Congestion Management Study

NOTE: In the most recent Federal transportation legislation (SAFETEA-LU), Congestion Management Studies have been replaced by Congestion Management Processes (CMP). However, the new CMP is not required for MPO's with less than 200,000 population, like the SPATS MPO. Therefore, the SPATS MPO presents the previously unpublished findings of the completed CMS for additional information in this long-range plan update.

Increasing mobility and reducing traffic congestion are two key components of the MPO's planning process. In many cases, highly traveled roadways cannot be improved by widening because of limited right-of-way, impact on adjacent properties or high costs. So, alternatives must be examined.

What is a Congestion Management Study (CMS)?

A CMS is a continuous cycle of transportation planning activities designed to provide decision-makers with better information about transportation system performance and the effectiveness of alternative strategies to deal with congestion. A CMS may be considered as consisting of four main components:

- Measurement and identification of congestion;
- A matrix of congestion mitigation strategies;
- Monitoring of effectiveness after implementation; and
- An orderly evaluation process.

The components of CMS form a continuous cycle of transportation planning activities. By monitoring the effectiveness of congestion mitigation strategies and evaluating their benefits in an orderly, consistent manner, planners and decision-makers can improve their ability, over time, to select the most cost-effective strategies appropriate to their specific local conditions and needs.

Mitigation Strategies

A key task in the development of a Congestion Management System is the identification and structuring of congestion mitigation strategies in a fashion that is easily understood by not only technical staff, but also the general public.

Strategy Classes

Strategy classes represent broad groupings of individual strategies and improvement measures. The strategies in this discussion have been broken into the following twelve classes:

1. Transportation Demand Management (TDM) measures

2. Traffic operations improvements
3. Measures to encourage high occupancy vehicle (HOV) use
4. Public transit capital improvements
5. Public transit operational improvements
6. Measures to encourage the use of non-motorized modes
7. Congestion pricing
8. Growth management
9. Access management
10. Incident management
11. Intelligent Transportation Systems (ITS)
12. General purpose capacity expansion

It is important to note that CMS guidelines do not specify that all possible strategies be analyzed for every location of congestion. Only those that could potentially mitigate congestion at the given location in a reasonable manner should be analyzed.

While many congestion mitigation strategies can be implemented as stand-alone projects, it often makes sense to examine combinations or packages of strategies. As a general rule, a strategy implemented in isolation only has a limited impact on congestion. This is because a given strategy generally addresses only one aspect of the complex mix of causes which generate traffic congestion.

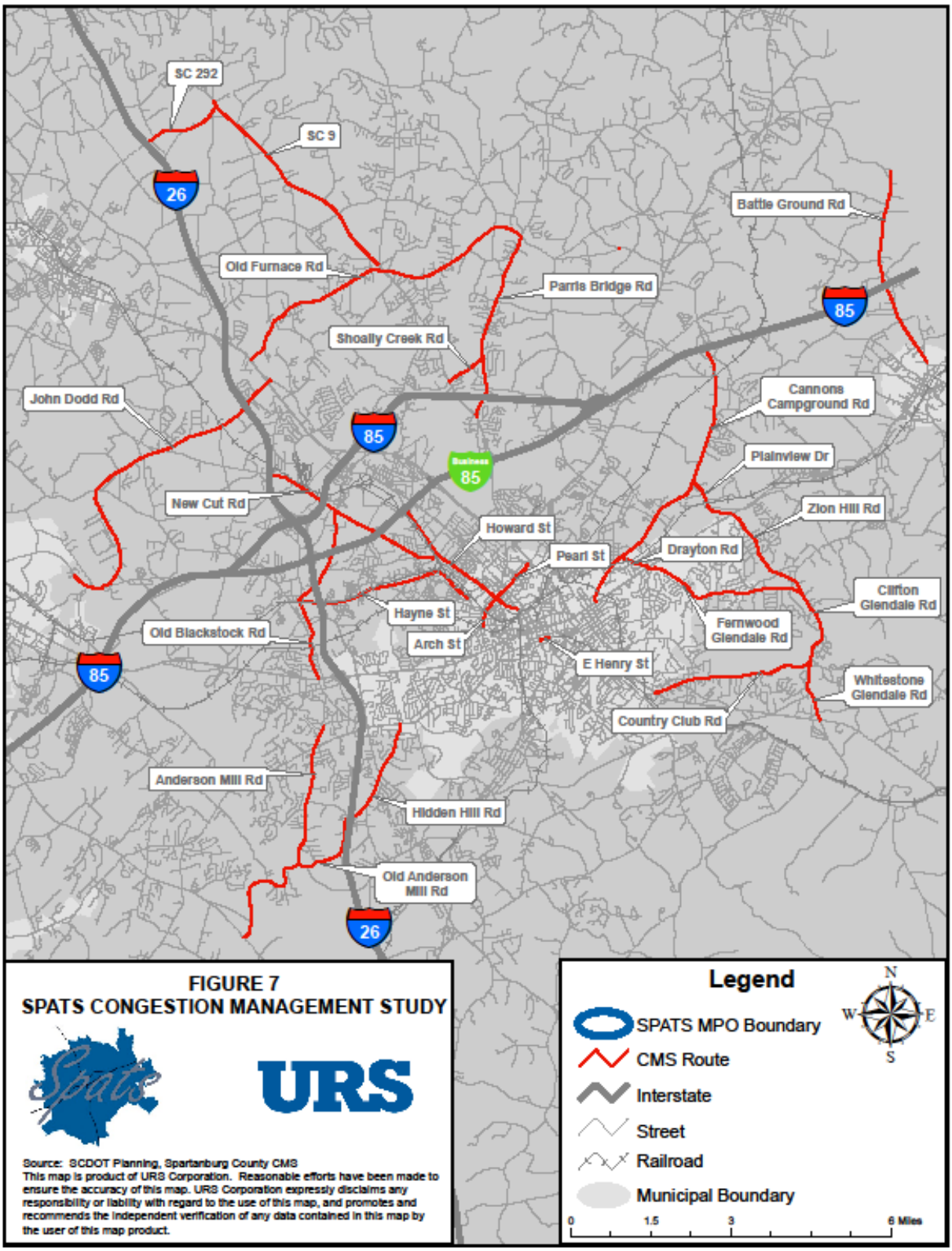
There are three primary reasons for packaging strategies:

- To take advantage of potential synergies between strategies;
- To take advantage of potential cost efficiencies during implementation; and
- To fully address a need or deficiency at a congested location.

Spartanburg County Congestion Management Study 2004

The SPATS MPO contracted with TranSystems Corporation to conduct a Congestion Management Study in 2004. The purpose of the study was to assist the SPATS staff and Policy Committee in setting priorities for future roadway and intersection improvements, based on current and future needs.

Several important roadways were identified by the SPATS staff and consultants for review during this study. The roadways identified for the study are shown in **Figure 7**. Data was collected along each of the roadways to determine the existing shoulder widths, lane widths, number of driveways and percentage of "no passing" zones. In addition to the physical data collection, the consultants collected 24-hour traffic counts at key intersections to determine the approaching traffic volumes.


SC 292
SC 9
26
Old Furnace Rd
Parris Bridge Rd
Battle Ground Rd
85
Shoally Creek Rd
John Dodd Rd
85
Cannons Campground Rd
Plainview Dr
Business 85
New Cut Rd
Zion Hill Rd
Howard St
Pearl St
Drayton Rd
Clifton Glendale Rd
Hayne St
Old Blackstock Rd
Arch St
Fernwood Glendale Rd
85
E Henry St
Whitestone Glendale Rd
Country Club Rd
Anderson Mill Rd
Hidden Hill Rd
Old Anderson Mill Rd
26
FIGURE 7
SPATS CONGESTION MANAGEMENT STUDY
URS
Source: SCDOT Planning, Spartanburg County CMS
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Legend
N
W
E
S
SPATS MPO Boundary
CMS Route
Interstate
Street
Railroad
Municipal Boundary
0
1.5
3
6 Miles

Utilizing the MPO's base year and future traffic models, the consultant calculated yearly growth factors for the each of the count stations. The growth factors were applied to the base year data from 2003 to determine the 2025 future traffic volumes.

Additional data that was used to determine the congestion levels on the identified roadways included roadway classification, segment length, terrain, percentage of trucks and percentage of recreational vehicles. A 1995 study by Wilbur Smith Associates was used as a basis for the truck data.

***The following excerpts and recommendations were taken from the March 2004 Spartanburg County Congestion Management Study.*

Methodology

Once the daily and peak hour traffic volumes were established for the base year 2003 and future year 2025, the volumes were analyzed to determine their operational characteristics. *Highway Capacity Software 2000, version 4.1c* was utilized to establish the operational characteristics of the various roadways at each count station. The results were ranked by three methods (volume to capacity ratio, level-of-service and average travel speed).

Volume to Capacity Ratio

The volume to capacity ratio, or v/c ratio, is considered an important indicator for congestion. A v/c ratio of 1.0 or less indicates that a roadway is at or under capacity. Under ideal conditions, capacity is 1,600 vehicles per hour per lane. This capacity is adjusted downward depending upon existing conditions such as inadequate shoulders, no passing zones or an excessive number of driveways. The higher the v/c ratio, the greater the need is for roadway improvements. The roadways were ranked by the highest 10 2025 v/c ratios. There locations are shown in **Table 4-1**. The table also shows the roadways 2025 v/c ratios with the recommended roadway improvements.

Table 4-1 Top 10 Ranking by V/C Ratio

Rank	Location	Road Name	2003 V/C Ratio	2025 V/C Ratio	2025 Lanes (per direction)	2025 V/C Ratio*
1	70	SC 9	0.64	1.18	2	0.63
2	72	SC 9	0.66	1.03	2	0.55
3	65	SC 292	0.47	0.93	2	0.50
4	68	SC 9	0.45	0.91	2	0.49
5	71	SC 9	0.58	0.86	3	0.57
6	81	US 129	0.59	0.86	2	0.46
7	115	Parris Bridge Road	0.60	0.81	2	0.43
8	69	SC 9	0.41	0.76	2	0.41
9	75	Old Furnace Road	0.47	0.69	2	0.37
10	40	New Cut Road	0.45	0.65	2	0.36

*2025 V/C Ratio with improvements
Source: Spartanburg County CMS, March 2004 (TranSystems)

Level-of-Service (LOS)

The results of a roadway operational analysis can also be described by the level-of-service (LOS) experienced by drivers. The LOS describes the quality of traffic operating conditions and ranges from "A" to "F". A LOS of "A" represents the most desirable conditions with free-flow movement of traffic and minimal delays. A LOS of "F" generally indicates severely congested conditions with excessive delays for motorists. Intermediate grades of B, C, D and E reflect incremental increases in congestion. The standard LOS thresholds for a two-lane Class I roadway where drivers expect to travel at high speeds and a two-lane Class II roadway where drivers expect lower speeds and stops are shown in **Table 4-2** in percent time spent following (PTSF) another vehicle. The standard LOS thresholds for multi-lane roadways are also shown in **Table 4-2** in passenger car per mile per lane (pc/mi/ln). A LOS of "D" was considered acceptable for future conditions.

Table 4-2 Delay Thresholds of Level-of-Service

Level-of-Service (LOS)	2-lane Roadway Class I PTSF	2-lane Roadway Class II PTSF	Multilane pc/mi/ln
A	≤ 35	≤ 40	11
B	> 35 – 50	> 40 – 55	18
C	> 50 – 65	> 55 – 70	26
D	> 65 – 80	> 70 – 85	35
E	> 80	> 85	40 – 45
F	*	*	> 40 – 45

*LOS F applies whenever the flow rate exceeds the segment capacity of 3,200 pc/h (two-way) or 1,700 pc/h (highest directional split)
Source: Spartanburg County CMS, March 2004 (TranSystems)

A list of the top ten locations with year 2025 levels-of-service that are worse than the acceptable level of "D" are shown in **Table 4-3** below. The existing and future LOS (with improvements) also are shown in the table.

Table 4-3 Top 10 Ranking by 2025 Level-of-Service (LOS)

Rank	Location	Road Name	Class	2003 LOS	2025 LOS	2025 Lanes (per direction)	2025 LOS*
1	70	SC 9	1	E	F+	2	C
2	72	SC 9	1	E	F+	2	C
3	16	Fernwood-Glendale	2	F	F	2-divided	B
4	17	Fernwood-Glendale	2	F	F	2-divided	A
5	27	Drayton Avenue	2	F	F	2-divided	B
6	28	Drayton Avenue	2	F	F	2-divided	B
7	65	SC 292	1	E	F	2	B
8	68	SC 9	1	E	F	2	B
9	69	SC 9	1	E	E	2	B
10	81	US 129	1	E	E	2	B

*2025 LOS with improvements
Source: Spartanburg County CMS, March 2004 (TranSystems)

Average Travel Speed

Another method of comparison is the expected average travel speed in miles per hour (mph). The average travel speed is determined from the service flow rate and the adjusted free-flow speed. A ranking of the top ten locations with the lowest average travel speeds, in future year 2025, is shown in **Table 4-4**.

Table 4-4 Top 10 Ranking by Average Travel Speed

Rank	Location	Road Name	2003 Avg Travel (mph)	2025 Avg Travel (mph)	2025 Lanes (per direction)	2025 Avg Travel (mph)*
1	115	Parris Bridge Road	20.5	15.5	2	45.9
2	65	SC 292	26.9	16.0	2	48.4
3	68	SC 9	27.1	16.0	2	48.4
4	75	Old Furnace Road	23.4	18.5	2	45.9
5	78	Parris Bridge Road	24.1	19.5	2	45.9
6	69	SC 9	28.1	19.7	2	48.4
7	116	Parris Bridge Road	23.0	20.5	2	45.9
8	114	Parris Bridge Road	23.3	20.9	2	45.9
9	1	Old Furnace Road	23.9	20.9	2	47.2
10	40	New Cut Road	25.4	20.9	2	48.4

*2025 average travel (mph) with improvements
Source: Spartanburg County CMS, March 2004 (TranSystems)

Recommendations

The recommended method of ranking is to utilize the volume to capacity (v/c) ratios. This ratio is the proportion of traffic volume to the volume of traffic that a roadway can reasonably carry. The larger the v/c ratios, the greater the problems with congestion on a roadway will be. In addition, the two decimal ratios allow for easier ranking. Two of the study areas that consistently ranked high using the various methods are the Boiling Springs area and the Fernwood-Glendale Road area. Traffic volumes in these areas are expected to grow and are already experiencing various levels of congestion.

SC 9 from Old Furnace Road to SC 292 and Parris Bridge Road from SC 9 to Old Furnace Road are likely to need five-lanes by 2025. The existing five-lane section of SC 9 will also likely need to be widened to seven-lanes in the future based on present growth factors. Old Furnace Road and John Dodd Road appear to work acceptable with three lanes or spot intersection improvement in the future, as long as they remain residential roadways. Fernwood-Glendale Road is also likely to need additional widening of varying widths from seven-lanes to three-lanes from Cannons Campground Road to Zion Hill Road.

One area that was not directly studied but does affect traffic flow on SC 9 is the intersection of McMillin Boulevard with SC 9 in the Boiling Springs community. This intersection is located approximately 300 feet south of Rainbow Lake Road and approximately 500 feet north of the very busy intersection of SC 9 and Old Furnace Road. Congestion in this area is severe during commuter and school arrival and dismissal periods. In addition, this is the general area where SC 9 changes from five-lanes to two-lanes. The spacing of these roadways is too close to permit good traffic flow and efficient signal timing on SC 9. It is also recommended that the intersection of SC 9 and McMillin Boulevard be closed and that McMillin Boulevard be relocated to tie into Rainbow Lake Road to facilitate traffic flow on SC 9. Widening on Rainbow Lake Road from the new intersection of McMillin Boulevard to SC 9 will also be needed with the relocation.

Another problem area that needs addressing, which does not show up in the ranking process, is the intersection of North Blackstock Road, Fairforest Road and Hayne Street. A set of railroad tracks are involved in this intersection as well. Traffic signals are located on both sides of the railroad tracks without adequate storage for traffic queues between the signals. Drivers will often make right turns on red and become trapped on the railroad tracks. Railroad pre-emption of the traffic signal, automatic traffic arms and flashing crossbuck lights and “no right turn on red” signs are in place. The reconstruction and relocation of the intersections near the railroad tracks are needed.

A summary of the widening and intersection improvement recommendations are shown in **Figure 8**.

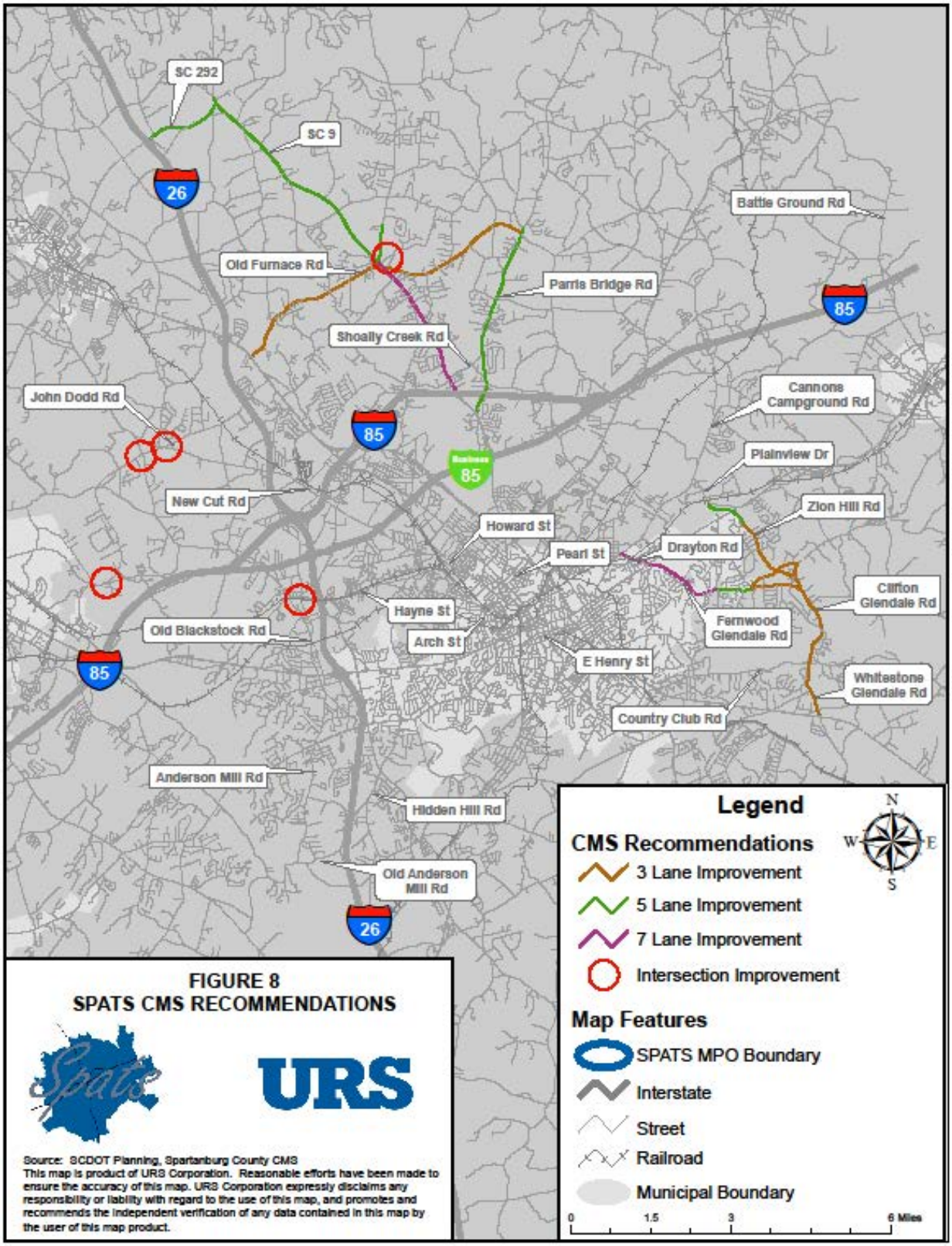

FIGURE 8
SPATS CMS RECOMMENDATIONS

URS

Source: SCDOT Planning, Spartanburg County CMS
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Summary

Some improvements are underway in critical traffic areas of Spartanburg County. The SCDOT has already installed fiber optic lines on SC 9 from Double Bridges Road to Rainbow Lake Road and on US 29 from Longwood Drive to the Spartanburg City Limits. Preliminary time of day plans are in place on SC 9 in the Boiling Springs area. However, the existing fiber optic interconnects between traffic signals will need to be maintained, timings adjusted and the network expanded as development continues and traffic signals are added to the roadway system. Fiber optic lines should be considered for all future widening projects where traffic signals exist and the signal timings evaluated. The need and overall length of the fiber optic lines will vary depending on traffic signal requirements at the time of construction.

Recommended future roadway widening projects are:

- 3 lanes – Old Furnace Road, John Dodd Road, Fernwood-Glendale Road
- 5 lanes – SC 9, Parris Bridge Road, Fernwood-Glendale Road
- 7 lanes – SC 9, Drayton/Fernwood-Glendale Road

Recommended intersection relocations and improvements:

- Close the intersection of McMillin Boulevard and SC 9 and relocate McMillin Boulevard into Rainbow Lake Road
- Reconstruction of the North Blackstock Road, Fairforest Road and Hayne Street intersection. Consider all options for closing roadways, relocating roadways, providing alternate routes or bridging the railroad tracks.

Consideration of other factors that can reduce the need for roadway widening while increasing the roadway capacity should also be given. These may include:

- Reducing the number of access points;
- Restricting left turns with concrete medians;
- Restricting or separating commercial and industrial areas from residential areas through zoning or planning restrictions; and
- Encouraging other modes of transportation.

As Spartanburg County grows, the existing roadway system will need to be expanded and modified to meet traffic demands. The purpose of this section is to pinpoint areas of growth for long-range roadway planning. If problem areas can be anticipated, planning for improvements can be underway prior to roadway capacity being exceeded.