

## **CHAPTER 8 – CONGESTION MANAGEMENT**

### **8.1 Introduction**

Federal requirements state that regions with more than 200,000 people, known as Transportation Management Areas (TMAs), must maintain a congestion management plan (CMP) and use it to inform transportation planning and decision-making. These requirements were introduced by the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and were continued under the successor law, the Transportation Equity Act for the 21st Century (TEA-21). Whereas previous laws referred to this set of activities as a congestion management system (CMS), SAFETEA-LU, refers to a “congestion management process”, which is intended to be an integral component of metropolitan transportation planning. The Regional Congestion Management Plan has been developed to address this federal requirement for the Columbia Area Transportation Study Metropolitan Planning Organization.

### **8.2 Existing Conditions**

Jacobs Carter Burgess was retained by the Central Midlands Council of Governments (CMCOG) to develop a Congestion Management Process/Plan (CMP) for the Columbia Area. A CMP is a process in which a transportation system is periodically monitored for congestion and mitigation strategies are recommended in response to identified deficiencies.

The CMP process is required in accordance with the 23rd Code of Federal Regulations, section 500, in the Federal Register, under the U.S. Department of Transportation. A CMP provides state Department of Transportation and MPOs with a methodical framework for addressing congestion. Federal rules require that a CMP area and network be defined by each MPO. In air quality non-attainment areas, projects that increase capacity for Single Occupancy Vehicles (SOV's) must be derived from a CMP.

Aside from the CMP being a federal requirement for a MPO with a population of over 200,000, CMP's help qualify and/or identify potential projects for inclusion into their regional transportation program. They identify potential improvements based on quantifiable data and they consider congestion in developing transportation improvements. CMP's establish a baseline condition for future comparison of conditions and allow for project prioritization based on potential congestion mitigation. CMP's can provide solutions beyond

merely adding road capacity as mitigation development includes other solutions that may be more effective and cost-efficient. CMP's encourage economic competitiveness and increase the reliability of planning for all modes and all journey purposes. Environmental programs that involve air quality and natural hazard mitigation also benefit from the CMP process.

Approximately 330 centerline miles of key roadways were examined in the Columbia area. The roadways were identified and selected based on the following sources: Year 2002 CMP corridors; an examination of Year 2005 and 2035 travel demand model volume-to-capacity projections; and CMCOG staff and stakeholder input. The resulting corridors identified for congestion screening are listed in table 8.1.

A sub-set of corridors was created from this list to facilitate a more accurate identification of congested segment locations. Approximately 775 directional corridors were examined with travel time runs in the AM and PM peak period. Two (2) runs using the standard "floating car" travel time run method were performed for each corridor and each peak period. Most of the sub-set corridors are half a mile in length or greater. Approximately thirty (30) of these directional corridors are between 500 and 1500 feet in length.

### **8.2.1 Congested Corridors**

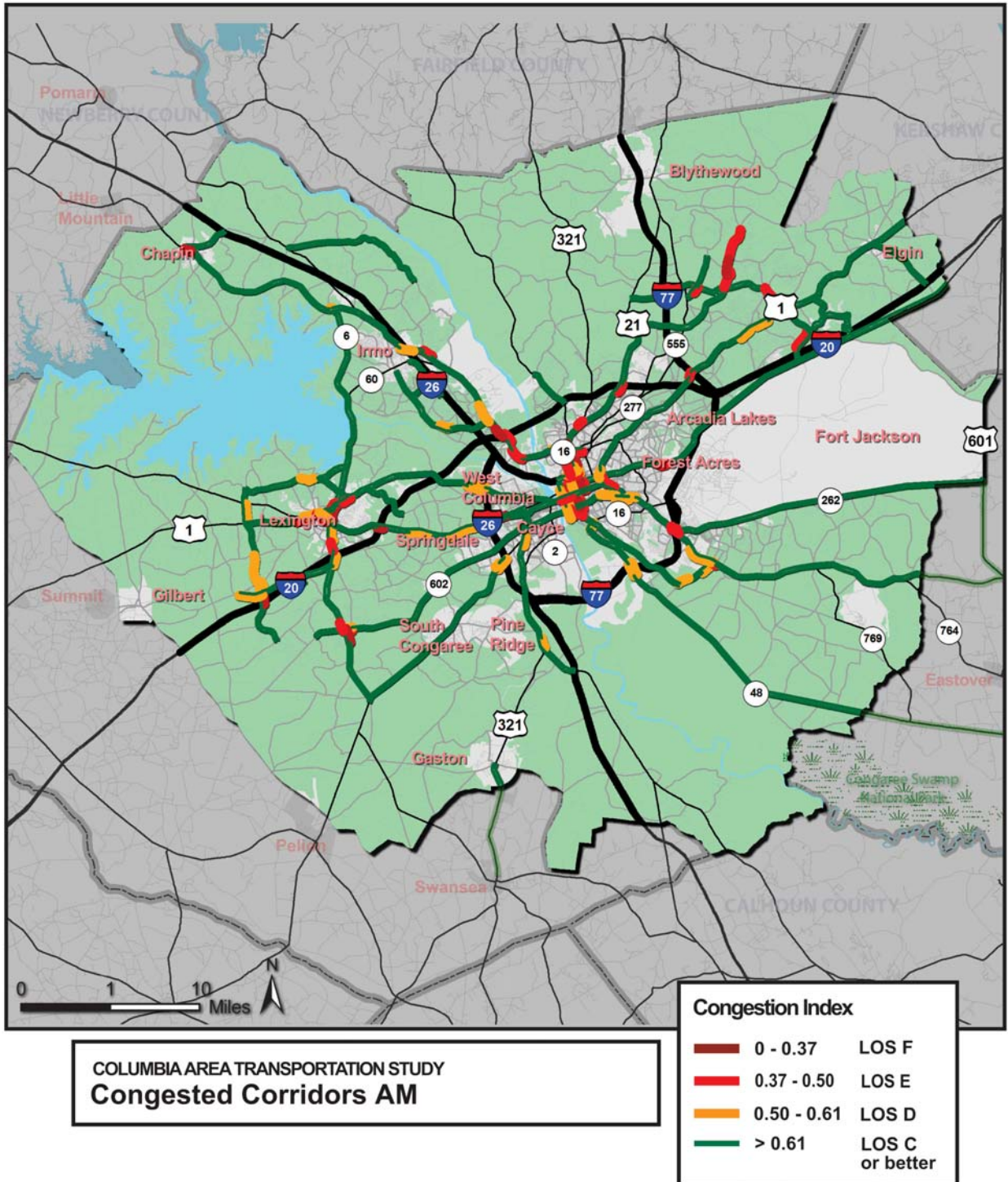
Based on the Federal Highway Administration (FHWA) Highway Capacity Manual (HCM) 2000-based congestion thresholds evaluated in this study, approximately 4% of the corridors were found to be congested (LOS E and F) and 4% were found to be potentially congested (LOS D) for both the AM and PM peak period (7-9AM, 4-6PM). Approximately 92% of the corridors examined were not congested.

Maps 8.1 and 8.2 show the congested and potentially congested corridors for the AM and PM peak periods, respectively. It should be noted that the closer spacing for the congestion index lines for the AM peak period compared to the PM peak period was intentionally designed so that the AM and PM peak period could also be combined and overlaid into one map showing the AM results as the inner lines and the PM results in the outer lines.

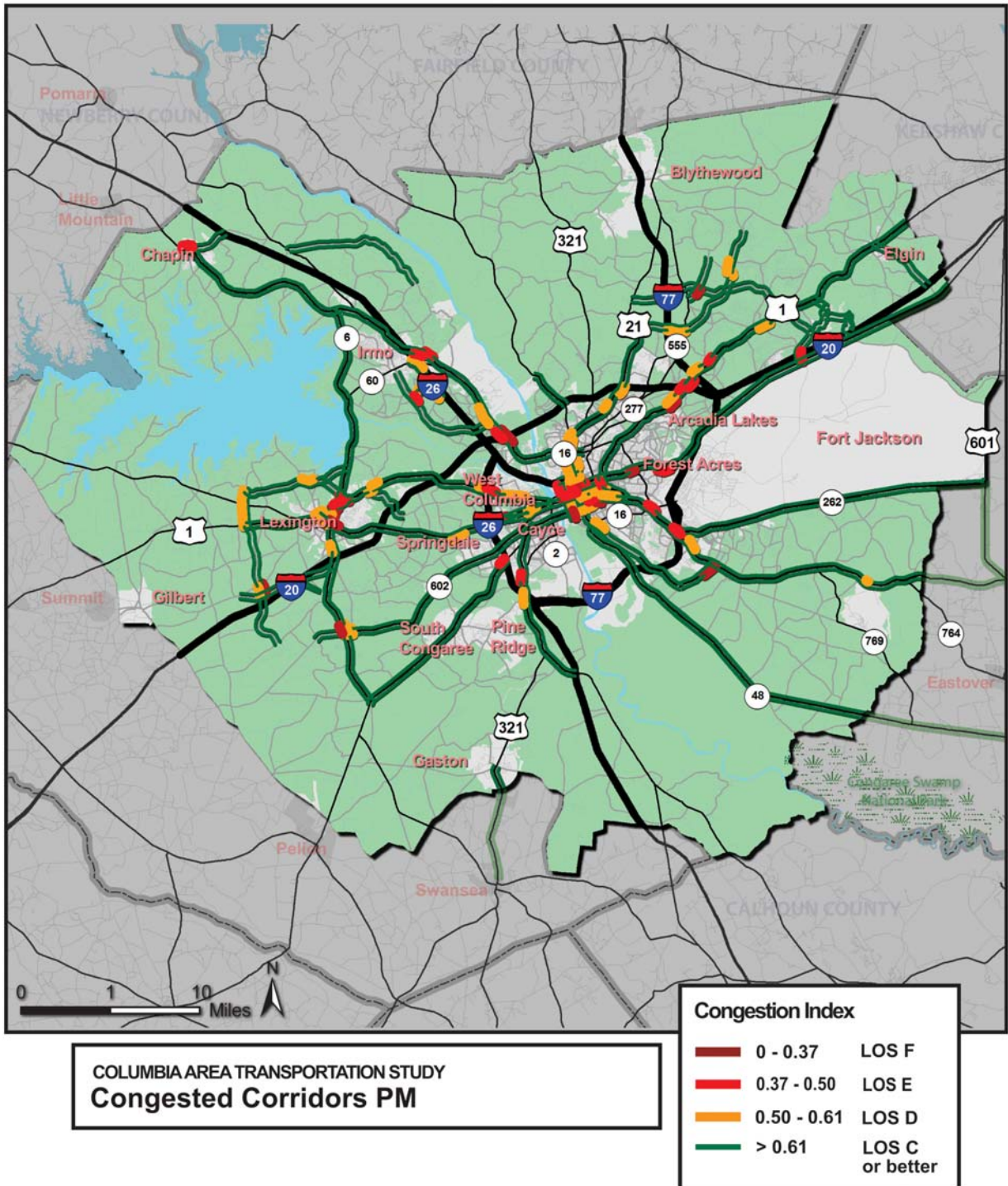
**Table 8.1: Corridors Identified for Congestion Screening**

<b>Route Name</b>	<b>Length (Miles)</b>
Clemson Rd / Killian Rd	12.3
Columbia Ave	5.4
Columbiana Dr	0.9
Earth Rd / Spears Creek Church Rd / Woodcreek Farms Rd / Old National Hwy / Turkey C	1.9
Harbison Blvd	1.6
Hardscrabble Rd	24.3
Hwy 302 / Edmund Hwy	2.2
Hwy 321	7.3
Jacobs Millpond Rd / Westlake Rd / Woodcreek Farm Rd	1.3
Kennerly Rd	8.0
Longs Pond Rd / Pisgah Church Rd	1.5
Longtown Rd	17.8
Mineral Springs Rd	2.4
Old Cherokee Rd	22.6
Park Terr / Bower Pkwy	8.1
Pilgrim Church Rd	11.1
Pineview Rd	2.4
Platt Springs Rd	26.6
SC Hwy 12 / Forest Dr / Percival Rd / Taylor St / Fort Jackson	21.1
SC Hwy 215 / Monticello Rd	2.0
SC Hwy 262 / Leesburg Rd	12.3
SC Hwy 277 / Bull St	4.9
SC Hwy 48 / Rosewood Dr / Bluff Rd	1.6
SC Hwy 6 / Lake Dr / Dreher Shoals Rd	2.1
SC Hwy 768 / Shop Rd	7.6
St Andrews Rd	1.3
Sunset Dr	5.4
Two Notch Rd	19.7
US Hwy 1 / Meeting St / Augusta Hwy	10.4
US Hwy 176 / River Dr / Broad River Rd	22.6
US Hwy 21 / US Hwy 176 US Hwy 321 / Blossom St / Charleston Hwy	9.4
US Hwy 321 / Huger St	2.4
US Hwy 321 / US Hwy 21 / Elmwood Ave	3.4
US Hwy 321 / US Hwy 21 / Main St / Wilson Blvd	2.2
US Hwy 378 / Columbia Ave / Augusta Hwy / Sunset Blvd / Geravis St	7.3
US Hwy 378 / US Hwy 1 / Millwood Ave / Two Notch Rd	0.9
US Hwy 50 / SC Hwy 12 / Jarvis Klapman Blvd / Main St / Augusta Rd	11.7
US Hwy 601 / McCords Ferry Rd	21.4
US Hwy 76 / Devine St / Garners Ferry Rd	6.1
White Pond Rd / Church St	26.6

**Map 8.1: AM Congested Corridors**



**Map 8.2: PM Congested Corridors**



### 8.2.2 Potential Intersection Hot Spots

An added value byproduct of travel time runs over a network consisting of approximately 330 centerline miles is that potential intersection hot spot congested locations can be identified. Using average approach delay (for through movements only) at intersections and HCM 2000 delay-LOS thresholds, potential intersection hot spots on the CMP network were identified. The CMP network consists of approximately 1,170 intersections, of which 845 are controlled by a traffic signal.

In the AM peak period, through movement approaches at forty (40) intersections had vehicular delays along the main road that correlated with HCM LOS E or F. In the PM peak period, through movement approaches at forty-one (41) intersections had vehicular delays along the main road that correlated with HCM LOS E or F. These intersections are illustrated in tables 8.2 and 8.3. It should be noted that this is a planning level analysis that does not adequately substitute for detailed traffic operational studies that are normally performed to identify improvement needs and improvement concepts to alleviate local congestion.

**Table 8.2: 2008 Corridors with Multiple AM Potential Hot Spot Intersections**

Route ID	Route Name	# of Congested Intersections
1001	Clemson Rd / Killian Rd - EB	2
1002	Clemson Rd / Killian Rd - WB	3
1011	Hardscrabble Rd - NE	2
1012	Hardscrabble Rd - SW	3
1021	Longs Pond Rd / Pisgah Church Rd - NB	3
1038	SC Hwy 12 / Forest Dr / Percival Rd / Taylor St / Fort Jackson - WB	2
1047	SC Hwy 6 / Lake Dr / Dreher Shoals Rd - NB	4
1050	SC Hwy 768 / Shop Rd - SE	3
1060	US Hwy 176 / River Dr / Broad River Rd - SE	3
1068	US Hwy 321 / US Hwy 21 / Main St / Wilson Blvd - SB	2

**Table 8.3: 2008 Corridors with Multiple PM Potential Hot Spot Intersections**

Route ID	Route Name	# of Congested Intersections
1002	Clemson Rd / Killian Rd - WB	2
1011	Hardscrabble Rd - NE	2
1037	SC Hwy 12 / Forest Dr / Percival Rd / Taylor St / Fort Jackson - EB	2
1047	SC Hwy 6 / Lake Dr / Dreher Shoals Rd - NB	3
1048	SC Hwy 6 / Lake Dr / Dreher Shoals Rd - SB	4
1049	SC Hwy 768 / Shop Rd - NW	2
1062	US Hwy 21 / US Hwy 176 US Hwy 321 / Blossom St / Charleston Hwy - SB	2
1063	US Hwy 321 / Huger St - NB	2
1064	US Hwy 321 / Huger St - SB	2
1070	US Hwy 378 / Columbia Ave / Augusta Hwy / Sunset Blvd / Geravis St - WB	2
1071	US Hwy 378 / US Hwy 1 / Millwood Ave / Two Notch Rd - NE	2

### 8.3 Future Updates

In addition to providing an analysis of existing conditions, the CMP also outlines a suggested program for updating the document once every four years. The recommended program includes guidelines for collecting new data to ensure all future data collection efforts are consistent with existing parameters. The result will be a continuous record of travel conditions on key corridors allowing for time series analysis and the identification of locations with increasing or decreasing congestion levels. The recommended field data collection and GIS database maintenance guidelines are provided below.

#### **Field Data Collection**

**Stage 1:** Examine congestion monitoring network versus travel demand model and note additional corridors for consideration.

**Stage 2:** Perform travel time runs for defined corridors in congestion monitoring network.

**Stage 3:** Physical roadway conditions along corridors already coded in GIS system are available for re-use. Collect additional roadway characteristics for new corridors.

**Stage 4:** Consider increasing number of travel time runs per corridor to increase statistical validity of results (3 to 4 runs).

### **GIS Database**

**Task 1:** Re-use Linear Reference System for existing corridor network (i.e. 660 directional miles). Update Linear Reference System with any new corridors in the monitoring network.

**Task 2:** Re-use corridor features for existing corridors and collect additional features for new corridors designated for travel time runs.

**Task 3:** Use current 2008 CMP data to verify and cross-check future data collection efforts.

It is recommended that the LOS E and F corridors be examined after four (4) years, along with any additional corridors identified by CMCOG and 1/2 of the LOS D corridors. In the Year 2016, a major update would be recommended, encompassing all of the corridors.

## **8.4 Mitigation Strategies for Congested Corridors**

A primary component of the CMP process involves developing a toolbox of mitigation strategies that are consistent with federal guidelines and can be applied to the identified congested corridors and intersections. The toolbox is intended to provide a hierarchical methodology for congestion mitigation that begins with the most cost effective and efficient strategies and ends with the most cost prohibitive and intrusive strategies (i.e. road widening for capacity improvement). The five major levels of mitigation strategies can be summarized as projects that include:

### **1) Decreasing the need for trip making (strategies at regional level versus corridor level)**

- Land use policies and regulations to limit growth in areas with limited infrastructure
- Land use policies and regulations to enhance jobs to housing balance along corridors and within sections of the region
- Flexible work hours

### **2) Shifting trips from automobiles to other modes**

- Public transit capital improvements (exclusive right-of-way, commuter express, circulator, park and ride)

- Public transit operational improvements (service enhancements, queue jumpers, information systems)
- Encourage the use of non-motorized modes (sidewalks, bicycle facilities, transit park and ride)

### **3) Increasing the use of High Occupancy Vehicles**

- Parking management/fee adjustment
- Vanpooling programs
- Ride share matching services

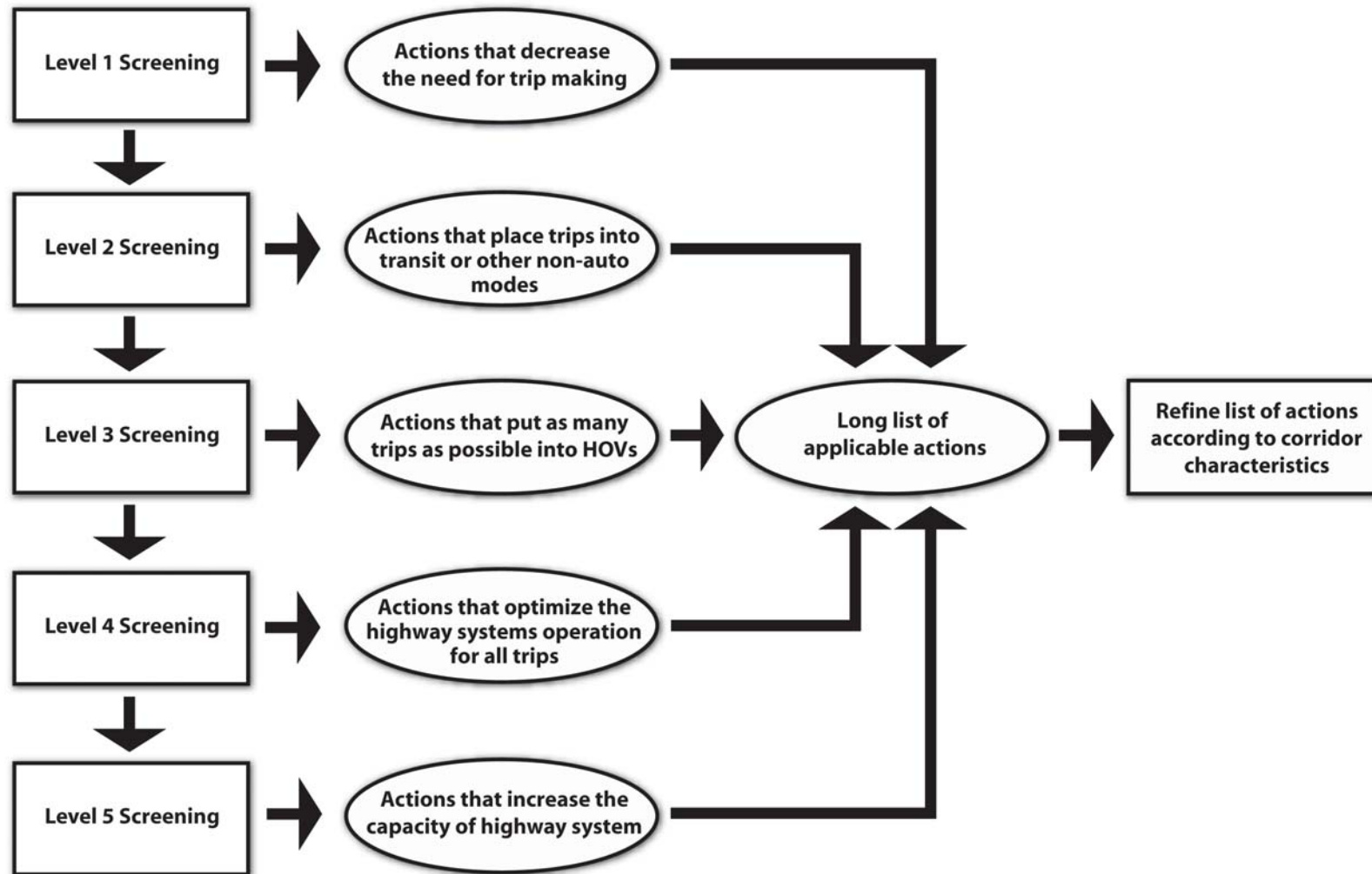
### **4) Enhancing operations on existing roadway facilities**

- Traffic operations improvements (intersection widening, signal coordination, traffic surveillance and control systems)
- Incident Management (detection and clearing of incidents)
- Access management (medians, signal and driveway spacing, frontage roads, inter-parcel connections)

### **5) Increasing roadway capacity through additional infrastructure Arterial roadway capacity (widening and new roads)**

As a part of the CMP, each congested corridor is subjected to a screening process that examines the unique characteristics of the roadway and determines the most appropriate level of mitigation treatment and corresponding improvement strategy. Figure 8.1 further illustrates the application of the screening process.

Figure 8.1: Process and Toolbox of Mitigation Strategies



## **8.5 Implementation of the Congestion Management Plan**

The CMP is expected to play an important role in COATS' future efforts to improve mobility in our region. COATS is faced with severe funding limitations and the likelihood that our region will fall under the U.S. Environmental Protection Agency's air quality "non-attainment" status. The CMP provides a series of coordinated strategies that can work within the expected funding constraints. The CMP also offers an array of potential projects that would comply with EPA air quality requirements and help the region meet its new air quality goals.

The CMP toolbox includes a wide range of programmatic, design and construction techniques to improve mobility. Road widening is one of these techniques, and, as "Level 5" of the five-level CMP screening system, is recommended for the most severely congested corridors.

The following implementation approach is based on funding strategies and organizational actions.

### **8.5.1 Funding Congestion Management**

Over the 27 year Midlands Tomorrow planning period, the financial plan recommends \$303.5 million for road widening, out of a total Guideshare revenue estimate of \$355.6 after debt service. Fifty-two million dollars is proposed for Intersections, Signal System, and Congestion Management/ITS. ("ITS" refers to Intelligent Transportation Systems, a sub-set of congestion management that focuses on technology to improve the safety and efficiency of travel). These funding recommendations are found in Table 12.1: Base Funding, Coast Constrained Plan in Chapter 12.

Other sources of funding available in the Financial Plan include transportation enhancement funds, which can be used to improve non-motorized transportation facilities, and Federal Transit Administration (FTA) Section 5307 funds, which can be used to fund transit-oriented CMP techniques.

The funding recommended in the Financial Plan for intersections, signalization, and ITS escalates over the lifetime of the plan, with increases occurring as funding hopefully increases with each reauthorization of the federal transportation funding bill.

Finally, staff is currently reviewing funding opportunities under the second economic stimulus bill expected in early 2009. This legislation

is expected to provide funding for “shovel ready” infrastructure projects including transportation facilities. COATS staff feels that this may provide an opportunity to accelerate the implementation of the CMP because, by definition, CMP projects can be designed and implemented relatively quickly.

### **8.5.2 Organizational Actions**

Following through on the recommendations of the CMP will require a number of new activities for COATS staff and consultants. These include performing the periodic traffic surveillance, working with the CMRTA and SCDOT, working with major employers and developing CMP projects for implementation. COATS will designate an existing qualified employee as CMP coordinator to lead a team in carrying out the CMP work program.

Additionally, COATS will add a congestion management component to all corridor plans, sub-area plans, and other special projects undertaken by the organization. During the annual development of the Unified Planning Work Program (UPWP), CMP monitoring and maintenance activities will be included, and any additional special projects needed to carry the CMP objectives forward will be included.

## **8.6 Objectives and Strategies**

- 1. Encourage the local and regional adoption of the CMP five step screening process for addressing congestion issues on key corridors in the central midlands region.**
  - Apply the CMP Screening process to all 4 and 5 lane roads identified in the 2035 highway widening needs assessment
  - Apply the CMP Screening process to projects in the enhanced revenue road widening list prior to inclusion in the cost constrained plan
  - Add a congestion management component to all corridor plans, sub-area plans, and other special projects undertaken by the organization to include consideration of the five step screening process on recommended projects
  - Encourage the use of the CMP five step screening process by member governments in developing local transportation planning priorities (e.g. transportation elements of comprehensive plans and Capital Improvement Programs)

**2. Implement a program of continuous monitoring and maintenance of the CMP and all associated datasets.**

- Update the CMP on the recommended four year cycle
- Follow recommended guidelines for updating travel times on congested corridors
- Follow recommended guidelines for maintaining associated GIS databases