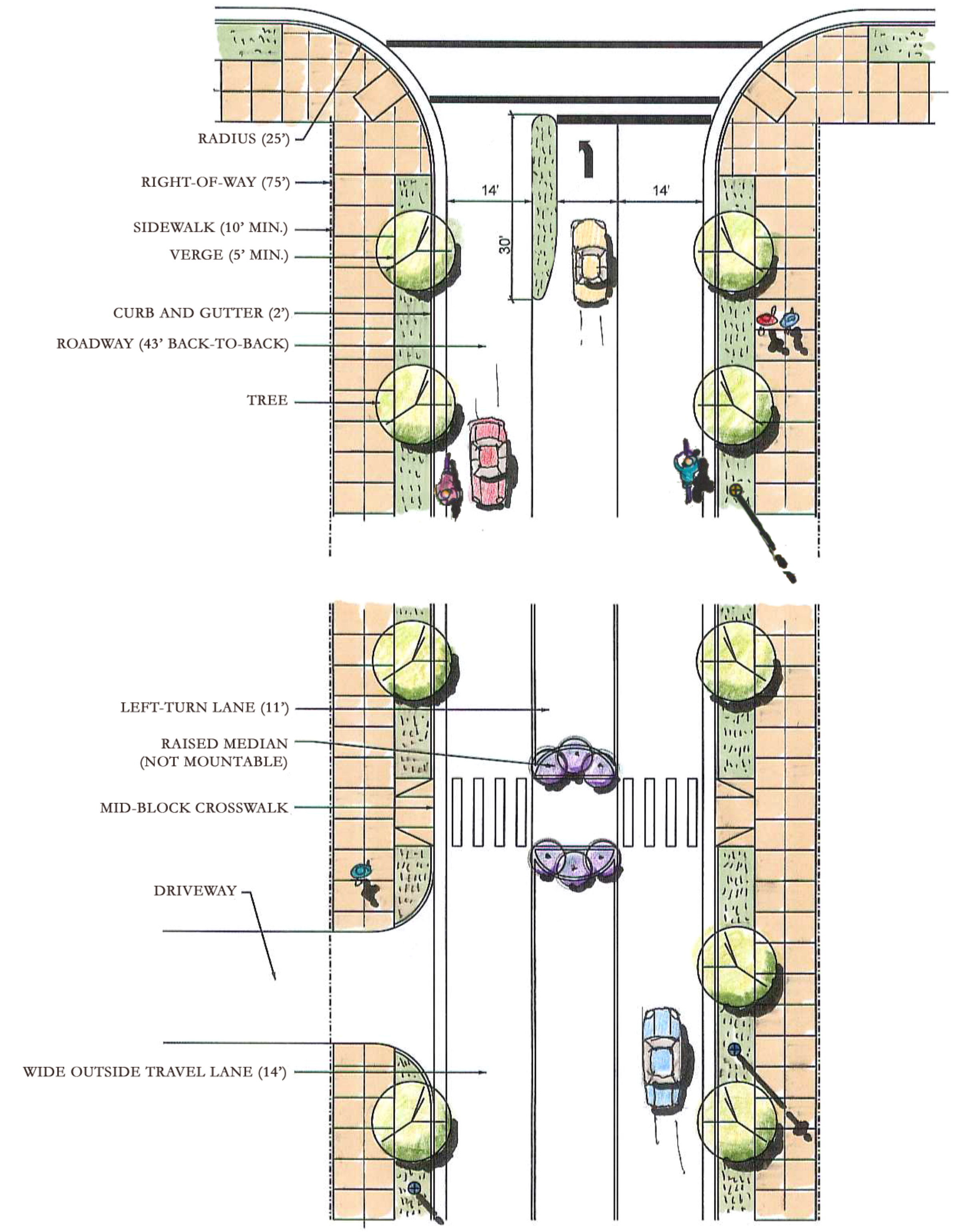
(3-LANE, 43' BACK-TO-BACK, SIDEWALKS, WIDE OUTSIDE LANES, LANDSCAPING)



Context Sensitive Design Features

This Commercial Collector is designed to limit automobile travel speeds to 30 miles per hour. It provides two fourteen-foot travel lanes along both sides of the street. The wide travel lanes provide opportunity for motor vehicles and bicycles to share the travel corridor and should be designated as official bicycle routes within the community supplemented by appropriate signage. An eleven-foot center left-turn lane separates the two travel lanes. In the event that a left-turn lane is not incorporated into the design for a specific collector street, a planted median will be sufficient. In more urban areas, a fifteen-foot sidewalk with street trees placed in individual planters and pedestrian scale street lighting spaced comfortably apart maximizes the sidewalk width for commercial activity along both sides of the street. Context sensitive design considerations should include:

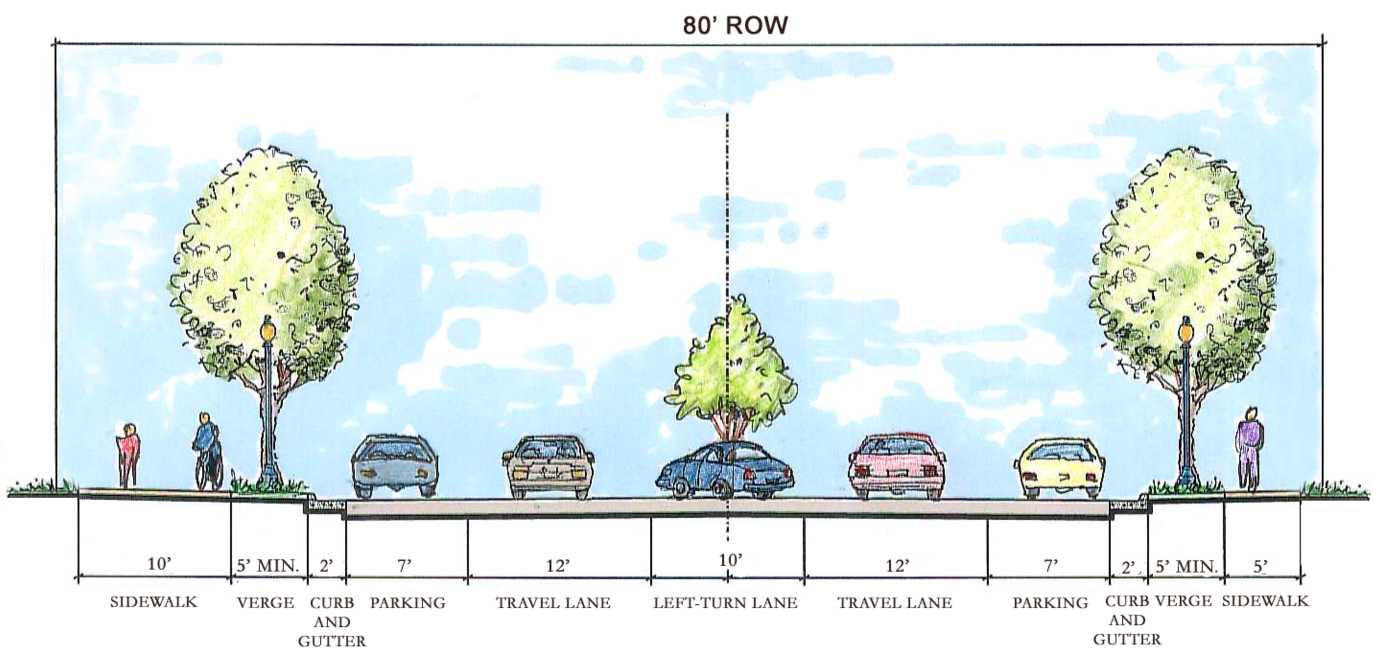
- Drainage (swale vs. curb and gutter)
- Street Trees (formal vs. random plantings)
- Pedestrian Circulation (sidewalk vs. multi-use path)
- Street Lighting (height/placement concerns)
- Need for On-Street Parking

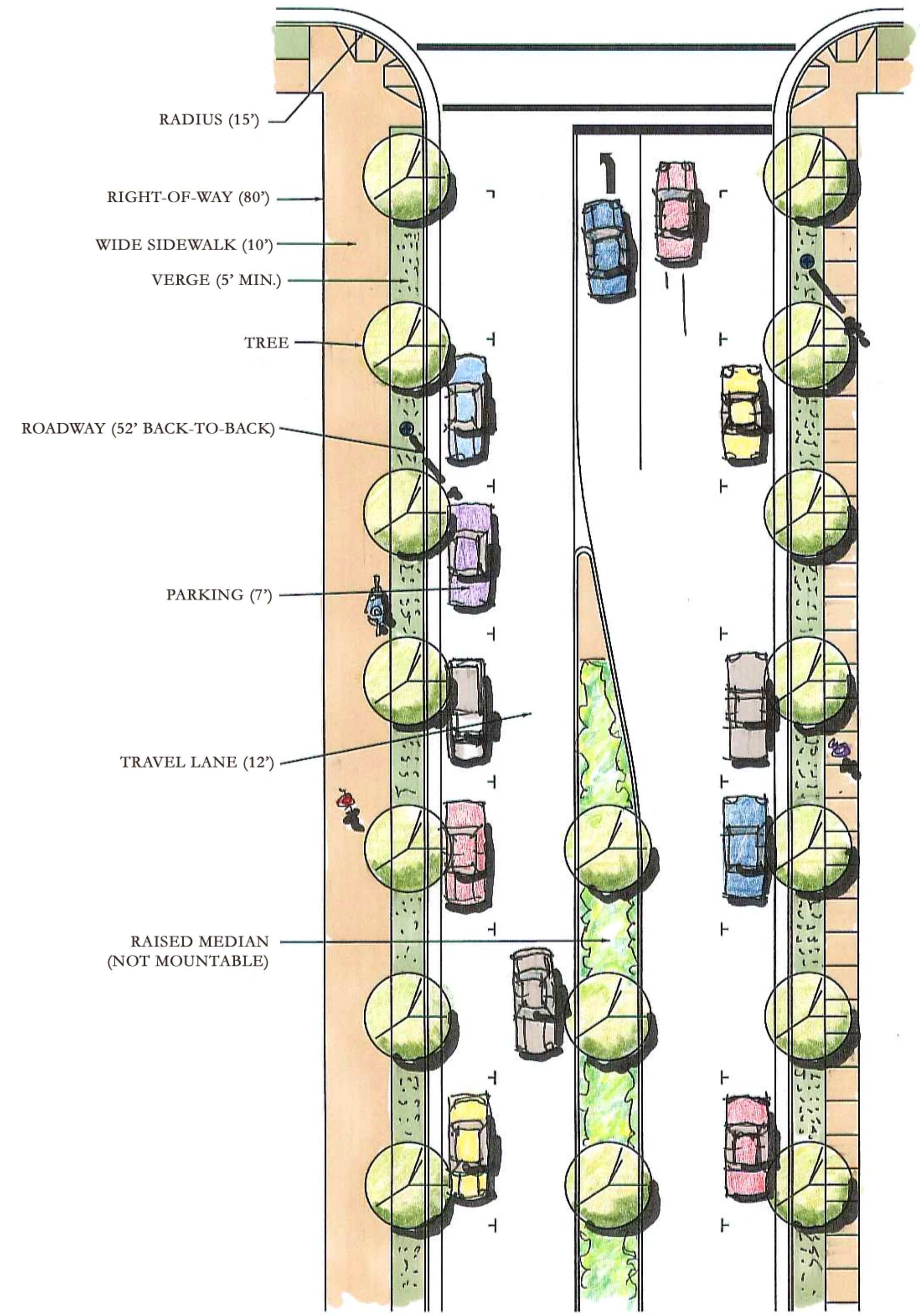


Plan
NOT TO SCALE

COMMERCIAL COLLECTOR - TYPE C

(2-LANE DIVIDED, LEFT TURN LANE, 52' BACK-TO-BACK, SIDEWALKS, LANDSCAPING, PARKING)





Plan
NOT TO SCALE

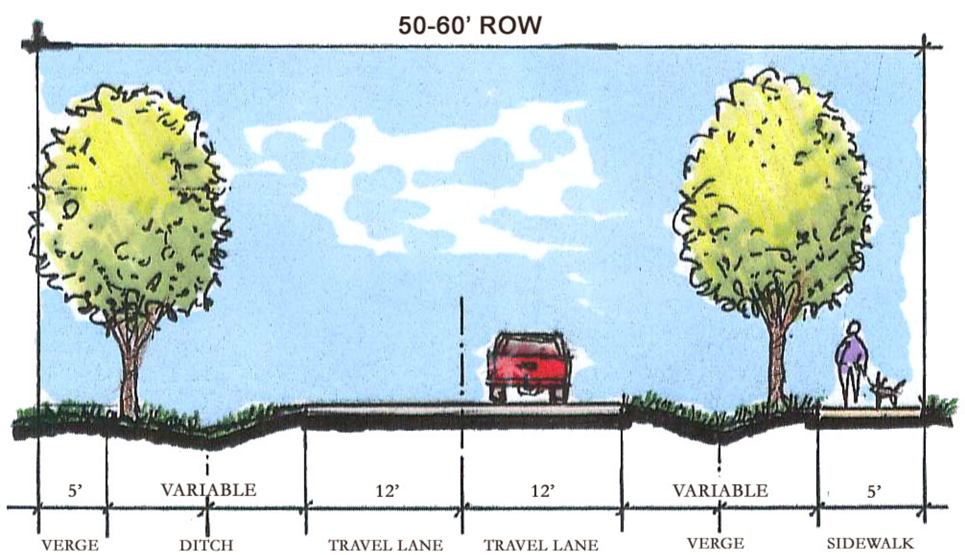
Context Sensitive Design Features

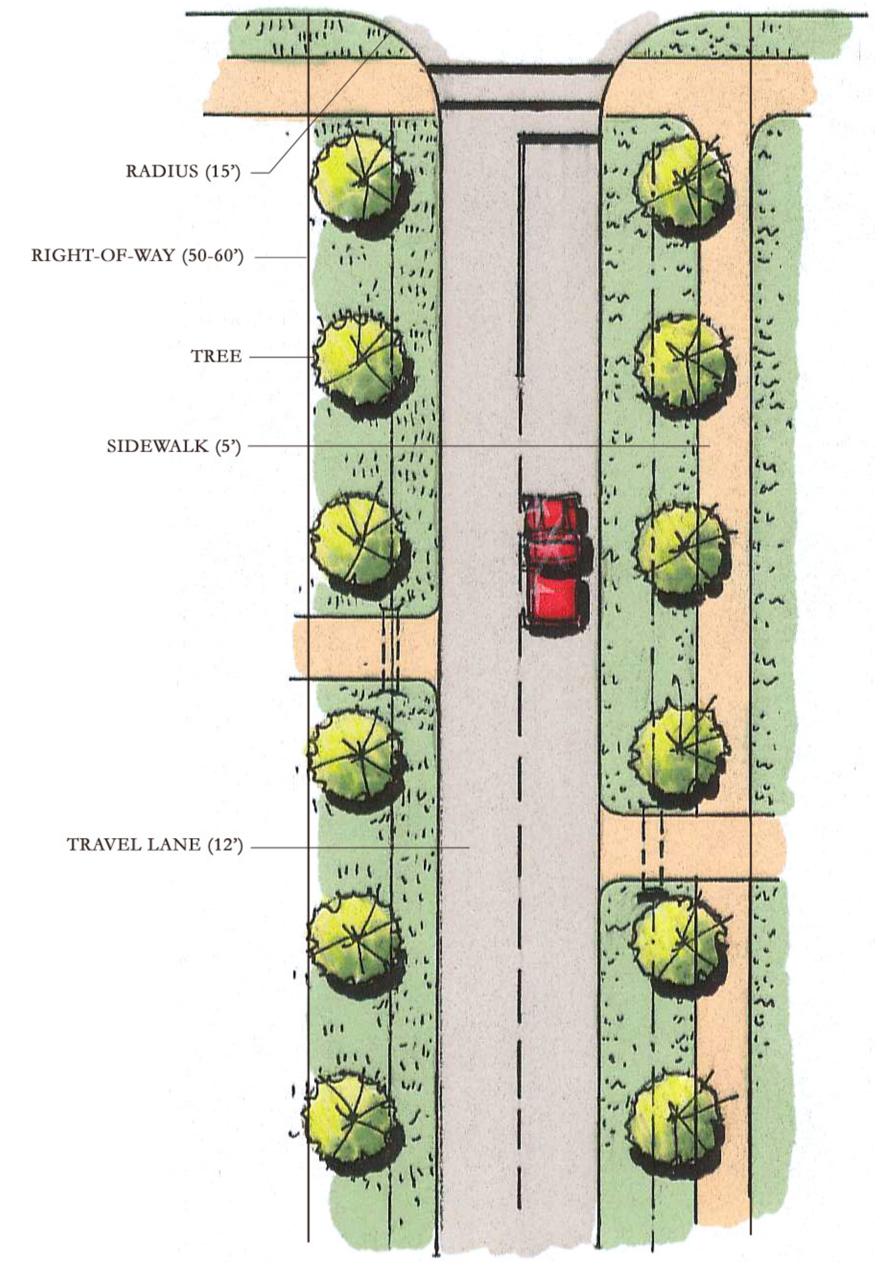
This Commercial Collector is designed to limit automobile travel speeds to 30 miles per hour. It provides two travel lanes and on-street parking with street trees along both sides of the street to provide shade and help soften the built environment. Sidewalks are preferred for both sides of the street in more urban areas. However, a ten-foot multiuse path on one side of the street is acceptable in less dense areas. A ten-foot planted median separates the two travel lanes and provides opportunities for left-turn bays and pedestrian refuge. Context sensitive design considerations should include:

- Striped Crosswalks at intersections and mid-block crossings
- Drainage (swale vs. curb and gutter)
- Street Trees (formal vs. random plantings)
- Pedestrian Circulation (sidewalk or multi-use path)
- Pedestrian-level Lighting
- On-Street Parking (only where it will be used most of the time)
- No Right Turn Lanes

RURAL COLLECTOR

(2-LANE, SIDEWALKS, LANDSCAPING)





Plan
NOT TO SCALE

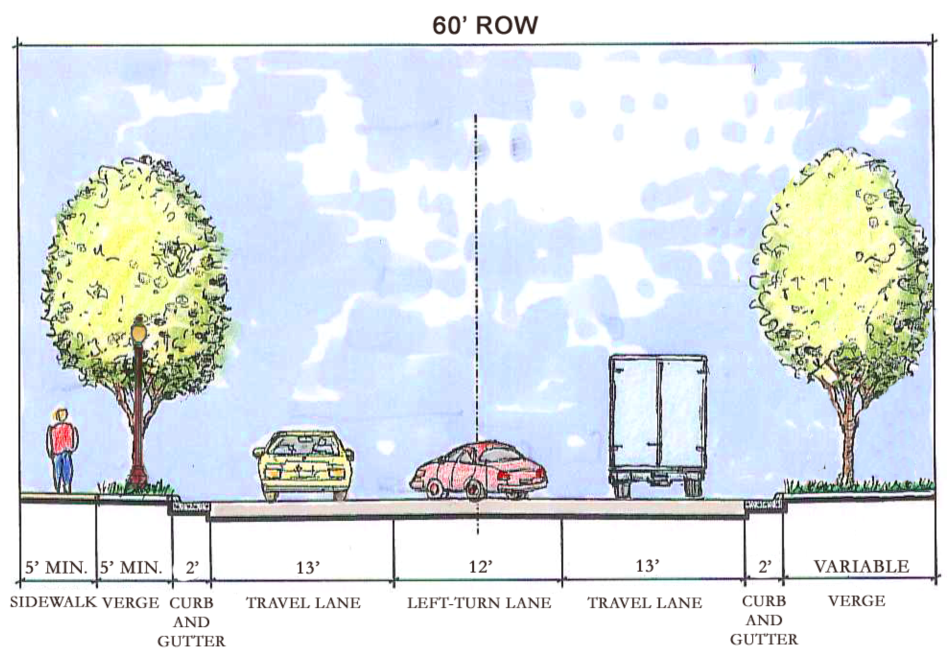
Context Sensitive Design Features

This Rural Collector is designed to limit automobile travel speeds to 35 miles per hour. It provides two travel lanes with street trees along both sides of the street to provide shade. A sidewalk is preferred for one side of the street. However, a ten-foot multiuse path on one side of the street is acceptable as well. A natural buffer extends from the back of the sidewalk to the private property line along the entire corridor. Higher functioning roadways would incorporate turn lanes at strategic locations and a four-foot paved shoulder. Context sensitive design considerations should include:

- Striped Crosswalks at intersections
- Drainage (swale vs. curb and gutter)
- Street Trees (formal vs. random plantings)
- Pedestrian Circulation (sidewalk or multi-use path)
- No Right Turn Lanes
- Paved or Grass Shoulders

INDUSTRIAL COLLECTOR

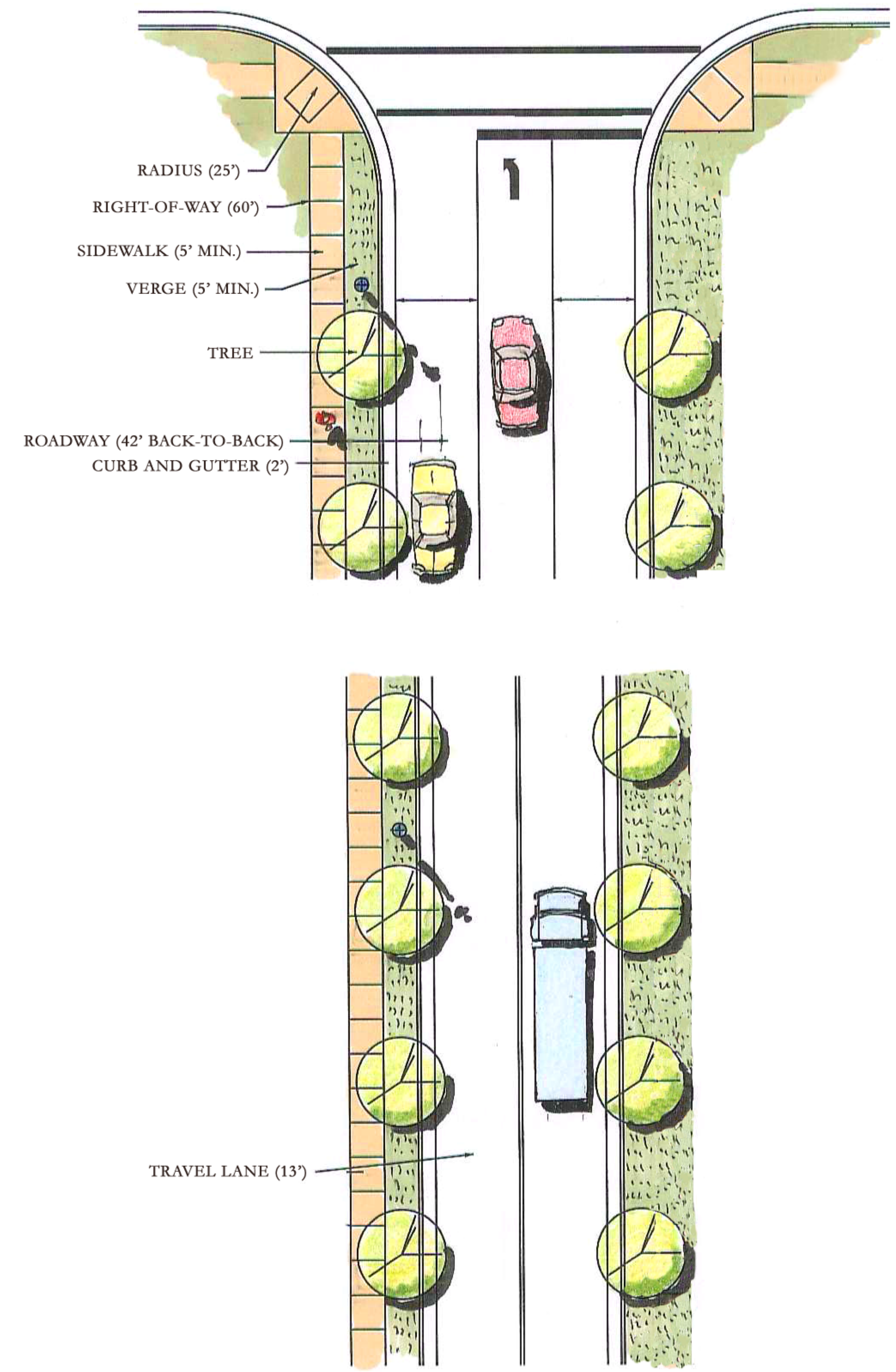
(2-LANE DIVIDED, LEFT TURN LANE, 42' BACK-TO-BACK)



Context Sensitive Design Features

This Industrial Collector is designed to limit automobile travel speeds to 30 miles per hour. It provides two travel lanes with opportunities for center left turn bays, where needed. The larger curb radius allows larger trucks to turn without damaging the curb. The wide travel lanes better accommodate larger vehicle traffic and provide the opportunity for motor vehicles and bicycles to share the travel corridor. In these instances, the facilities should be designated as official bicycle routes and supplemented by appropriate signage. Street trees are envisioned along both sides of the street to provide shade and help soften the built environment. Sidewalks are preferred for both sides of the street to connect complementary land uses. However, a ten-foot multiuse path along one side of the street is acceptable in less intense areas. Context sensitive design considerations should include:

- Drainage (swale vs. curb and gutter)
- Street Trees (formal vs. random plantings)
- Pedestrian Circulation (sidewalk vs. multi-use path)
- Street Lighting (height/placement concerns)



Plan
NOT TO SCALE