DCHC

Metropolitan Planning Organization

Planning Tomorrow Today

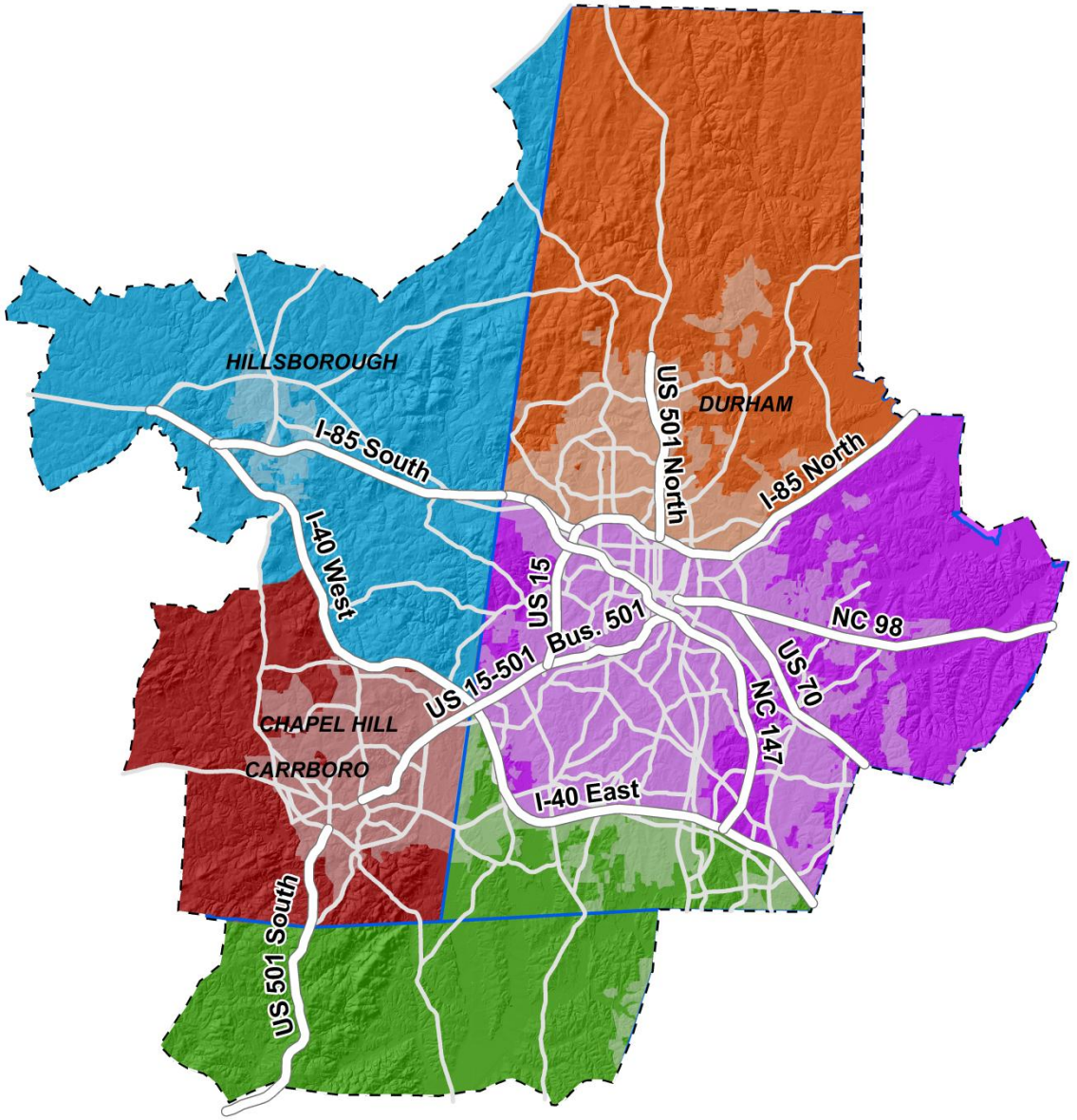
prepared by Stantec Consulting Services Inc.
& J S Lane Company, LLC

July, 2014

DCHC MPO CONGESTION MANAGEMENT PROCESS - SYSTEM STATUS REPORT 2014

The 12 Corridors (listed below) and five districts used in the Congestion Management Report are shown on this map.

Corridor	Extent
I-85 North	I-85 inside Durham County
US 70	Durham County to NC 98
I-40 East	I-40 inside Durham County
I-40 West	I-40 inside Orange County and DCHC planning area
US 15-501	Chapel Hill to MLK Boulevard
US 15-501 BUS.	South of Downtown Durham
Business 501	MLK Boulevard to NC 147
I-85 South	I-85 from Durham County to I-40 merge
NC 147	I-40 to I-85
US 501 North	I-85 to Latta Road
US 501 South	NC 54 to DCHC planning area boundary
NC 98	Roxboro Street to Durham County



EXECUTIVE SUMMARY

The CMP System Status Report indicates that the DCHC MPO and the greater Triangle Region is doing quite well in managing congestion and related issues compared to other metropolitan regions with similar growth and size characteristics. The public survey conducted suggests that people in our Region are nevertheless concerned about congestion, with minor variations depending on race, income, age, or gender. Congestion and public transportation ridership levels vary greatly across the 12 corridors studied, and there is considerable room for improvement in many places for policy, program and infrastructure investments. The specific strategies for improvement are discussed at the end of this report in greater detail.

Executive Summary

Overview: The Durham-Chapel Hill-Carrboro (DCHC) Metropolitan Planning Organization (MPO) **has created this report to help its citizens, elected officials, business partners, and other laypeople gain access to an array of transportation performance information** that otherwise would require many hours of sifting through detailed technical memoranda, databases, and other sources of information.

The report comprises the major documentation of the Congestion Management Process (CMP) that the DCHC MPO uses to identify, evaluate, and monitor congestion-related issues. The importance of understanding the scope, duration and impact of transportation issues is hard to overstate, impacting business operations, daily travel, personal safety, availability of mobility options, and the delivery of goods and services that everyone in our planning area (Durham County, and parts of Orange and Chatham counties as well) needs.

The major body of work necessary to produce this report comprised collecting, analyzing, and summarizing a tremendous amount of data from a variety of sources, some of which are created only through the DCHC MPO planning process. This performance has been presented in such a way that it hopefully provides an easy understanding of where we stand with respect to our transportation systems.

Highlights of Where We Are Now in Transportation Performance: The 12 major transportation corridors addressed in this report provide a snapshot of transit service that, while still light, provides some significant benefits to overall travel in several of the corridors, particularly between our major urban centers. Compared to auto travelers, transit riders are incurring a 3:1 or 4:1 differential in their travel times between major destinations, indicating that with better, more direct service further increases in transit ridership are possible, based on improved competitiveness. Walking and cycling is notably less pervasive, in part due to a dearth of infrastructure compared to that provided for the private automobile.

Driving is still the dominant form of personal travel and primary means of moving freight in our area, with 96% of the sample population owning at least one car. The cost of congestion for a car driver can range as high as $2.00 per trip on one of these corridors; yet our metropolitan area is one of the least impacted by travel delay of any comparable metro, as measured in one nationwide survey (interestingly, 45% of survey respondents felt that traffic congestion has gotten “a lot worse” since they moved here). Peak congestion typically added less than 10% more time to the off-peak trip, validating other sources that suggest we are managing peak period travel delay well. Transportation performance means different things to different people: women and seniors are more sensitive to safety concerns, and lower income populations are less likely to be mobile either by car or by bicycle.

At a system-wide level, we are doing quite well as a region, showing relative (compared to what we might expect with our growing population) improvement in travel delay and fuel consumption, for example.

This report provides some summary information across five sub-districts, as well as maps to provide more detailed information to the reader (*see Map Book*).

Where Do We Go From Here: This report suggests a menu of recommended treatments to support improvements in these corridors, but in reality detailed assessments – corridor studies – should be performed to determine how to best improve travel conditions in the region. The report should be updated periodically, preferably on

the same cycle as the metropolitan transportation plan updates – about every four years. Although collecting and re-evaluating the data to produce the successors to this report is not a simple task, it is necessary to complete the monitoring component of the CMP and, more importantly, to help us understand how previous actions have improved transportation performance.

Recommended Treatments: With this report, decision-makers, MPO officials, and local planners will have a better understanding of congestion in the DCHC MPO planning area and can take steps to prioritize and implement the necessary infrastructure improvements to resolve congestion issues. The locations of the infrastructure projects are identified in this document as areas for improvement. The majority of these projects are not yet funded for implementation. A map illustrating the locations of all projects is provided at right (Figure 1). In addition to the specific projects identified on the map and listed on the following page (Table 1), four other policy recommendations were included as part of the final conclusions of this report. These are listed below; see the final section for a more detailed description of each of these recommendations, the performance areas addressed by each, resources required to implement them, and timing considerations.

1. Support Private Sector Technology Solutions
2. Implement Dynamic Signalization in Durham in Select Corridors
3. Implement Ramp Metering on I-40, NC 147, 15-501, and I-85 (sections)
4. Emphasize Non-Recurring Congestion in Planning and Design

These more policy-focused recommendations merit significant consideration, as do the unfunded project recommendations outlined in the table below. Using this report as well as subsequent updates and revisions to the report as a guide, the DCHC MPO can target available funding resources to those areas with the most severe congestion.

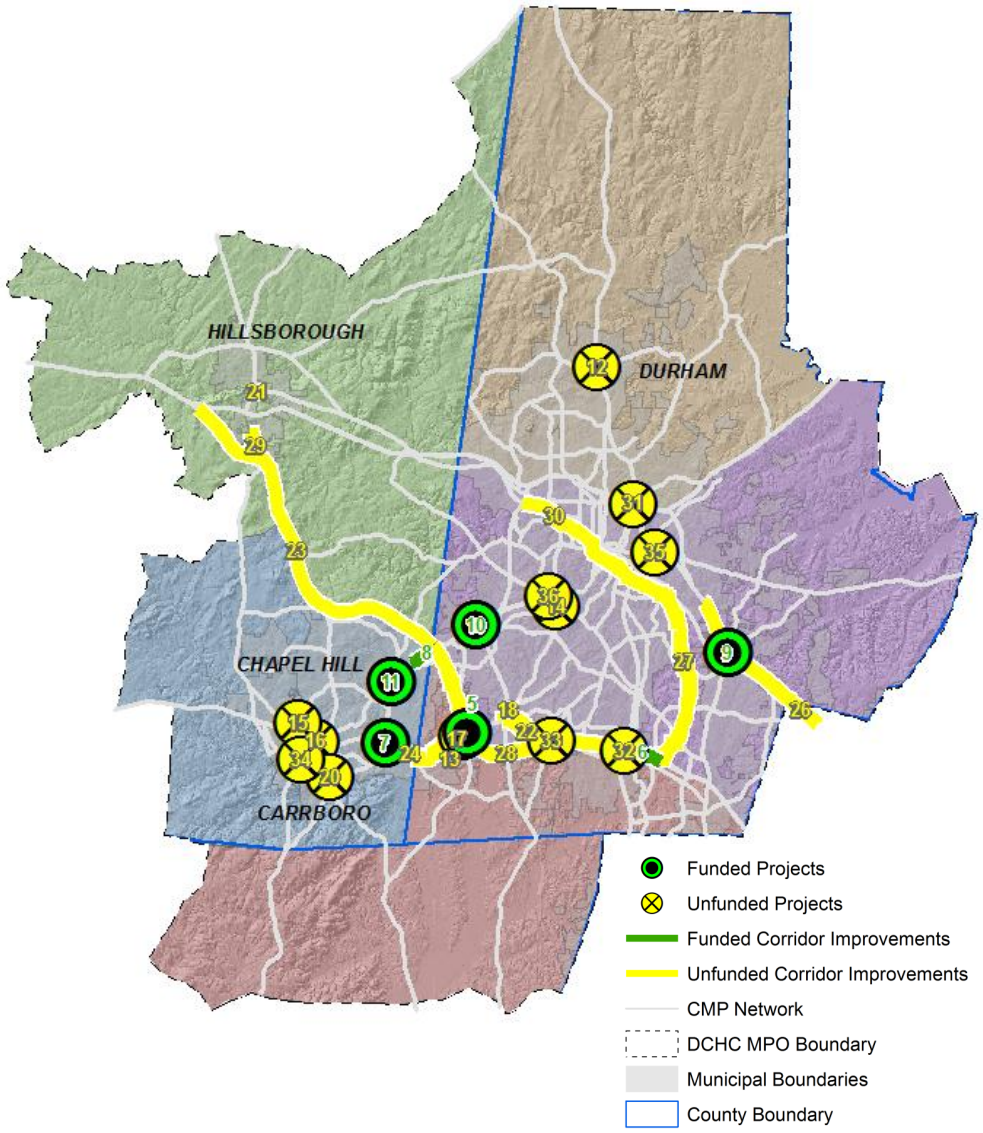


Figure 1. Project-Level Recommendations (refer to Table 1 for descriptions)

Status	MAP ID	Recommendation	On
Funded / Programmed	5	***Improve interchange (Durham County)***	*I-40*
	6	***Widen for a westbound auxiliary lane (Durham County)***	*I-40*
	7	***Improve interchange (Orange County)***	*US-15, US-501*
	8	***Upgrade to "Superstreet" (Orange County)***	*US-15 Fordham Boulevard, US-501*
	9	***Upgrade existing at-grade intersection to interchange (Durham County)***	*US-70*
	10	***Upgrade at-grade Intersection to Interchange (Durham County)***	*US-15, US-501*
	11	***Intersection improvements (Orange County)***	*US-15, US-501*
Unfunded, but Prioritized	12	***Add lanes through intersection***	*US-501 Roxboro Road*
	13	***Construct grade separation***	*NC-54*
	14	***Construct Roundabout***	*NC-751 Hope Valley Road*
	15	***SR 1780 (Estes Drive)/SR 1772 (Greensboro Street) Construct Roundabout***	*SR-1780 Estes Drive*
	16	***Franklin Street/Merritt Mill Road/Brewer Ln/East Main Street intersection Improvements***	*SR-1010 Franklin Street/East Main Street*
	17	***Widen Roadway to 6 Lanes with Bicycle, Pedestrian, and Transit Facilities (Adjacent Multiuse Path)***	*NC-54*
	18	***Construct new alignment***	*Woodcroft Pkwy Ext*
	19	***Light rail system from UNC Hospital in Chapel Hill to Alston Avenue in downtown Durham***	*TTA Durham - Orange Co Light Rail FY 2016*
	20	***Construct additional lane for northbound to eastbound entry movement***	*US-501 Fordham Blvd*
Unfunded, but Prioritized	21	***Orange Grove Road Extension (Orange Grove Road to US 70) with Sidewalks and Bicycle Lanes***	*SR-1006 New Route - Orange Grove Road*
	22	***Widen to Multi-Lanes with Bicycle, Pedestrian, and Transit Accommodations***	*NC-54*
	23	***Add Additional Lanes***	*I-40*
	24	***Improve NC 54 to a Superstreet design and construct interchange at Barbee Chapel Road***	*NC-54 Raleigh Road*
	25	***Construct Roundabout and Related Safety Improvements at the Existing intersection of Mount Carmel Church Road and Bennett Road***	*SR-1771*
	26	***I-40 from I-85 to US 15/501: Upgrade Roadway to Freeway***	*US-70*
	27	***Widen Roadway to 6 Lanes and Rehabilitate Pavement***	*NC-147 Durham Freeway*
	28	***Construct 1 Managed Lane Per Direction (Additional 16Ft of Pavement - 12Ft Lanes + 4Ft Pavement For Separation with General Purpose Lanes)***	*I-40*
	29	***I-40 to Eno River. Widen to Multi-Lanes with Landscaped Median, Bicycle Lanes, and Sidewalks, Widen Bridge No. 240 Over Southern Railroad***	*SR-1009 South Churton Street*
	30	***NC 147: Widen to 6 lanes***	*NC-147 Durham Freeway*
Unfunded, not Prioritized	31	***Safety/Access Management Improvements***	*Roxboro and Avondale near I-85*
	32	***Safety/Access Management Improvements***	*I-40 and NC 55/NC 54*
	33	***Safety/Access Management Improvements***	*I-40 and Fayetteville Road/NC 54*
	34	***Creation of parallel routes, Increase Bus Frequency, Add Park and Ride***	*Smith Level Road and NC 54*
	35	***Widen from 3 to 4 lanes, improve access management***	*NC 98 (Holloway St)*
	36	***Restripe markings, pavement rehabilitation, new marking considerations, extend acceleration lanes***	*Chapel Hill Road and Cornwallis Road*

Table 1. Project-Level Recommendations (refer to Figure 1 for locations)

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CONGESTION MANAGEMENT PROCESS

What is included here?

1. The CMP: *What is It?*
   - *Regulatory Basis*
   - *Regional Context*
   - *Purpose of this Report/How will it be Used?*
2. The CMP 8-Step Process
3. Primary Performance Measure Information

The Congestion Management Process (CMP) is a federal requirement comprised of a number of steps, or actions, that the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO) has to undertake periodically. The CMP identifies transportation performance measures, issues, strategies, and monitoring practices. The remainder of this report is the documentation of the CMP actions.

Congestion Management Process

The CMP: What is It?

The CMP has been defined by the Federal Highway Administration of the US Department of Transportation as a systematic and regionally-accepted approach for managing congestion that provides accurate, up-to-date information on transportation system performance. It also assesses alternative strategies for congestion management that meet state and local needs and is intended to advance the strategies towards implementation. This report is a companion to the DCHC *2014 Mobility Report Card*, which goes into exhaustive detail for data collection; this report focuses instead on using data to present an accessible picture of congestion-related performance.

Regulatory Basis

Congestion Management Process (CMP) provides a systematic and continuous way for transportation planning in the DCHCMPO area to identify and manage congestion in a multi-modal manner. The development and implementation of a Congestion Management Process (CMP) in a metropolitan area with population exceeding 200,000, known as a Transportation Management Area (TMA), is a requirement of the current surface transportation law-MAP-21. As stipulated by federal regulations, the MPO CMP must include a data collection and monitoring system, a range of strategies for addressing congestion, performance measures or criteria for identifying when action is needed, and a system for prioritizing which congestion management strategies would be most effective. The goal of a CMP is to have a systematic, transparent way for transportation planning agencies to identify and manage congestion and utilize performance measures to direct funding toward projects and strategies that are most effective for addressing congestion.

Regional Context

The Research Triangle region is a burgeoning sunbelt metropolitan region. The region has experienced a rapid growth in population and jobs. Population in the region is one of the fastest growing in the country. Population of the region is forecasted to increase 81% between 2010 and 2040. The number of households is projected to increase 79%, and number of jobs is forecasted to increase 61% during the same period. As our region has grown so has traffic congestion. The main reason for the increase in congestion within the DCHC MPO area and the region is the increase in population, but it is also attributable to a significant increase in Single Occupant Vehicles (SOV), or drive-alone trips, and a relative increase in longer trips. Over the past two decades, auto occupancy in the triangle region has been decreasing consistent with the national trend. This general decrease in auto occupancy has been accompanied by an increase in auto registration and a relative increase in vehicle miles of travel. Along with this trend, the U.S. Census data shows the average household size is declining while the number of trips per household and the average travel time per vehicle is increasing. The result is the intensification of congestion within the DCHC urban area and as well as in the Triangle Region.

Purpose of this Report/How will it be Used?

Traffic congestion continues to challenge our transportation system, resulting in additional delays, excess fuel consumption, higher emissions and raise economic cost. The MPO CMP and the State of the System report will be used to:

- Provide a framework for responding to congestion in a consistent and coordinated manner.
- Measure multi-modal transportation system performance with data collected on an annual basis.
- Identify congestion problem locations.
- Determine the causes of congestion.

- Develop and evaluate alternative strategies to mitigate congestion.
- Implement cost effective actions.
- Measure the progress of implemented strategies in reducing congestion.
- Identify low cost strategies that complement major MTP capital recommendations.
- Inform and receive information from other elements of the MPO transportation process, including the Metropolitan Transportation Plan (MTP) and the Transportation Improvement Program (TIP).
- Support the re-evaluation of the MTP goals, objectives and performance targets.
- Assist in monitoring of the MTP performance targets.
- Support the incorporation of the CMP into NEPA Concurrency 1: Purpose and Need.
- Feed into the development of CTP and MTP Purpose and Needs statement.
- Provide a framework for the integration of operations into the planning process.
- Provide a guide and information for consideration by traffic and division engineers when considering low cost strategies (low-hanging fruits solutions).

The CMP: 8-Step Process

The FHWA updated its Congestion Management Guidebook in 2011, which recommends a number of steps that comprise a valid and useful congestion management process, with the evaluation stage (Step 8) feeding back into the assessment of performance in subsequent updates. Importantly, federal guidance recommends a variety of transportation characterizations be taken into account in the CMP, such as partnerships, community livability, respecting the context of individual corridor conditions, and working multimodal measures into the CMP. All of these are all emphasized in the current generation of best practices. The CMP is required to consider "reasonable" demand management and operations strategies for a corridor in which single-occupant vehicle (SOV) capacity increases are proposed. In these regards, the CMP is not effective if it becomes a stand-alone process and document; it has to be a part of the overall planning and decision-making process.

Step 1: Develop Objectives

The objectives of the CMP should derive from the many previous studies and plans developed by the DCHC – particularly the Metropolitan Transportation Plan. Hence, this document points back to that Plan and other adopted plans for objectifying the performance of the transportation system.

This CMP includes descriptions of and performance measures for so-called "alternative" travel modes (biking, transit and walking) with the goal being to assess how well the area accommodates and encourages its travel options.

Step 2: Analysis Sub-Areas and CMP Corridors

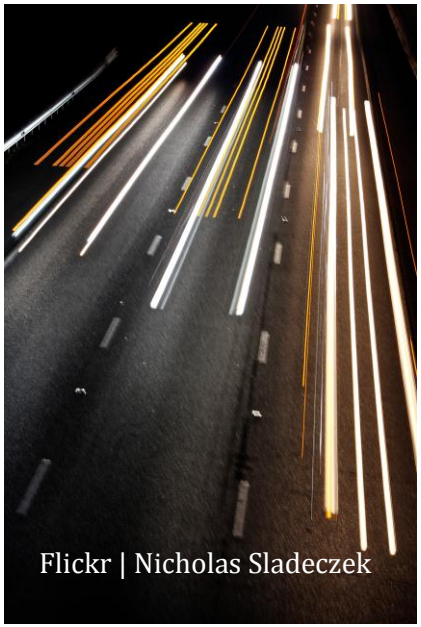
The DCHC planning area has too many streets, neighborhoods, transit routes, and bicycle-pedestrian corridors to present in a way that can be easily grasped, much less help to distill important directions in transportation performance. Therefore, a combination of congestion (identified through computer modeling), crash histories, and volumes of traffic were used to identify 12 major corridors into which some of the performance data was aggregated to help discern performance. Similarly, five sub-areas were identified that correspond to the major, contiguous areas of influence in the Region: central Durham County; north Durham County; south Durham County/north Chatham County; Chapel Hill-Carrboro's vicinity; and the Hillsborough/northeast Orange County area. These five subareas roughly correspond the urban agglomerations of Chapel Hill/Carrboro, Durham, and Hillsborough and their surrounding areas.

The more rural north Durham and south Durham areas deserve their own subareas to help separate them from the more urban conditions in central Durham County. Although DCHC has to look at its entire study area, people residing in these five areas will perhaps more easily identify with their own place as opposed to a larger region or corridor.

Step 3: Performance Measures

The role of performance in the CMP and other MPO processes is substantial, since they provide clear benchmarks into how well the transportation system is performing. The DCHC MPO and its consultant identified a list of candidate performance measures that could be **readily obtained** through existing data sources, provide a **unique perspective** on transportation performance, insert more **clarity** into how decision-makers understand the functioning of various transportation modes, and with each measure having a **clear purpose** in terms of explaining one or more goals in the long-range transportation plan (into which any recommendations coming from this process and document must enter to be implemented). Most of the measures discussed in the CMP were part of the CMP Framework Study completed by DCHC in 2011.

The performance measures contained in this report (generally described by mode) meet these criteria; additional measures, particularly system- and metro area-wide performance measures, were added to help round out the "big picture" of our planning area's performance. It is important to note that the modes of travel often work together, with buses traveling along with autos, and pedestrians walking to transit stops.



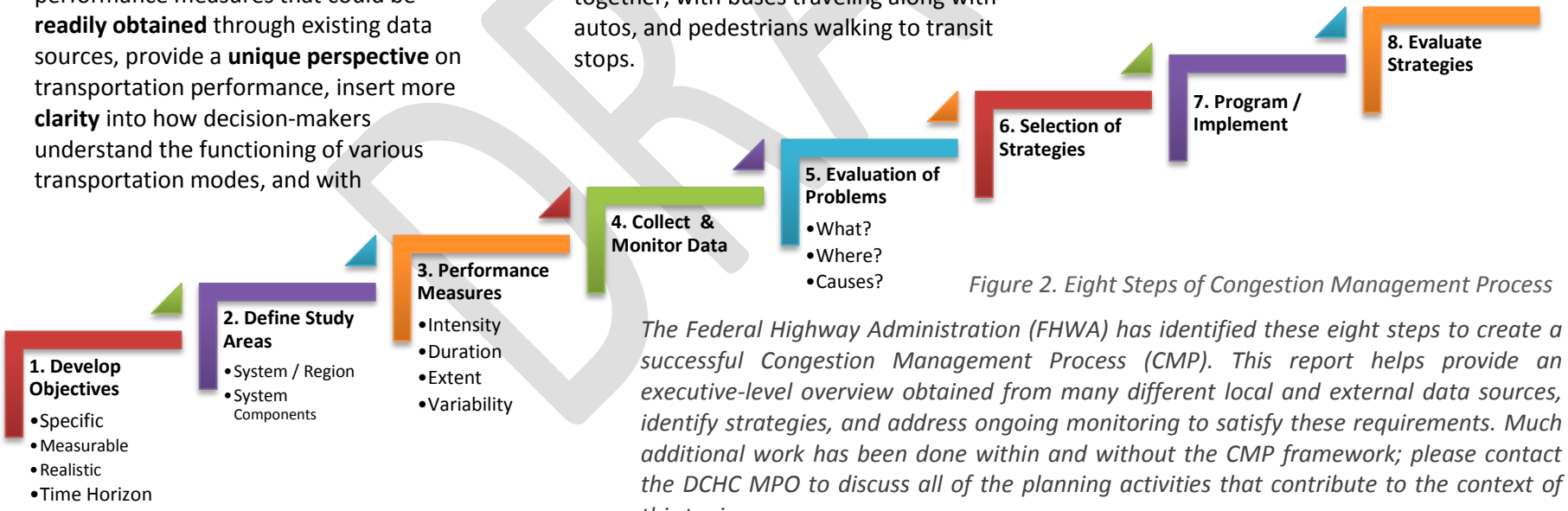


Figure 2. Eight Steps of Congestion Management Process

The Federal Highway Administration (FHWA) has identified these eight steps to create a successful Congestion Management Process (CMP). This report helps provide an executive-level overview obtained from many different local and external data sources, identify strategies, and address ongoing monitoring to satisfy these requirements. Much additional work has been done within and without the CMP framework; please contact the DCHC MPO to discuss all of the planning activities that contribute to the context of this topic.

Step 4: Collect & Monitor Data

DCHC MPO, NCDOT, and transit operators as well as third-parties like the Texas Transportation Institute's Congestion Management Report provided the bulk of the data. These data sets included travel time studies along 160 individual routes; hundreds of daily traffic counts, and forecasted information from the Triangle Regional Travel Demand Model as well as on-board data collection of the three main transit operators (Durham, Chapel Hill, and Triangle Transit)* in the study region. The data will be collected again within the next four years (at a maximum) and the updated report completed at that time will be able to compare information contained in this report to help understand trends as well as the effectiveness of strategies implemented by the MPO.

Steps 5 & 6: Evaluation of Problems and Selection of Strategies

The degree of congestion, crash records, and travel time information were compared against each other to identify the "hot spots" and shorter sections of the transportation system that have now, or are expected to have in the future, performance issues.

**Note: Orange County Public Transit did not have comparable data at the point in time for this report, but it is described where possible.*

The strategies were accordingly devised based on the context of the roadway (e.g., ramp metering isn't feasible if the roadway experiencing congested conditions isn't a controlled-access facility) as well as the type of problem noted. Two levels of strategies were noted: broad, corridor-based actions as well as more focused, defined actions that the MPO and / or its partner agencies can undertake to alleviate particular "hot spot" areas suggested by the analysis or to create a policy response.

Step 7: Program & Implement

DCHC MPO, like other metropolitan planning organizations, has to adopt a metropolitan transportation plan with a fiscally constrained 20-year (minimum) outlook. Longer-term actions recommended in this CMP document can be implemented through that document; however, some of the policy responses or program recommendations could be implemented sooner through the annual work program or even through third-party partnerships.

Step 8: Monitoring and Evaluation

Future iterations of this report will need to compare the data contained in this version with any datasets that have been updated, which means that updated travel time runs, new model information, and new daily traffic counts will need to be gathered. The format of the report and the graphics used will also need to be reconsidered, since a trend (of sorts) will be described to understand if the directionality of the performance measure is desirable. The DCHC MPO staff and boards will discuss the outcomes of this comparison and decide if certain strategies are effective or if other measures are necessary through their regular board meetings and planning processes.

Table 2 illustrates the primary (there were secondary, system-level measures shown to help compare our metropolitan area to peer regions) performance measures and desirable targets or direction of trend values, some of which should be considered in light of the DCHC planning area's population growth rather than in absolute terms, due to the area's high growth rate. Comparing population growth to the change in a congestion-related performance measure does not imply a strictly linear relationship, but does recognize that as more people are added to the transportation system it will face greater pressures than would be expected in a low- or no-growth area. In most cases, where a relative change is shown in this report, the absolute change is also shown.

Table 2. Primary Performance Measures and Targets

PERFORMANCE MEASURE	TARGET (OR TREND)
Volume-to-Capacity Ratio	*0.80 on major arterials, exclusive of high pedestrian activity centers*
Percent Time Spent in Congestion	*DOWN, relative to population growth*
Crash Rate (per VMT)	*DOWN*
Vehicle Miles of Travel	*DOWN, relative to population growth*
Travel Time Index (TTI)	*DOWN*
Percent Non-Motorized Mode Share	*UP, IN ABSOLUTE TERMS*
Connectivity Ratio or Index	*1.5*
Sidewalk-to-Street Centerline Ratio	*1.0*
Ratio of Transit Travel Time to Auto Travel Time	*2:1*
Persons within ¼-mile Distance of Transit Service	*75%*
EJ Population with ¼-mile Distance of Transit Service	*90%*
Cost of Congestion	*DOWN, relative to population growth*
Survey of Users / MPO Member Agencies	*Improved perception of congestion conditions*

A CONGESTION MANAGEMENT PROCESS (CMP) *is a systematic and regionally-accepted approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meet state and local needs. The CMP is intended to move these congestion management strategies into the funding and implementation stages.*

– Congestion Management Process Guidebook, 2011

PERFORMANCE RESULTS/CURRENT TRENDS

What is included here?

1. Introduction to Performance Results
2. Performance Measures – How do we compare?
3. How the World Sees Us
4. How We See Ourselves
5. Roadway Performance
6. Transit System Performance
7. Alternative Mode Performance
8. The Map Book

This section provides an overview of the four main areas of performance review conducted for the CMP: a system-level overview ("How Others See Us"); the results of a public survey ("How We See Ourselves"); and three sections on automobile, transit, and alternative mode (transit, bicycle, pedestrian) travel. Later sections also describe the location of "hot spots" or bottleneck areas, as well as high crash rate locations that contribute to non-recurring congestion problems.

Introduction to Performance Results

The Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO or referred to as simply "DCHC" in this report) is required to provide a picture of the transportation conditions – performance – within its planning area. This area covers Durham County and a portion of Orange and Chatham Counties, as well as the City of Durham and municipalities of Carrboro, Chapel Hill, and Hillsborough.

DCHC has strongly committed to developing data collection strategies and analyses to assess and monitor transportation conditions in automobile, public transportation and bicycle-pedestrian modes of travel in the past. **The purpose of the *DCHC MPO CMP System Status Report 2014* is to summarize and present all of this information in a way that is meaningful to elected officials, stakeholders, and segments of the public that may not be familiar with a lot of the transportation procedures and jargon commonly used in the day-to-day planning, design, construction, maintenance and service provision of a large transportation network.**

A series of "dashboards" and maps allow us to visualize the performance of our transportation system. Additionally, more detailed information can be obtained by contacting DCHC directly. The contents of the *DCHC MPO CMP System Status Report 2014* (the "Report") are as follows.

How the World Sees Us: Since much of the information that the average business or person considers is not the same as that collected through the extensive fieldwork and efforts of DCHC and its partners, presenting a picture to the rest of the world is often left to third-party data sources. This section describes how that data describes us in terms of traveler delay, time spent in congestion, freight mobility, and our "walkability."

How We See Ourselves: An important part of this study is "checking the pulse" of our citizens: how they get around, if they think mobility is getting better or worse, and other ways that our customers judge *our* performance.

Roadway Performance: A tremendous preponderance of our mobility is derived from our roadway system, including the buses that run on it and the bicycle facilities and sidewalks that share space with roadway corridors. This section describes typical congestion and delay figures in more depth and with more accuracy, not just for the DCHC study area but for key subareas and corridors.

Alternative Mode Performance: Alternative modes are, for increasing numbers of people, vital lifelines to school, work, and medical treatment. This section of the Report describes pedestrian, bicycle, and transit performance in terms of delay, Extent, and competitiveness with the private car.

Three more sections, Displaying Information in Space, the Map Book, and the Recommended Evaluation and Strategies, complete the report and help fulfill federal requirements as well as identify sources of information.

Monitoring and Future Steps: This Report serves as the accessible information piece of the federally mandated Congestion Management Process (CMP) that DCHC has to provide and update. A key component of that effort is the monitoring and establishment of goals and priorities. The DCHC MPO will update the CMP whenever it updates its Metropolitan Transportation Plan (MTP). This ensures that the planning efforts are coordinated and efficient. This section will also highlight how DCHC is planning on improving roadway, public transportation and bicycle/pedestrian performance over time.

Sources and Data: This Report contains a lot of information, and the graphics are largely provided through an updateable MS-Excel™ workbook that can also serve as a presentation tool. The Sources and Data Section describes how to access, update, and use this information.

Performance Measures – *How do we compare?*

Table 3 provides insight on the transportation performance of the Durham-Raleigh Metropolitan region. In addition to providing a baseline for understanding regional transportation performance, this chart also compares the Durham-Raleigh Metropolitan Region to "peers;" i.e. regions of a similar size. This chart uses data from 2001 and data from 2011 for this comparison and helps refine our understanding of transportation performance over time. More information about transportation performance in this region is presented by mode in the following pages.

Table 3. Regional (Durham-Raleigh Metropolitan Area) Performance, 2001 - 2011

Performance Measure	Average of Our Metro Peers in 2001	Durham-Raleigh Metro 2001	Average of Our Metro Peers in 2011	Durham-Raleigh Metro 2011	Durham-Raleigh Metro Difference Between 2001 - 2011	Durham-Raleigh Metro Better from 2001 - 2011?	Durham-Raleigh Metro Better than Population Change 2001 - 2011?
Population (1,000)	1,414	790	1,609	1,142	44.6%	N/A	N/A
Peak Travelers (1,000)	745	418	910	651	55.7%	✗	✗
Commuters (1,000)	691	388	844	605	55.9%	✗	✗
Freeway Vehicle Miles Travel (1,000)	12,912	7,715	15,487	12,738	65.1%	✗	✗
Arterial Vehicle Miles Travel (1,000)	12,628	10,320	14,205	12,427	20.4%	✗	✓
Transit Passenger Miles (Million)	179	50	200	100	99.6%	✓	✓
Transit Unlinked Trips (Million)	40	12	40	24	110.3%	✓	✓
Gasoline Cost ($)	$1.54	$1.43	$3.35	$3.32	132.2%	✗	N/A
Diesel Cost ($)	$1.57	$1.47	$3.70	$3.64	147.6%	✗	N/A
Percent of Time Spent in Congested Conditions	53	40	55	50	25.0%	✗	✓
Percent of Lane-Miles Congested	44	43	46	52	20.9%	✗	✓
Excess Gallons Fuel (1,000)	17,197	6,059	18,265	8,407	38.8%	✗	✓
Gallons Per Commuter	19.1	11.0	16.7	11.0	0.0%	✗	N/A
Total Hours of Delay (1,000)	36,361	13,003	39,747	17,923	37.8%	✗	✓
Hours of Delay per Commuter	41	24	37	23	-4.2%	✓	N/A
CO2 due to Congestion (million pounds)	338	123	359	170	38.2%	✗	✓
CO2 per Peak Commuter (pounds)	377	213	329	217	1.9%	✗	✓
Congestion Cost (Million $)	$604	$219	$856	$396	80.8%	✗	✗
Congestion Cost ($ per Commuter)	$673	$543	$780	$502	-7.6%	✓	N/A
Travel Time Index	1.23	1.13	1.20	1.14	0.9%	✗	✓
Roadway Congestion Index	1.04	0.96	0.99	0.96	0.0%	✗	✓

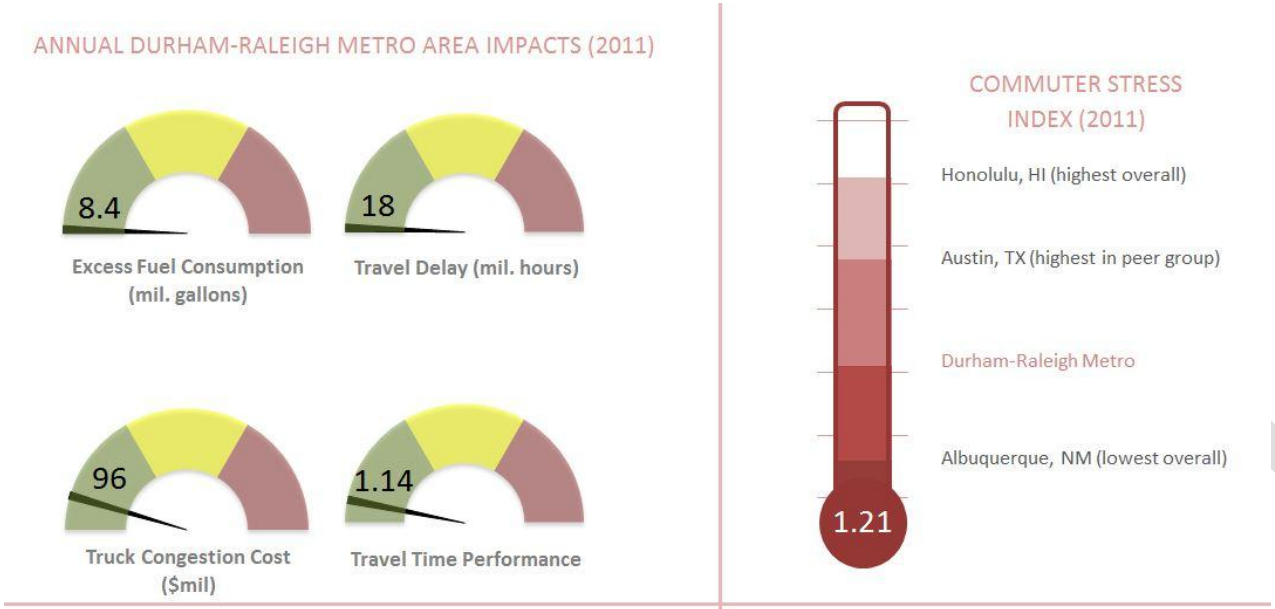
Breakdown of Regional Performance

The Durham, Chapel Hill-Carrboro, Raleigh, and Cary municipalities, as well as the smaller cities and unincorporated areas of several counties in which they reside, are typically viewed as a single entity. Table 3 is derived from the most recent, annual computation of over 400 such metropolitan areas; our peers noted in this chart are "large" metropolitan areas - they have a similar population size to our own. The chart shows the performance of a variety of transportation indicators between 2001 and 2011, the most recent 10-year period for which the Texas Transportation Institute has compiled this dataset. The data is arranged to show our metropolitan area's performance as well as those of our similarly-sized peer areas. **The final two columns at right illustrate how our metro has done over this time period, as well as how we have performed considering our robust population growth (nearly 45%) and how we compare to the average of our peer group**. While most of the indicators shown in the 2001 to 2011 comparison are not favorable in absolute terms, this fact must be taken in light of the rapid population expansion that our area has experienced. **If we control the results for population growth (last column on the right) we can see that our performance is actually better than the population - and therefore congestion/consumption of transportation services - might suggest for most of the performance measures**. However, note that the number of commuters and freeway vehicle miles of travel have actually increased faster than our population, suggesting that we are "pulling" more commuters not only from within our own market but from adjoining areas as well. The two indices in the bottom two rows of the chart illustrate the fairly static nature of congestion: the Travel Time Index compares peak travel delay against free-flow speeds (about the same across ten years) and the Roadway Congestion Index compares both the duration and intensity of congestion - again, with virtually no change in our metro area (although our peer group actually improved very slightly on both measures). In spite of our rapid population increase, **the number of hours of delay per commuter is actually slightly better in 2011 than in 2001, which translates into a 7.6% reduction in costs due to congestion**. Also notable is the increase in transit ridership, which has doubled between 2001 and 2011. Finally, an important measure is the time spent in traffic congestion. Here, **our number of hours spent in congestion has only increased by 25% from 2001 to 2011 - a significant leap in a ten-year span, but still respectable performance when compared to our metro's population growth of almost 45%**.

Flickr | Doug Kerr

How the World Sees Us

When businesses look to relocate or people seek to move to a place that fits their lifestyle and preferred mobility choices, they usually go to only a few sources for information – even though those sources may use methods and data that have flaws. This panel describes how the rest of the world sees us through commonly accessed information.



Top-Left: Common Denominators

The DCHC area (combined with Raleigh to form the "metro") performs the best of its peer group in travel delay created by congestion as well as fuel consumed due to time spent in congestion. The Travel Time Index is a measure of reliability – again, the score is excellent, as was congestion experienced by trucks on freeways and major arterials.

Top-Right: "Pain" Index

Traveling in congested conditions is stressful, but the Durham-Raleigh Metro Area outperforms nearly all its peers.

Bottom-Left: Getting to Work

Commuting within our Metro Area isn't a cinch yet, but some destinations clearly are much more accessible than others. Naturally, more centrally located destinations, such as RTP, require less commute time to reach.

Bottom-Right: Walkability

At Hillsborough, some activities can be accomplished on foot. Most errands in other municipalities require a car.

How We See Ourselves

Part of our study consisted of asking 951 residents of our area (via random telephone survey) how their view of mobility is changing. We'll repeat this survey when we update the Transportation Report, and keep checking to see how our people think we're doing.

Top-Left: How to Fix Transportation

The people we surveyed thought that creating more transit options, adding more walking and bicycling facilities, and maintaining the roads we have were more important than building wider roads. Redesigning our communities to be friendlier to alternative modes of travel was also important to us.

Top-Right: How Much We Drive & Bike

Overall, we still drive a lot – typically at least six times each week. But lower-frequency drivers actually biked just as much as they drove.

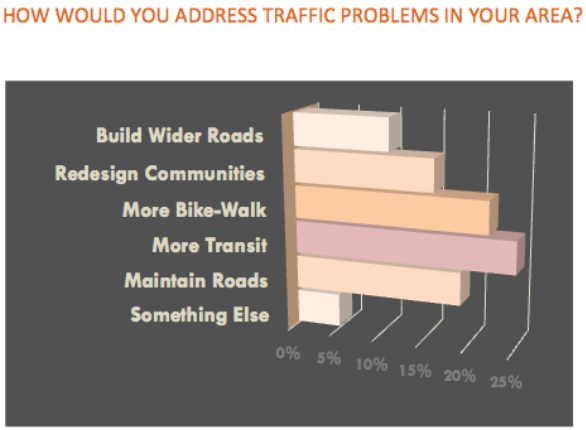
Middle Row: Owning a Car and Congestion

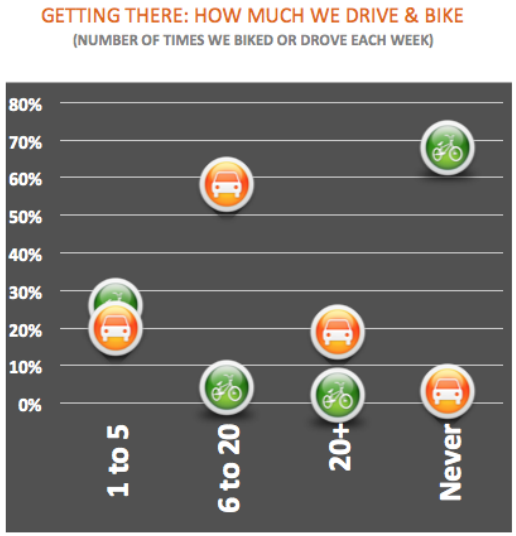
Overwhelmingly (96%), our respondents own a car (Census data suggests this figure is between 92% and 96%), and 67% thought traffic congestion was worse than when they moved here (although a quarter thought it was about the same). When asked what was more important, reducing travel delay came in a distant second to overall personal safety.

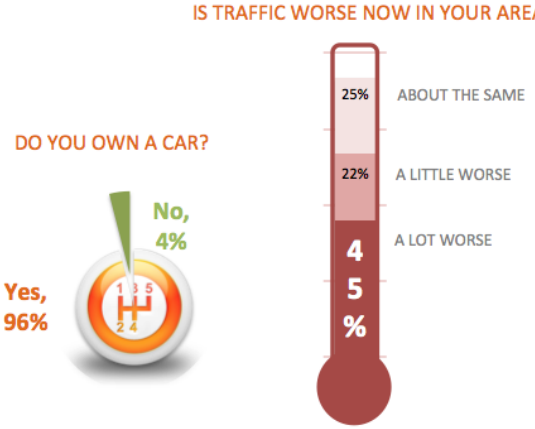
Bottom: How are We Different (or the Same)?

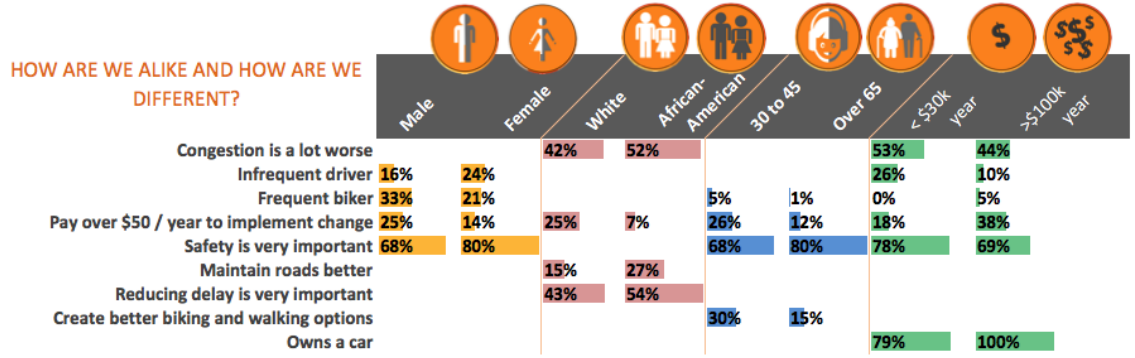
MPOs like DCHC are required to consider how well they provide services to lower-income and minority populations. We do have a few differences:

- *Women and seniors value safety more highly than men and middle-age respondents;*
- *Reducing delay and improving congestion are more important to African-American respondents, but they are less willing to pay the maximum amount ($50/year) to see improvements they want; and*
- *People in the lowest income bracket are much more likely to be infrequent drivers, but the same group is also less likely to ride a bicycle frequently, too.*

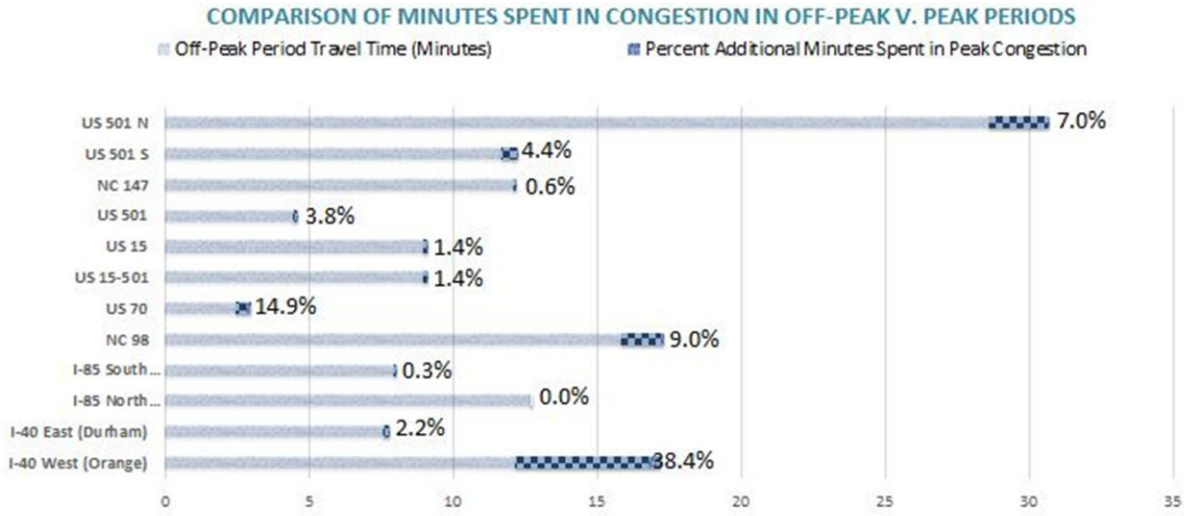


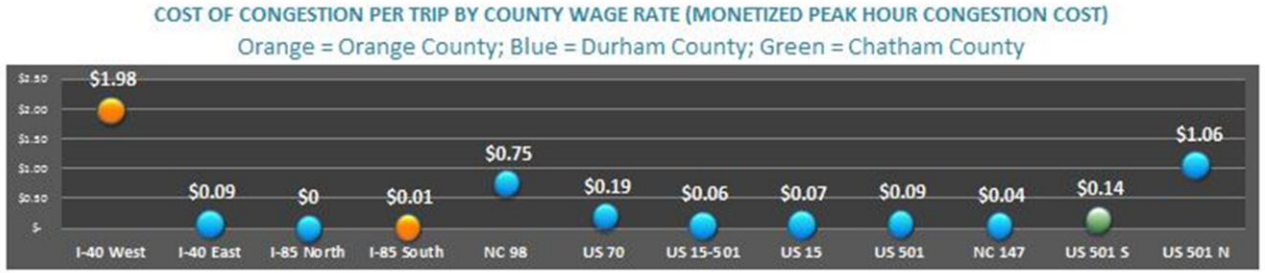






Roadway Performance





CONGESTION COST PER TRIP

DCHC MPO District	Total Congested Time on All Corridors within District per Mile	Total Congestion Cost by District per Trip
South Durham and Northeast Chatham	0.03	$0.28
North Durham	0.11	$1.06
Hillsborough and Northeast Orange	0.21	$1.99
Chapel Hill and Carrboro	0.18	$2.25
Central Durham	0.03	$1.29

6.7%
of the Peak Hour Driving Time is under Congested Conditions

Roadways serve as the principal mobility arteries in the region, carrying the majority of the transportation system users on any given day. We selected 12 of the most important highway corridors for analysis, based on volumes carried and length in the planning area.

Top: What happens during the Peak Hour?

Using travel time data collected from numerous in-vehicle measurements, we calculated the typical (median) time it took to traverse a corridor under peak and off-peak conditions. In some cases, there was little change. In others, however, marked differences in travel times were apparent.

Middle Row: Cost of Congestion

For almost every trip along a corridor during congested conditions, the extra time spent driving is associated with a cost to the driver. The average wage rates for each county were used to determine the cost of time. The congestion on I-40 West and US 501 North accounts for over one dollar for each trip by a single user under congested conditions.

Bottom: Which district has the worst congestion?

Of the 12 highway corridors studied, those around Chapel Hill and Carrboro hold the dubious honor of accounting for the longest delay per mile in the planning area. The South Durham County / Northeast Chatham County region have the least. Across the planning area, 6.7% of time spent traveling is spent in congested conditions.

Transit System Performance

Performance for Bus Service	2002	2012	Percent Change (red: worse; green: improved)
Operating Expense per Vehicle Revenue Mile	$5.78	$8.03	39%
Operating Expense per Vehicle Revenue Hour	$73.22	$92.07	26%
Operating Expense per Passenger Mile	$0.91	$1.03	13%
Operating Expense per Unlinked Passenger Trip	$2.50	$2.12	-15%
Unlinked Passenger Trips per Vehicle Revenue Mile	2.3	3.8	64%
Unlinked Passenger Trips per Vehicle Revenue Hour	29.3	43.5	48%

Performance for Bus Service	2002	2012	Percent Change (red: worse; green: improved)
Operating Expense per Vehicle Revenue Mile	$4.86	$6.27	29%
Operating Expense per Vehicle Revenue Hour	$67.30	$88.72	32%
Operating Expense per Passenger Mile	$0.79	$0.74	-6%
Operating Expense per Unlinked Passenger Trip	$2.27	$2.68	18%
Unlinked Passenger Trips per Vehicle Revenue Mile	2.2	2.3	9%
Unlinked Passenger Trips per Vehicle Revenue Hour	29.7	33.1	12%

Performance for Bus Service	2002	2012	Percent Change (red: worse; green: improved)
Operating Expense per Vehicle Revenue Mile	$3.76	$5.70	52%
Operating Expense per Vehicle Revenue Hour	$86.90	$116.70	34%
Operating Expense per Passenger Mile	$0.87	$0.67	-23%
Operating Expense per Unlinked Passenger Trip	$7.12	$7.96	12%
Unlinked Passenger Trips per Vehicle Revenue Mile	0.5	0.7	36%
Unlinked Passenger Trips per Vehicle Revenue Hour	12.2	14.7	20%

Flickr | James Willamor

The Bull City Connector provides fare-free service across Central Durham. Within the DCHC MPO, Chapel Hill Transit also provides fare-free service on every route across the entire system.

Three fixed-route transit providers operate in the DCHC MPO region, Triangle Transit (TT), the Durham Area Transit Authority (DATA), and Chapel Hill Transit (CHT). Universities and Orange County also operate services, but do not report data in the same format or over the same timeframe. While these transit systems serve a substantial area of the MPO region, paratransit is also provided for those areas outside of the fixed-route service areas.

Using data (adjusted for inflation to 2012 dollars) from the Federal Transit Administration's National Transit Database, we present information for each of the major fixed-route transit systems here. It is important to note that these systems operate independently and should not be compared against one another, but rather should be taken as separate systems serving different transit markets. While it is tempting to draw conclusions regarding, for instance, operating expense per passenger mile between a small community fixed-route system (CHT) and an express and long distance route system (TT), the difference in the type of service and locations served make any conclusions questionable.

More information about alternative modes, including transit, is included on the subsequent page as well as in the following Map Book section.

Alternative Mode Performance

Although the great majority of trips are still being made by automobile, the way that we move is always changing. These charts explain how bicycle, walking, and transit use are keeping pace.

Top: Corridor Travel Time

Travel times for buses are usually longer than for cars unless they have their own space to operate. These times can differ greatly depending on starting and stopping points. The Hillsborough-Durham trip, for example, will no longer be as circuitous thanks to the initiation of new service in this corridor. In some cases, just getting to a transit stop takes a long walk, such as the eastern end of NC 98.

Middle-Left: Changes Over Time

If we view how we are performing as a metro area in creating alternative mode trips, the picture isn't great. The picture changes a lot, however, if we weigh performance by all the new people we've added between 2002 and 2012.

Middle-Right: Sidewalk to Street Centerline Ratio

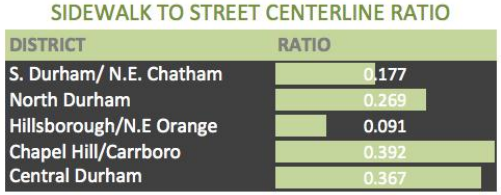
If every street were to have a sidewalk on both sides, this ratio would equal 2. This metric identifies those subareas with low ratios of sidewalk to streets, most notably Hillsborough/Northeast Orange County.

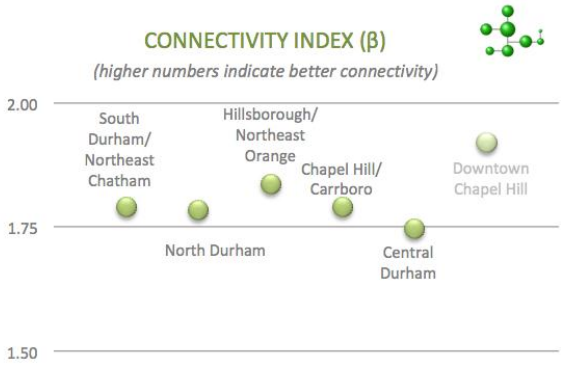
Bottom-Left: Connectivity

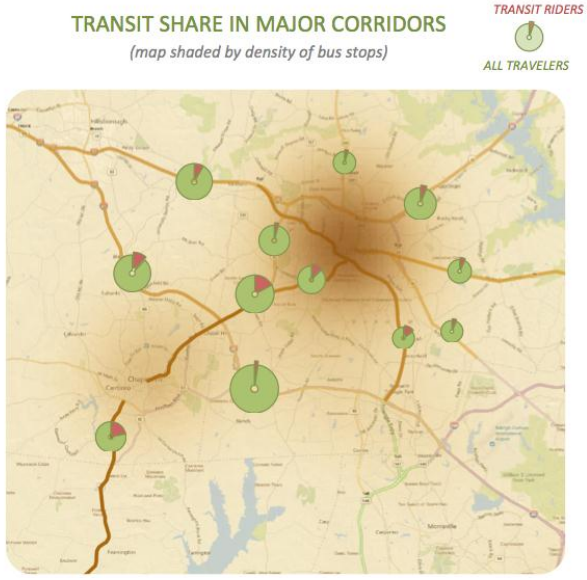
This index just compares the number of streets to the number of intersections: the higher the value, the better the connectivity. Downtown Chapel Hill is provided for the sake of comparison.

Bottom-Right: Transit Share

While the number of people taking transit in our major corridors remains fairly small, some of the shares of daily riders are substantial (e.g., US 15-501). Without transit, many more cars would be on these already-busy highways.







The Map Book

The following maps – collectively described here as a "map book" – present information at one of the three levels of geography just described. Here is a succinct listing of the maps in the order in which they appear:

Map No. 1: Durham, Chapel Hill, and Carrboro Metropolitan Planning Organization Area Map

Map No. 2: Volume to Capacity Maps

Map No. 3: Crash Clusters and Congestion – Bottleneck Locations/Non-Recurring Congestion

Map No. 4: Bottleneck Locations

Map No. 5: Crash Rates

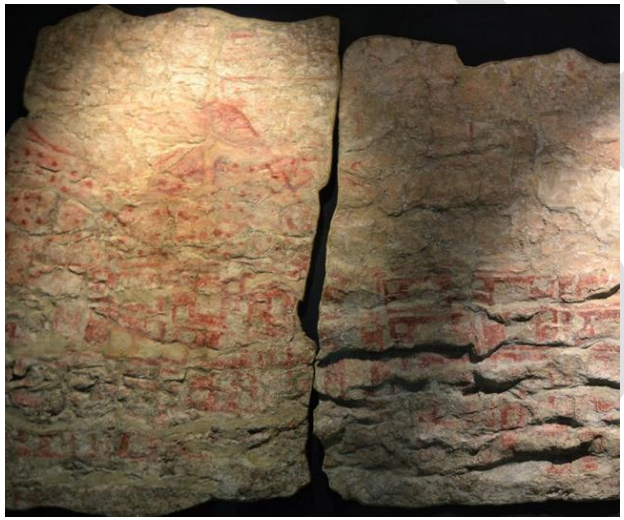
Map No. 6: Transit and Environmental Justice – Part 1: High Poverty Populations

Map No. 7: Transit and Environmental Justice – Part 2: Large Minority Populations

Map No. 8: Transit and Environmental Justice – Part 3: Subarea Analysis

Map No. 9: Transit Stops Analysis

Map No. 10: Pedestrian and Bicycle Crash Locations



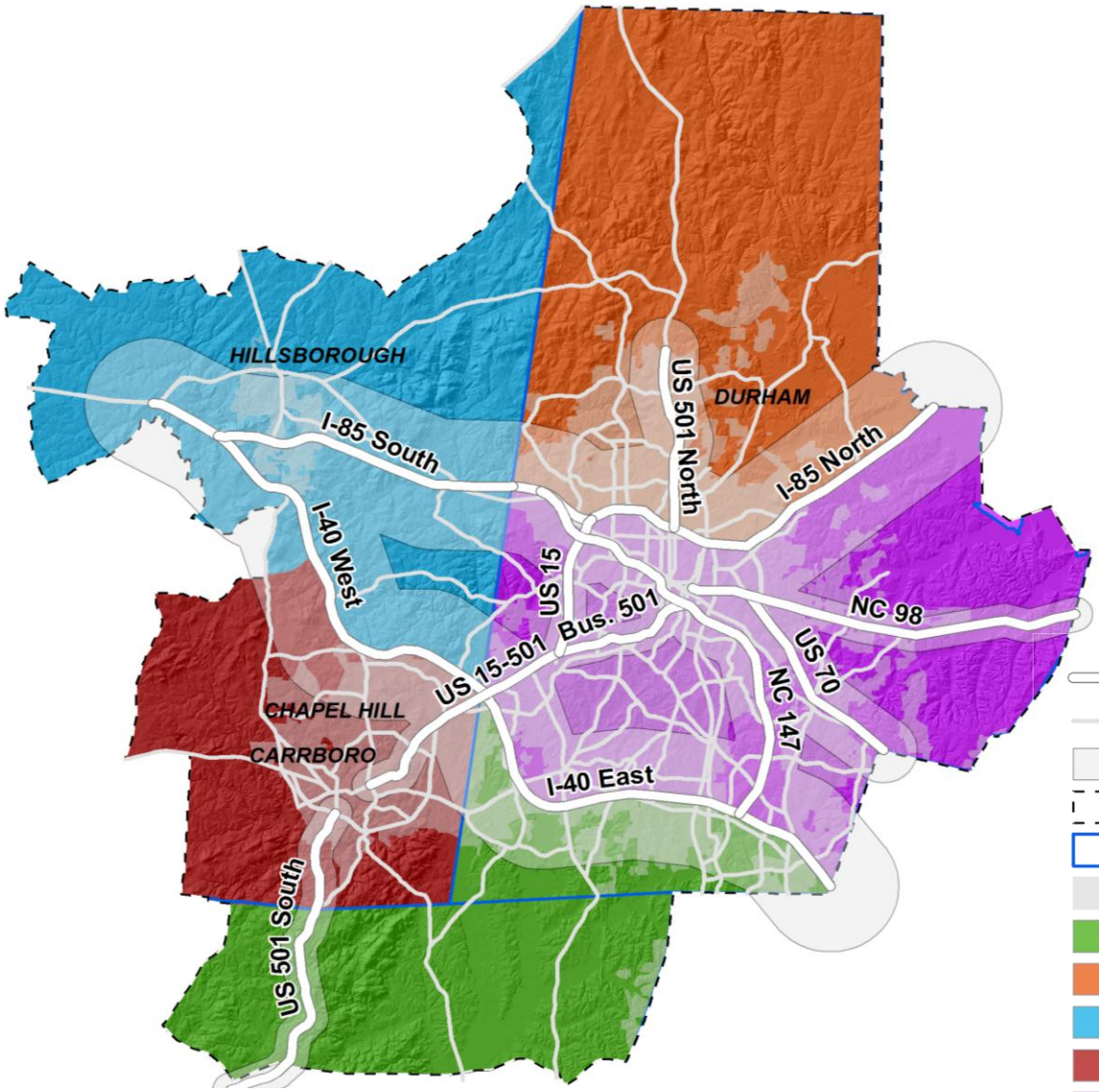
Created 8500 years ago, this map (and an artist's rendering of the original painting, below) may show twin volcanoes that once threatened the Stone Age town of Çatalhöyük in Turkey. Streets and the layout of the town are visible.

Source: New Scientist, Stone Age mural ups the stakes in quest for oldest map, January, 2014.

Maps are some of the earliest recorded documents found once people started drawing (see text box at lower-right for an example). To make a good map, it has to be clear, present information honestly, and convey a message better than a simple listing of data. To reach this objective, the maps on the following pages make use of three different levels of geography to present information effectively.

- Individual Roadways – This geography is the smallest and most intricate, although not every roadway has data attached to it. Generally, higher-volume roadways and their associated transit, bicycle, and pedestrian facilities that run along or on them are displayed at this scale.
- Corridors – Corridors generally aggregate information from multiple roads, transit routes, or other sources to convey information about the 12 major travel ways across and within the DCHC MPO planning area.
- Districts – Five districts, or subareas, were chosen to display information that might be of interest to people living or working in them, and to help distinguish any key differences within the large DCHC MPO planning area boundary.

In some earlier parts of this report, the entire DCHC study area was assessed as one unit.



Map #1 Durham, Chapel Hill and Carrboro Metropolitan Planning Organization (MPO) Area Map

This Congestion Management Process Status of the System Report addresses congestion within the bounds presented in this figure. For analytical purposes, the MPO was divided into five subareas, which are indicated by the different colors. Additionally, twelve roadways were evaluated in more detail, so-called "CMP Corridors". These corridors are the most important mobility carriers in the MPO and are more congested than other roadways. To better understand information about each corridor, data around each corridor was collected in a buffer. The width of each buffer varied based on the level of traffic on each corridor. The smaller roadways indicated on this map are "CMP Network", i.e. other roadways that are significant for traffic movements in the planning area.

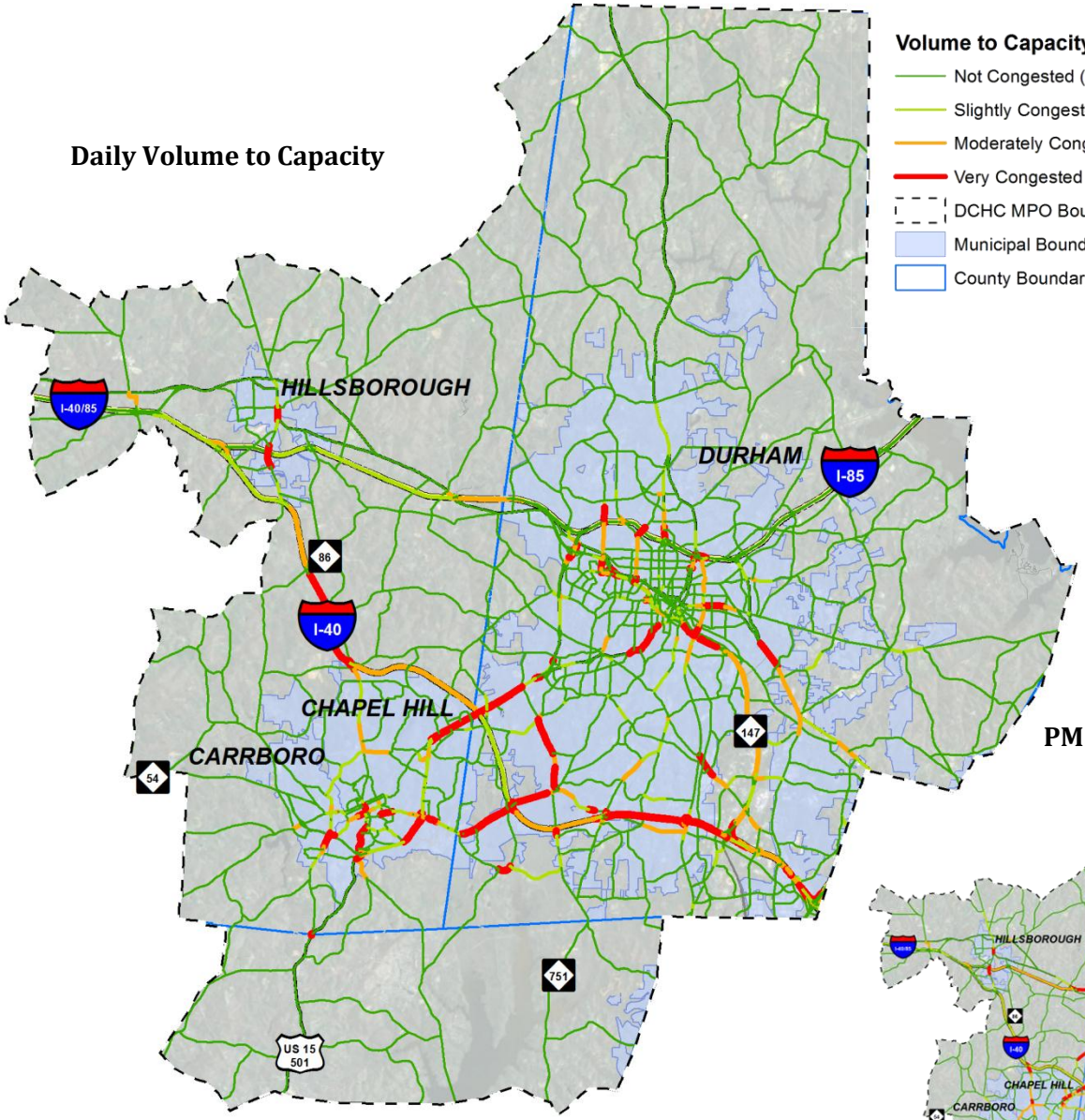
- CMP Corridors
- CMP Network
- CMP Corridor Buffers
- DCHC MPO Boundary
- County Boundary
- Municipal Boundaries
- South Durham and Northeast Chatham
- North Durham
- Hillsborough and Northeast Orange
- Chapel Hill and Carrboro
- Central Durham

Map #2●Volume to Capacity Maps

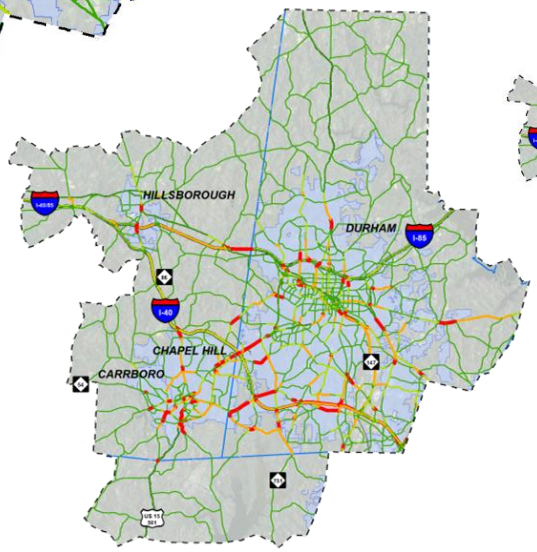
Volume to capacity ratios provide detailed information about levels of congestion by roadway segment. Generated from the Triangle Regional Model, these ratios incorporate information from across the entire region, including trip beginnings and ends, mode choice, and route choice to assign traffic flows to specific roadway links. Current land use conditions are also included in the model. Based on this information, certain corridors are clearly congested in the DCHC MPO, including segments of I-40, US 15-501, NC 147, and NC 54. Other congestion occurs in areas around Chapel Hill and Carrboro and on certain locations close to Downtown Durham.

Key Takeaway: Congestion levels for auto traffic are worse in the evening, but are generally fairly consistent throughout the day.

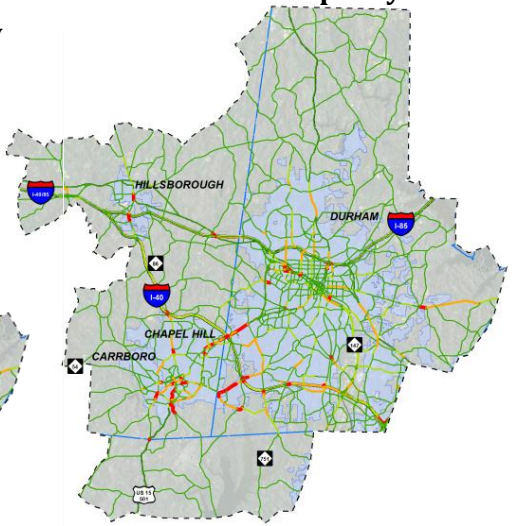
Daily Volume to Capacity

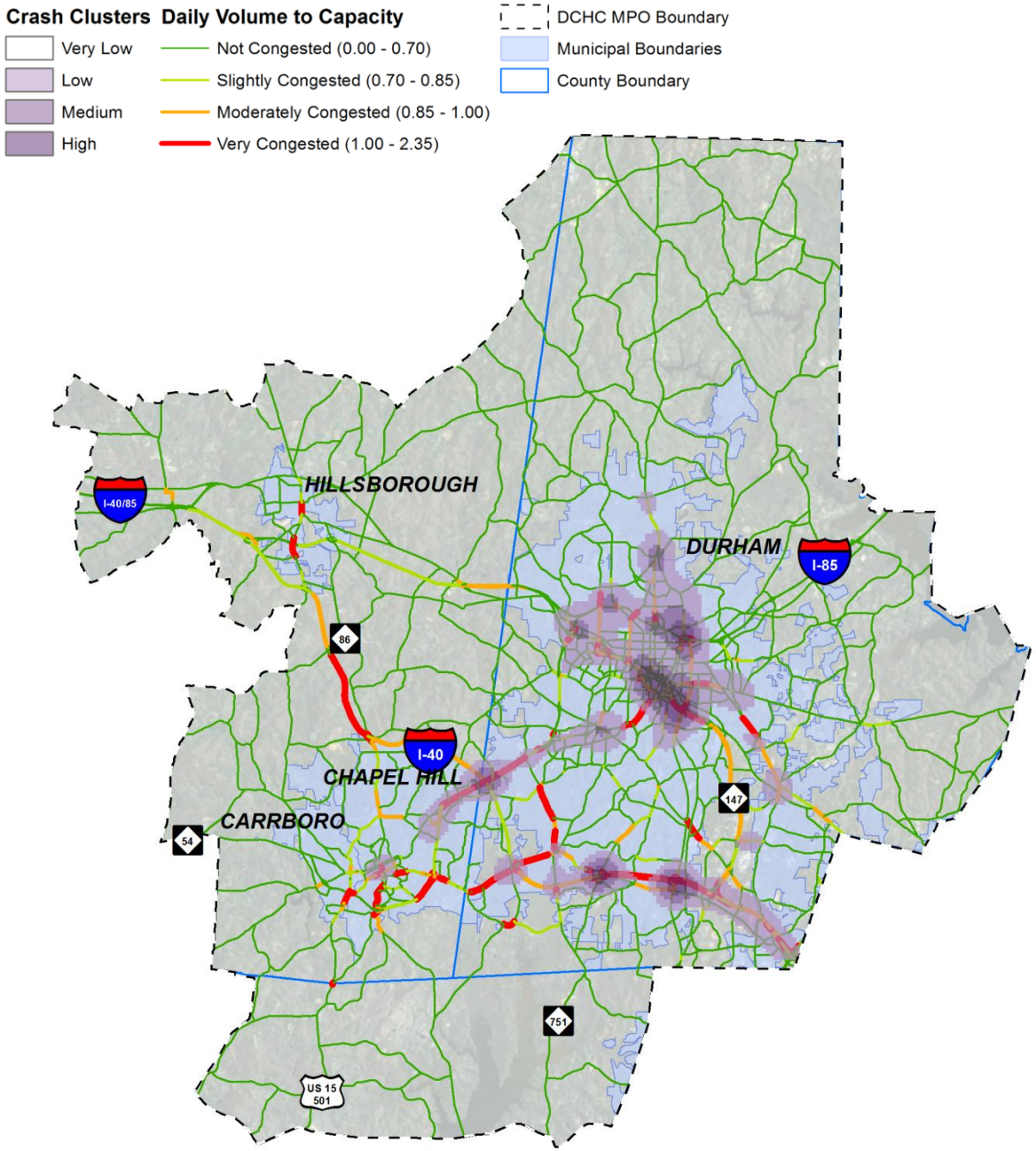


PM Volume to Capacity



AM Volume to Capacity



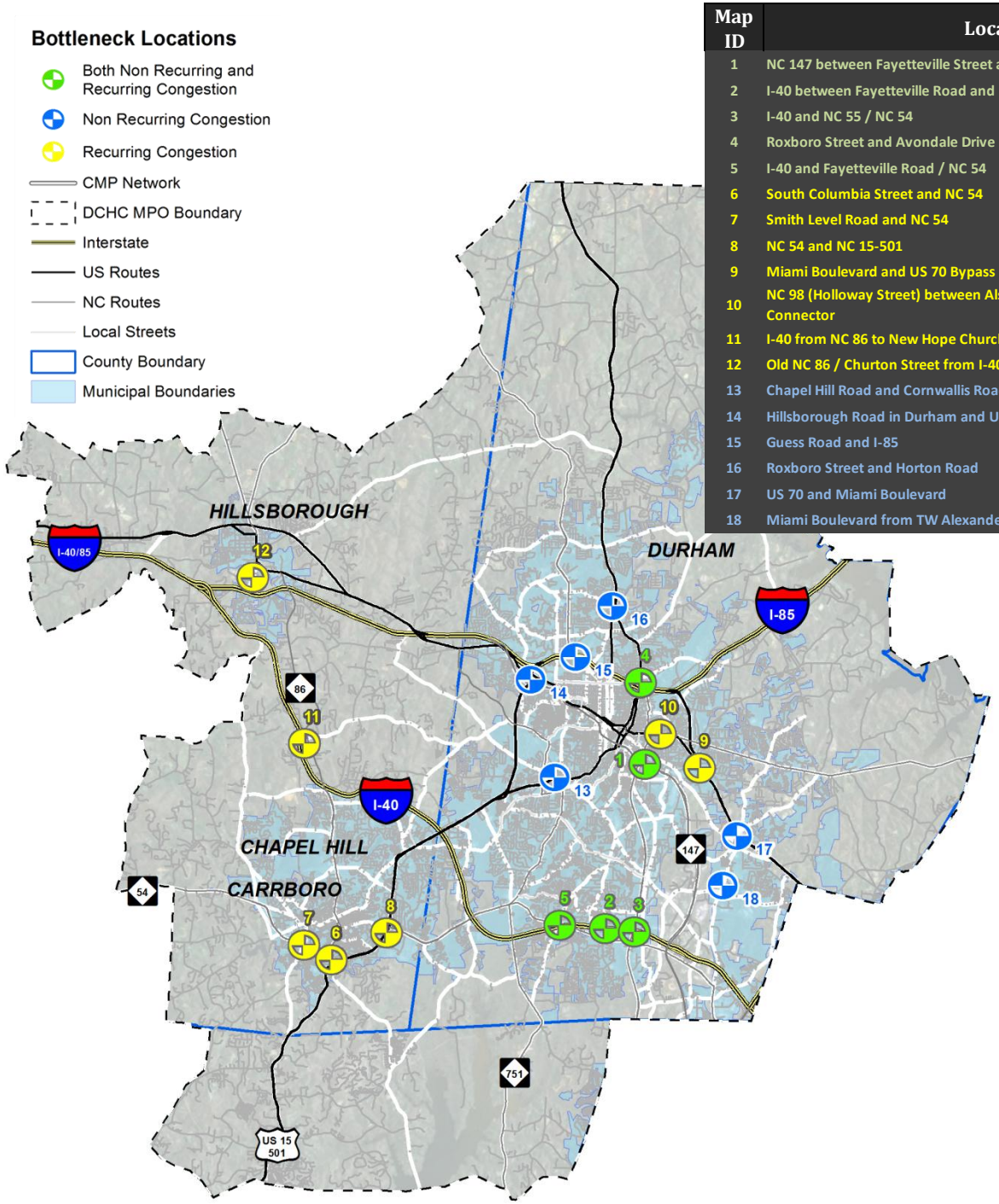


Map #3●Crash Clusters and Congestion – Non-Recurring Congestion / Recurring Congestion (Bottleneck Locations)

Recurring congestion can be defined as congestion that occurs during uniform times and at the same location. The most likely source of recurring congestion is peak hour commuting patterns**. Non-recurring congestion is defined as congestion resulting from incidents, disabled vehicles, work zones, adverse weather events, and other sources, i.e. congestion that does not occur all the time, but only under certain conditions or when certain events occur.** The most likely source of non-recurring congestion is automobile crashes. Locations that experience a high likelihood of crashes as well as peak congestion relating from commuting patterns have both recurring and non-recurring congestion. This map reveals areas with roadways operating over capacity as well as with high rates of automobile crashes, which can equate to areas likely to experience congestion of either recurring or non-recurring congestion or both.

Another source of non-recurring congestion is sporting events, festivals, performing arts, and other special events. Anecdotal evidence confirms that NC 54 between I-40 and UNC's campus, US 15-501 between Durham and Chapel Hill, and NC 147 between I-40 and Downtown Durham during major events.

Key Takeaway: Automobile crashes, as the most common form of non-recurring congestion, account for substantial delays in the region, particularly along highly traveled roadways.

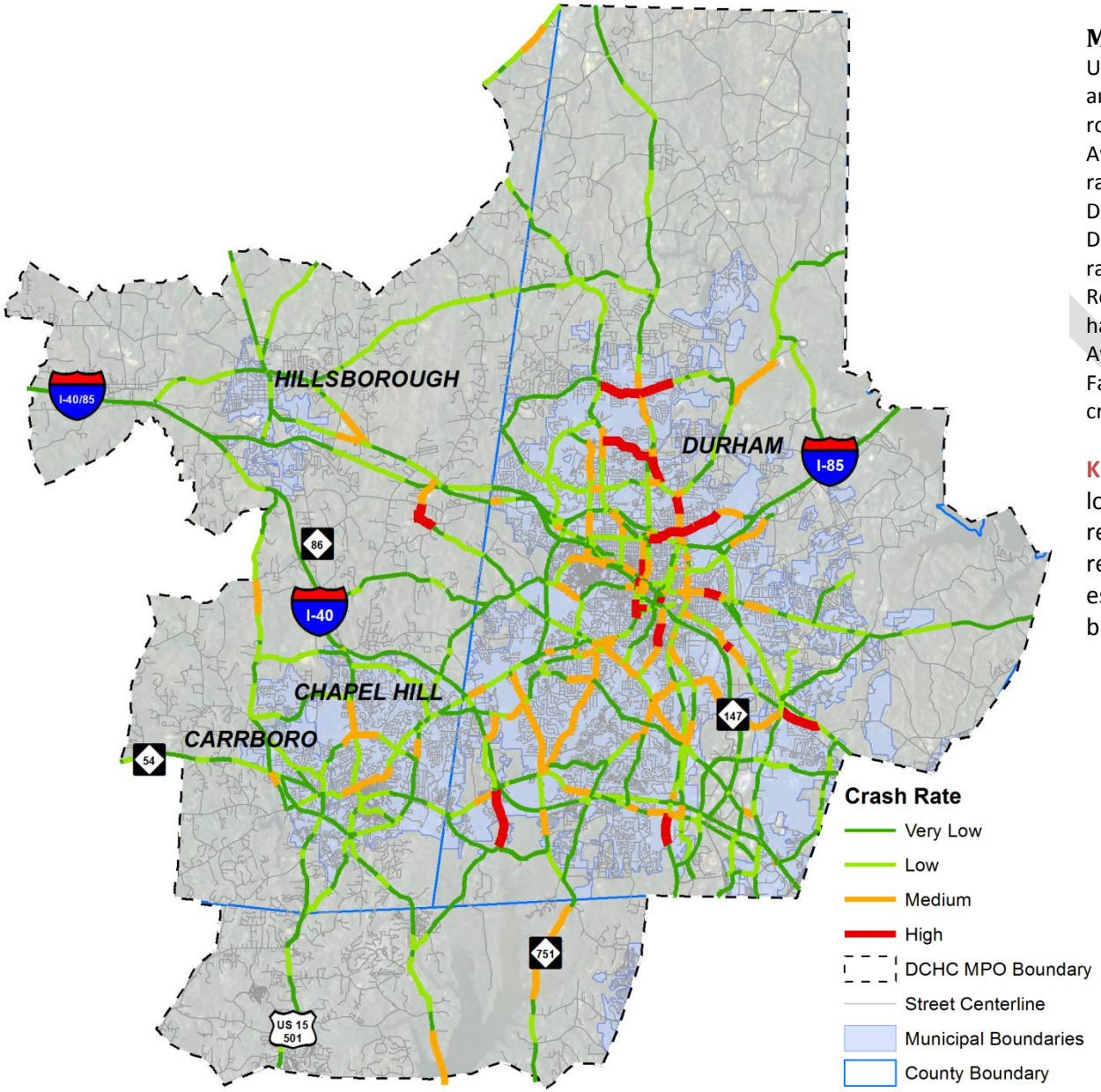


Map ID	Location	Volume-to-Capacity Ratio in Half-Mile	Bike/Pedestrian Crash Issue?
1	NC 147 between Fayetteville Street and Briggs Avenue	57%	✓
2	I-40 between Fayetteville Road and NC 147	89%	✗
3	I-40 and NC 55 / NC 54	83%	✗
4	Roxboro Street and Avondale Drive near I-85	63%	✓
5	I-40 and Fayetteville Road / NC 54	74%	✓
6	South Columbia Street and NC 54	69%	✗
7	Smith Level Road and NC 54	67%	✗
8	NC 54 and NC 15-501	81%	✗
9	Miami Boulevard and US 70 Bypass	45%	✗
10	NC 98 (Holloway Street) between Alston Avenue and the East End Connector	38%	✓
11	I-40 from NC 86 to New Hope Church Road	35%	✗
12	Old NC 86 / Churton Street from I-40 to West King / St. Mary's Road	53%	✗
13	Chapel Hill Road and Cornwallis Road	44%	✗
14	Hillsborough Road in Durham and US 15-501	50%	✗
15	Guess Road and I-85	50%	✗
16	Roxboro Street and Horton Road	44%	✗
17	US 70 and Miami Boulevard	66%	✗
18	Miami Boulevard from TW Alexander Drive to Angier Avenue	57%	✗

Map #4● Congestion Locations –Recurring Congestion/Non-Recurring Congestion

This map identifies locations of recurring congestion, non-recurring congestion, and areas where both types of congestion occur. The average Volume to Capacity ratio of streets within a half-mile buffer of each location is also included to provide some context with regard to which areas are experiencing the most severe *recurring* congestion. Overall, locations along I-40 had the highest V/C ratios and numbers of crash clusters.

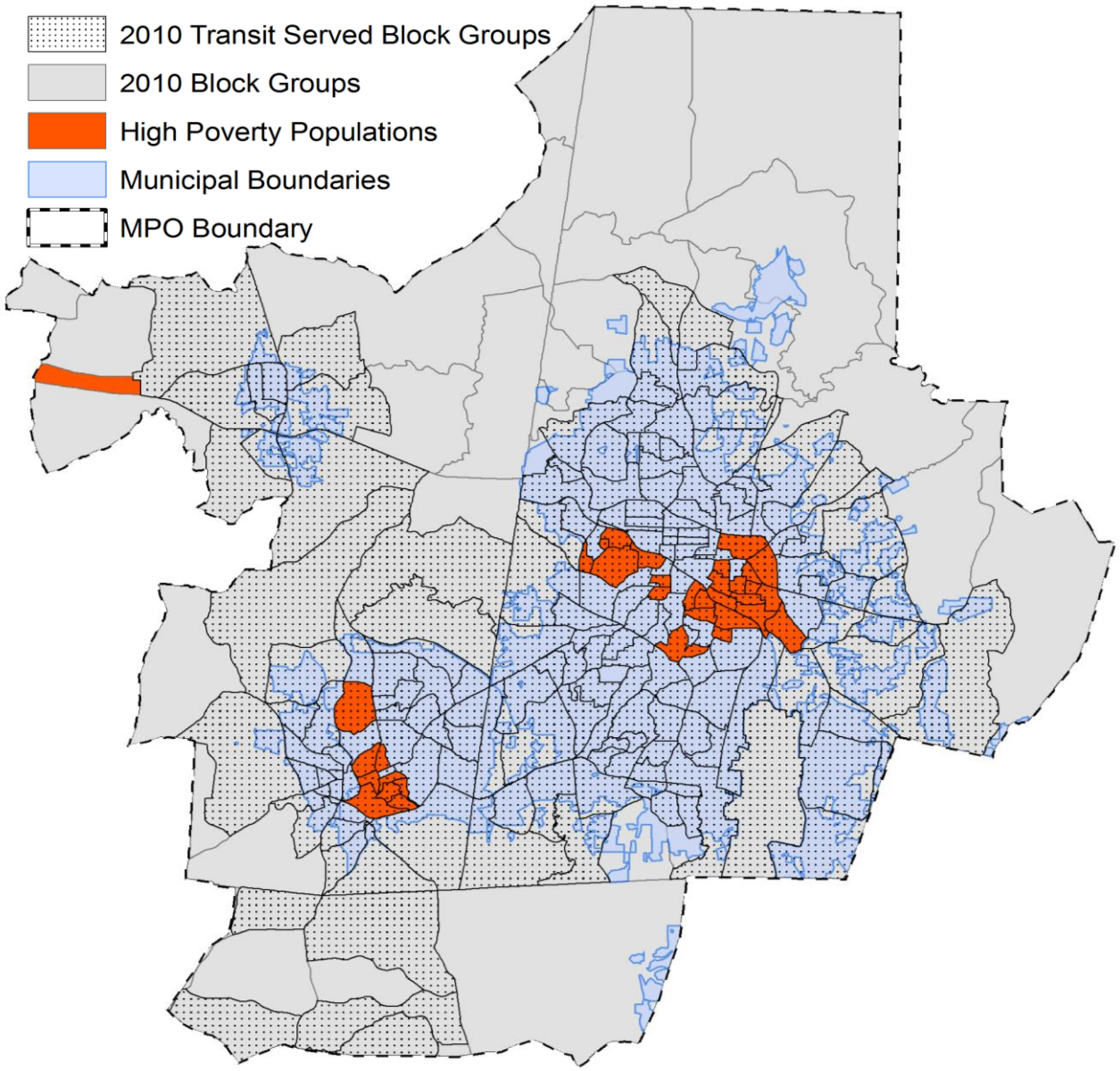
Key Takeaway: These locations are most likely to experience congestion in the DCHC region.



Map #5 Crash Rates

Using the CMP Network as the basis for this analysis, crash numbers were associated with each roadway segment and divided by the Annual Average Daily Traffic (AADT) values to create a crash rate. Latta and Horton Roads north of Downtown Durham as well as Club Boulevard east of Downtown Durham had particularly high crash rates, while Angier Avenue, NC 55, and Farrington Road in the southern areas of Durham County also had significant crash issues. Additionally, Vickers Avenue, South Roxboro Street, Duke Street, and Fayetteville Street (all Downtown Durham) had high crash rates as well.

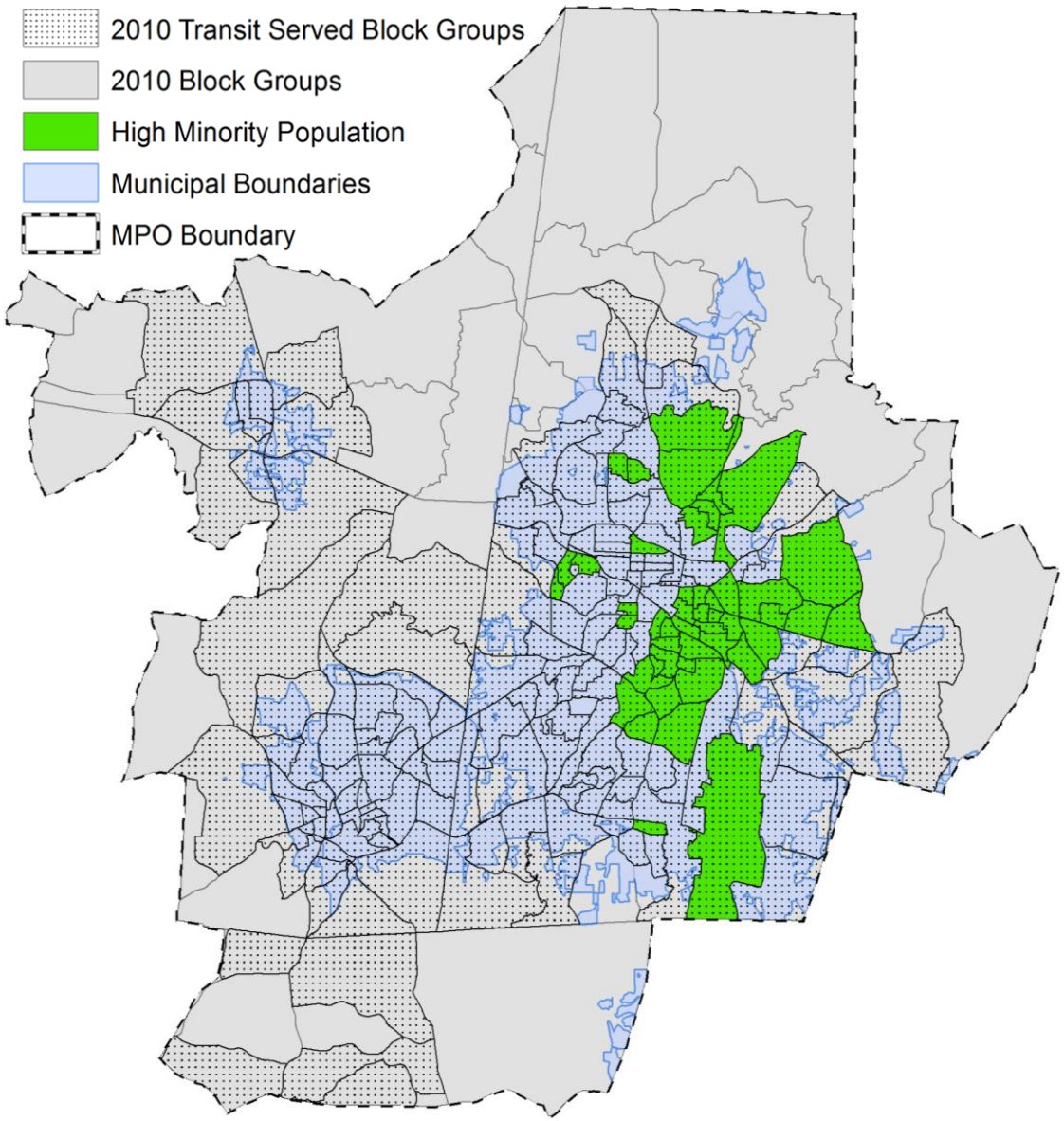
Key Takeaway: By addressing high crash locations through safety improvements, non-recurring congestion is less likely to occur. The reliability of the system will also increase, an especially important consideration for many businesses.



Map #6 Transit and Environmental Justice – Part 1: High Poverty Populations

Using the entire MPO study area, block groups that had disproportionately high levels of poverty were assessed, i.e. those block groups with rates of poverty over one standard deviation from the average poverty level in the entire region. Many people under or close to the poverty level depend on transit as their primary means of transportation, so it is crucial that transit service reach areas with higher concentrations of poverty. Defined as having a transit stop within ¼ mile of the block group, all of the shaded block groups are served by transit. From a regional perspective, local transit providers are reaching those communities most in need of the service, particularly around downtown Durham and Chapel Hill. We used Block Groups from the 2000 Census in this analysis as poverty data is not reliably available for subsequent Census iterations.

Key Takeaway: Areas with high poverty populations are more likely to depend on transit. These areas are well served by local transit providers in the DCHC MPO area.

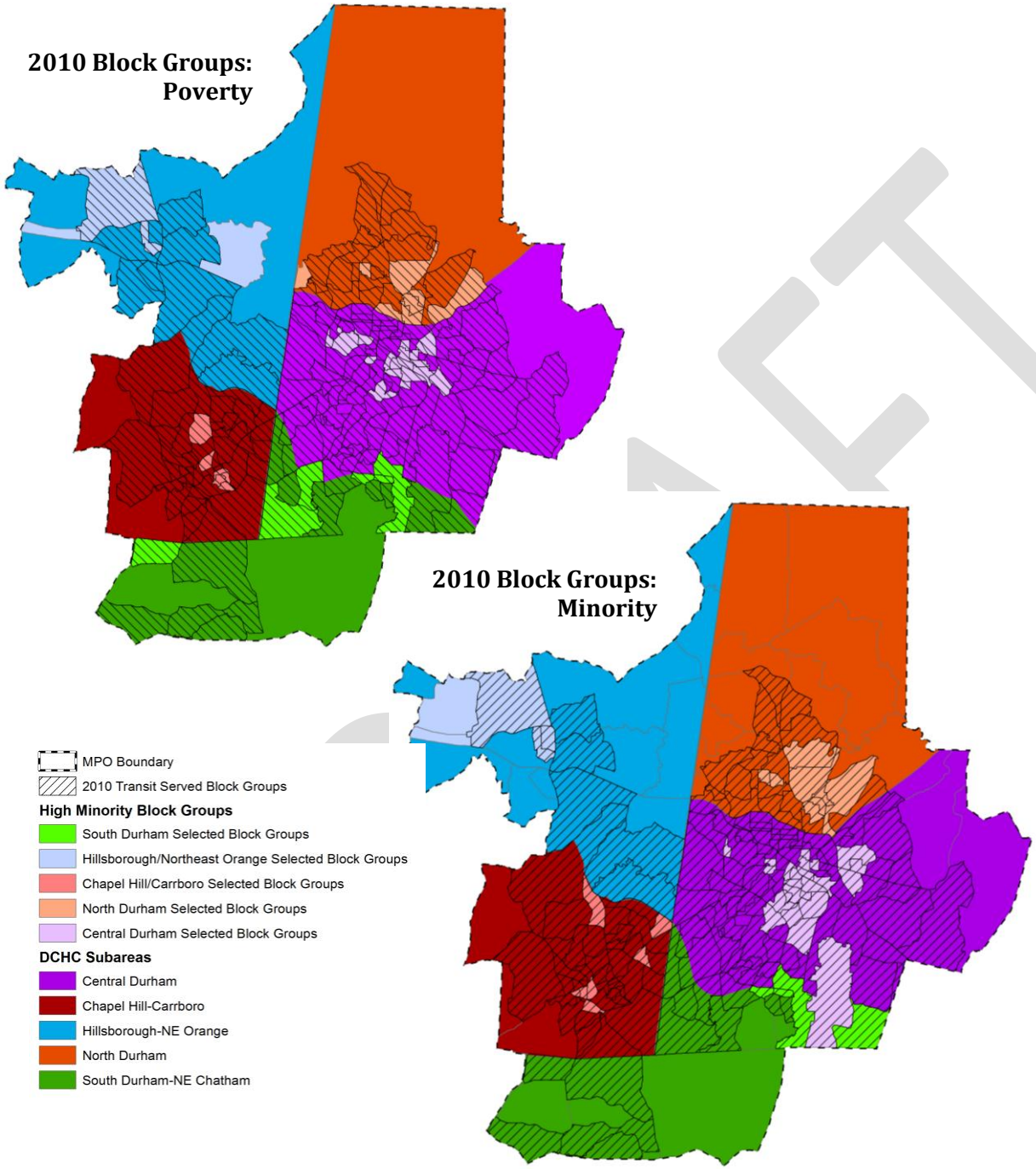


Map #7● Transit and Environmental Justice – Part 2: Large Minority Populations

Another group that may rely on transit to accomplish vital daily functions, such as commuting to work or shopping, is the minority community. Using data from the 2010 Census, the analysis considered fixed route transit accessibility to block groups with a minority population higher than one standard deviation from the mean minority population.

Large areas of eastern Durham County have large minority populations and are also served well by local transit providers, in this instance the Durham Area Transit Authority (DATA) and Triangle Transit (TT). Again, block groups having transit stops located within a ¼-mile distance from the geography were assumed to have access to transit service. While it would seem that transit service is serving those communities most in need, a more refined analysis of transit by subarea is presented in the following map and provides a more nuanced understanding of service in the Durham Chapel Hill and Carrboro MPO.

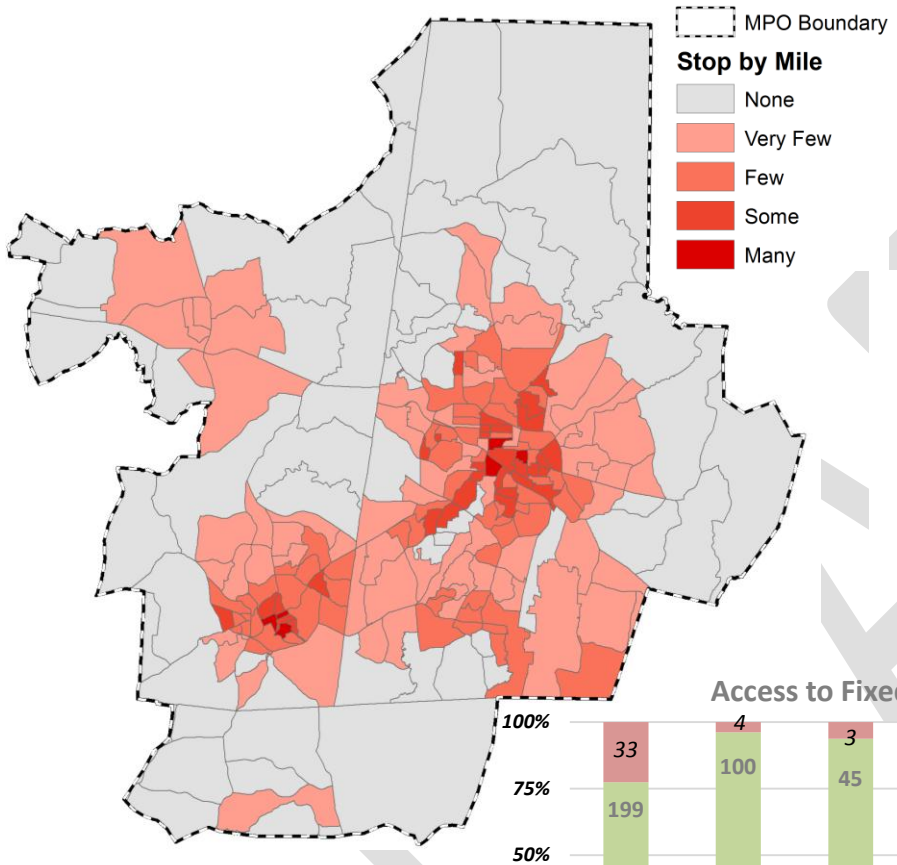
Key Takeaway: High minority population areas are also likely to use transit for daily travel needs. Local transit providers are serving this population well.



Map #8 Transit and Environmental Justice – Part 3: Subarea Analysis

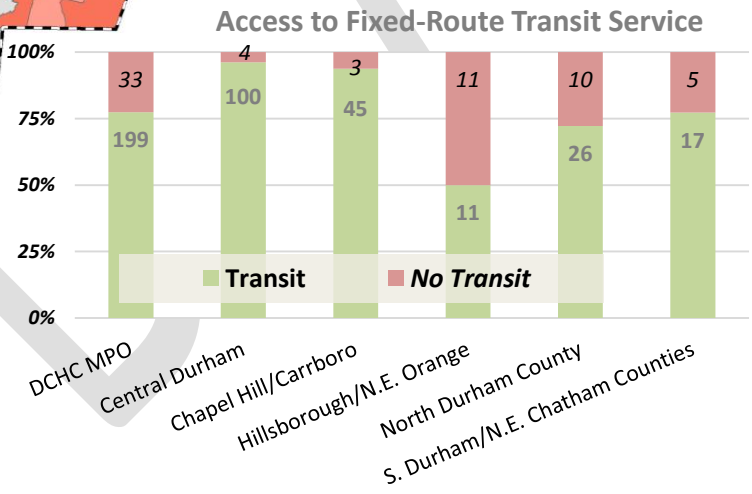
Instead of analyzing poverty and minority representation on a regional scale, we calculated the average poverty and minority level for each subarea to understand which block groups in each area have larger populations of minorities or people living in poverty in a more local context. Most of the subareas have excellent transit coverage, in particular Central Durham and Chapel Hill/Carrboro, which both have rates of coverage of over 90 percent. Rural Hillsborough/Northeast Orange County, on the other hand, has the lowest transit coverage and, indeed, certain block groups within this subarea do have high rates of poverty or minority populations and are not served by transit whatsoever.

Key Takeaway: Rural minority and poverty populations are in some cases not served by transit in the DCHC MPO area, but overall, and in most subareas, coverage is good.



77%

of the Census block groups in the DCHC planning area have access to fixed-route transit service

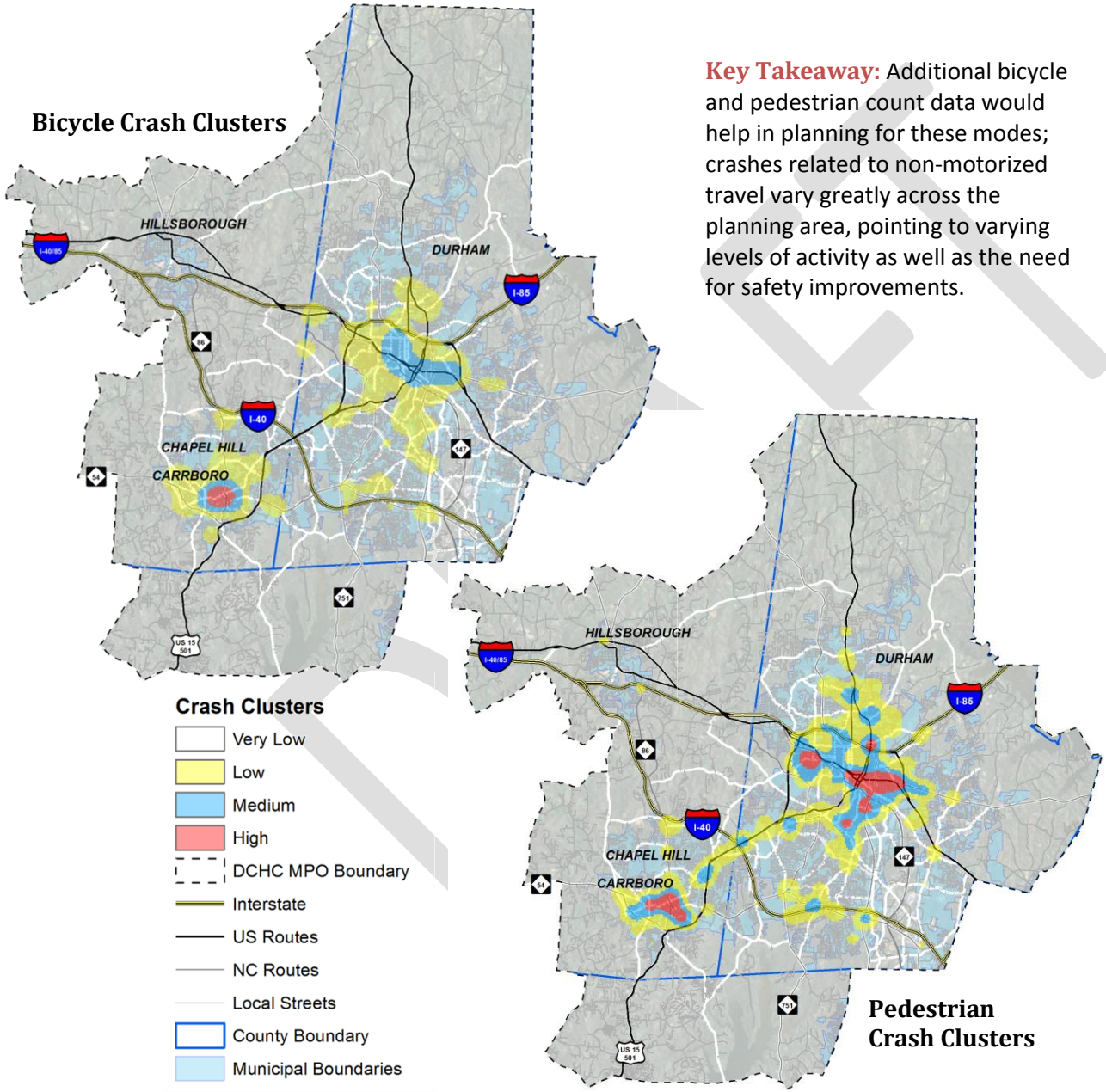


Map #9●Transit Stops Analysis

While identifying block groups served by transit is important to understanding the reach of transit service in the region, little information is provided with regard to the quality and frequency of transit service in these block groups. This map indicates those block groups that contain large numbers of transit stops. As Census Block Groups are loosely based on population, this analysis is particularly meaningful if normalized by area, in this case square mile. With roughly equal population totals in each block group and accounting for area, this analysis provides insight into how well transit serves each area.

Needless to say, the more dense downtown areas in the DCHC MPO are better served by transit, while other areas in close proximity to the Research Triangle Park are also well served. It is important to note that the large student populations in Durham and Chapel Hill also drive transit service and contribute to the large numbers of stops in Central West Durham and in Downtown Chapel Hill.

Key Takeaway: Transit providers in the DCHC MPO area provide excellent service to core downtown areas, along the US 15-501 corridor, as well as to the Research Triangle Park. Considering previous maps, the quality of service generally aligns with the presence of lower income and higher minority geographies. Other areas are much more sparsely served, if at all.



Key Takeaway: Additional bicycle and pedestrian count data would help in planning for these modes; crashes related to non-motorized travel vary greatly across the planning area, pointing to varying levels of activity as well as the need for safety improvements.

Map #10 • Pedestrian and Bicycle Crash Locations

Many cities, towns, and MPOs do not collect bicycle and pedestrian counts. Without this data, it can be difficult for local jurisdictions to install pedestrian and bicycle facilities and safety improvements in locations that truly make walking and bicycling more safe, convenient, and comfortable. The DCHC MPO, however, does collect pedestrian and bicycle counts at a variety of locations, although not to the same degree as automobile counts. Pedestrian and bicycle crash data can serve as a rough surrogate for the level of non-motorized activity in an area.

Pedestrian and bicycle crashes are clustered where one would expect, very close to the major universities in Chapel Hill and Durham as well as close to the downtown areas. Chapel Hill, in particular, experiences high crash clusters for both cyclists and pedestrians, while downtown Durham also has pedestrian crash issues. Pedestrian crashes are also clustered along 15-501 between Chapel Hill and Durham, near South Point Mall, along Hillsborough Street in Durham, on North Roxboro Street, and in close proximity to North Carolina Central University. Bicycle crashes roughly mirror these locations.

What Does It Mean?

We presented a great deal of information in the preceding section of this document. Now, we present the key points and takeaways in one convenient location.

- The DCHC area **performs the best** versus other metropolitan areas in terms of **travel delay created by congestion and fuel consumption due to congestion**. The Travel Time Index (TTI), Commuter Stress Index, and congestion experienced by trucks metrics also perform well in comparison to other similar metropolitan areas.
- **Hillsborough**, possibly due to its small compact size, **has the highest walkability rating** of all DCHC MPO communities. Chapel Hill has the next highest walkability ranking.
- **Most people** that took our survey **own a car**, but **want more biking and walking opportunities and more transit service**.
- The **highest delay** on the most important 12 highway corridors **occurs on I-40 west of the US 15-501 exit**.
- 15-501 in Chatham County and I-40 have the largest transit mode shares.
- **Chapel Hill and Carrboro and Central Durham have the highest ratio of sidewalks to streets**, though the connectivity ratios in these subareas leaves something to be desired.
- Indexed to population, the entire DCHC MPO area is performing better than before in terms of emissions, fuel consumption, and transit-passenger miles, among others.
- Segments of certain corridors, such as **I-40, US 15-501, NC 147, and NC 54**, are likely to **experience severe recurring congestion**.
- Areas of recurring congestion occur mostly on major highways, while non-recurring congestion occurs more often on major city arterials as a result of crashes.
- **Transit serves transit-dependent populations** in the DCHC MPO **very well**. Transit service is focused on major downtowns in a spoke and hub system configuration.
- **Pedestrian and bicycle infrastructure and crossing improvements** along 15-501, North Roxboro Street, Hillsborough Street in Durham, and across I-40 **can enhance safety substantially and also reduce congestion**.

Flickr | Doug Kerr

RECOMMENDATIONS AND FUTURE DIRECTIONS

What is included here?

1. Corridor Strategies
2. Top Project / Program Recommendations

The following identifies the overall corridor strategies and specific directions to take based upon the performance measures indicated in this report. Specific project recommendations based on additional, detailed assessments including state-level ranking procedures, are also presented. These recommendations are described as either funded or not funded to aid in the determination of their timelines.

Corridor Strategies

The 12 corridors studied have been paired with those strategies likely to create a positive benefit (Table 4). The Congestion Management Process recognizes that additional evaluation, planning, public engagement, and preliminary design work will need to occur before any particular strategy is selected, but those shown in this table will create positive benefits in the 12 corridors. Although traditional roadway widening or new road construction projects are not shown in the legend of strategies, this omission is intentional, since the CMP examines other strategies first before undertaking expensive new road construction.

In a number of cases, very detailed studies have been conducted in these corridors, with specific recommendations concerning additional transportation infrastructure and services. The recommendations herein are not intended to supersede the outcome of those studies, but are intended as a guide to formulating a range of countermeasures to alleviate existing and forecasted congestion.

Table 4. Suggested Corridor-Level Strategies

ID	Corridor	From	To	Strategies		
				A	T	O
1	**I-85 Durham**	MPO Boundary	Durham County Boundary			
2	**US 70**	MPO Boundary	NC 98			
3	**I-40 Durham**	MPO Boundary	Durham County Boundary			
4	**I-40 Orange**	Durham County Boundary	MPO Boundary			
5	**US 15-501**	Columbia Street	15-501 Split			
6	**US 501**	15-501 Split	Roxboro Street			
7	**US 15**	15-501 Split	I-40			
8	**I-85 Orange**	Durham County Boundary	I-40			
9	**NC 147**	I-40	I-85			
10	**US 501 North**	I-85	Latta Road / Infinity Road			
11	**US 501 South**	MPO Boundary	NC 54			
12	**NC 98**	MPO Boundary	US 501			

LEGEND						
(A)uto	*Ramp Metering*	*Signal Coordination*	*Intersection Improvements*	*Safety Counter-measures*	*Access Management*	*Improve Connectivity*
(T)ransit	*Traveler Information*	*Private Services*	*Parking Fees / Structuring*	*Improve Service / Headways*	*Bus on Shoulder-BRT*	*Passenger Rail Service*
(O)ther	*Cong. Pricing / Tolling*	*TDM Strategies*	*Faster Crash Response*	*Parallel Greenway*	*Land Use & Design*	*Marketing / Collaboration*

What We Mean when We Say…

Private services: *arranged car or shuttle services between two private parties, with or without an intermediary agency…**TDM Strategies:** any of an array of strategies that manage on-site parking, alter employee work hours, promote ridesharing, or other types of demand-reduction options…**Intersection Improvements**: include adjusting intersection offsets, expanding turning lanes, or otherwise improving geometry to reduce delay or crashes (or both)…**Bus-on-Shoulder-BRT:** may include any option where buses are not competing with automobiles in the same travel way… **Marketing/Collaboration**: creating and implementing educational programs for drivers, cyclists, pedestrians, transit customers or developing marketing campaigns, perhaps in association with other agencies and nearby units of government…**Land Use & Design**: may include controlling development densities to support transit, improve design features to encourage walking, and creating environments and policies whereby mixed use development occurs that will eliminate some trips or shift them to modes other than private automobiles.*

Top Recommendations & Directions

While we have to be cautious about drawing too fine a conclusion from aggregated data from so many different sources, Table 5 should be considered positive directions in which the DCHC MPO and its partners, both public and private, can take to move the needle in a positive direction on the performance measures previously discussed. Since additional, detailed work is needed to move any of these recommendations towards reality, the partnerships and resources needed to implement these ideas are presented in broad terms. The recommendations are presented by their potential implementation timeframe, not priority. Site-specific recommendations are provided on the following pages.

Table 5. Program and System-Level Recommendations

Recommendation	Performance Areas Addressed	Description	Partnerships	Resources	Timing
1. Support Private-Sector Technology Solutions	*Transit Service Frequency, Extent and Ridership*	*A surge of (often) technology-driven transportation services has arisen to serve niche markets. These include JustPark (parking spot locator app), peer-to-peer car-sharing, Bridj (private bus companies) and similar services that are individualized, provide flexible and more direct routing, or serve niche marketplaces. The MPO should support the private sector-initiatives by working with existing service providers to open up shop in this area and create favorable policy environments to make these services welcome here.*	*Private sector service providers; coordination with existing mass transit operators and taxi companies; local policymakers*	*Staff / Consultant time on the order of 300-500 hours ($30,000 - $50,000)*	*Short- to Medium -Term*
2. Implement Dynamic Signalization in Durham in Select Corridors	*Travel Delay; Crash Frequency; Environmental (Air Emissions)*	*The City of Durham, particularly its most densely populated areas with the greatest number of traffic signals, would benefit greatly by incorporating more advanced signal system capabilities. These might include adaptive signal timing, and improved communications infrastructure between signals in the same system.*	*NCDOT, City of Durham*	*Typical cost: $13 million*	*Medium-Term*
3. Implement Ramp Metering on I-40, NC 147, 15-501, and I-85 (sections)	*Travel Delay*	*A 2013 report completed by Atkins analyzed the feasibility of ramp metering on several corridors in Durham and Wake counties, with a number of locations along I-40 suggested for further analysis and implementation. As congestion levels increase on other controlled-access facilities, ramp metering will become more feasible – and more accepted by the public – on additional roadways.*	*NCDOT, DCHC*	*Varies; $30,000 to $70,000 per installation*	*Short- to Medium-Term*
4. Emphasize Non-Recurring Congestion in Planning and Design	*Crash Frequency; Travel Delay*	*Various studies (esp. Pisarski, 2007; Chin, et al, 2002; Hallenbeck, et al, 2003) suggest that non-recurring delay caused by crashes, weather, and construction account for 30% to 70% of all traffic delay. Identifying counter-measures to reduce this type of delay will be more cost-effective in many corridors compared to capacity-oriented solutions. Planning: more data and analysis to determine extent and cost of non-recurring delay on various corridors; Design: identify and fund small-scale improvements to infrastructure; Programs: increase awareness of "move over" program and extent of IMAP roadside services, and expand the Triangle Incident Management program.*	*DCHC, NCDOT*	*Varies*	*Short- to Long-Term*

Table 5a. Funded and Prioritized Project-Level Recommendations

						SCORING MEASURE			
MAP ID	Recommendation	TIP	Route	From / Cross Street	To	Congestion	Cost ($millions)	[Travel Time] Benefit/Cost	Safety
5	***Improve interchange (Durham County)***	*N/A*	I-40	at NC 54		**100**	$1.16	100	33
6	***Widen for a westbound auxiliary lane (Durham County)***	*N/A*	I-40	NC 147	NC 55	**100**	$15.50	18	65
7	***Improve interchange (Orange County)***	*N/A*	US-15, US-501	at NC 54 (Raleigh Road)		**95**	$1.16	100	33
8	***Upgrade to "Superstreet" (Orange County)***	*U-5304B*	US-15 Fordham Boulevard, US-501	East Lakeview Drive	Sage Road	**84**	$2.10	100	88
9	***Upgrade existing at-grade intersection to interchange (Durham County)***	*N/A*	US-70	at Miami Boulevard		**73**	$25.10	29	66
10	***Upgrade at-grade Intersection to Interchange (Durham County)***	*U-2807*	US-15, US-501	at Garrett Road		**69**	$23.80	41	66
11	***Intersection improvements (Orange County)***	*U-5304C*	US-15, US-501	at SR 1742 (Ephesus Church Road)		**68**	$2.17	69	66
				DEGREE OF DIFFERENCE BETWEEN PROJECTS, BY SCORING MEASURE:					

Detailed Recommendations. Table 5a illustrates seven projects that are funded now, or have a reasonable expectation of being funded. The first four on the preceding page are policy/program or system-wide (signalization system upgrade) initiatives that can have a positive influence over a broad area. The seven funded (numbered 5 – 11) projects are infrastructure improvements that are funded now or in the near future; all seven directly impact at least one of the 12 CMP corridors studied in this report. As these concepts are implemented, future iterations of this report will address how well they have worked to reduce or slow the increase of congested conditions.

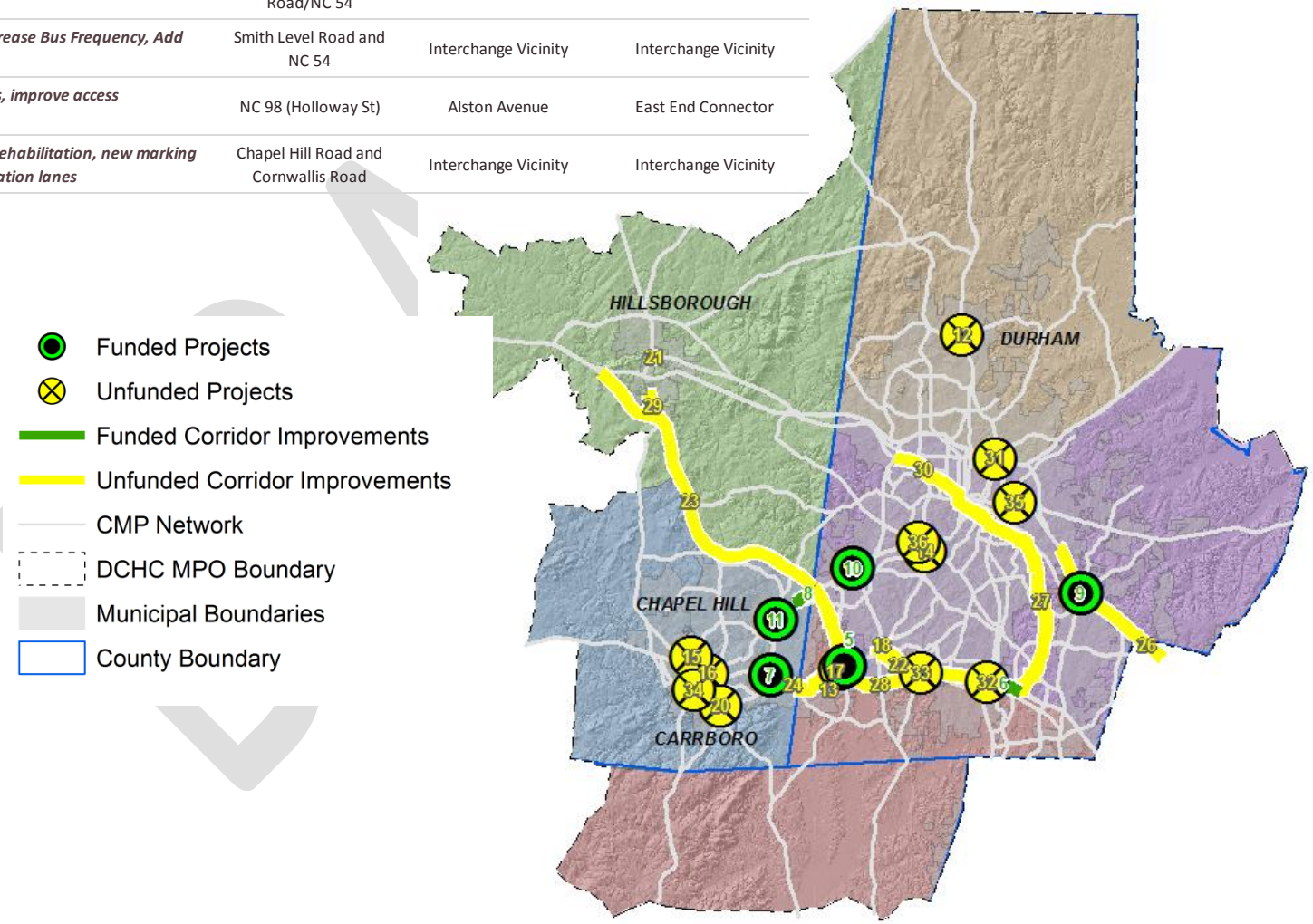
Tables 5b and 5c on the following pages show more projects that are unfunded priorities of the MPO. Table 5b describes projects that have been assessed using the most recent NCDOT-developed prioritization program (SPOT 3.0). These priority scores are shown, with each project being sorted by benefit-cost ratio. Table 5c provides a listing of additional projects not yet prioritized through the SPOT process that were identified during the development of the CMP and this report.

Table 5b. Unfunded, Prioritized Project-Level Recommendations

						SCORING MEASURE					
Map ID	Project Recommendations	TIP	Route	From / Cross Street	To	Cost ($Millions)	Benefit/Cost	Safety	Freight	Accessibility & Economic Competitiveness	Final Score
12	*Add lanes through intersection*	*U-5516*	US-501 Roxboro Road	SR 1448 (Latta Road) / SR 1639 (Infinity Road)		$4	25.0	6.7	0.0	2.2	63.0
13	*Construct grade separation*		NC-54	Farrington Road		$2	25.0	5.0	0.0	10.0	65.2
14	*Construct Roundabout*		NC-751 Hope Valley Road	SR 1183 (University Drive)		$1	25.0	6.7	0.0	1.4	63.1
15	*SR 1780 (Estes Drive)/SR 1772 (Greensboro Street) Construct Roundabout*		SR-1780 Estes Drive	SR 1772 (Greensboro Street)		$1	20.0	5.0	0.0	0.0	68.8
16	*Franklin Street/Merritt Mill Road/Brewer Ln/East Main Street intersection Improvements*		SR-1010 Franklin Street/East Main Street	Merritt Mill Road (SR 1771)/Brewer Lane		$1	20.0	6.7	0.0	0.0	68.8
17	*Widen Roadway to 6 Lanes with Bicycle, Pedestrian, and Transit Facilities (Adjacent Multiuse Path)*	*U-5324A*	NC-54	SR 1110 (Barbee Chapel Road)	I-40	$9	11.4	6.0	0.0	1.3	63.0
18	*Construct new alignment*		Woodcroft Pkwy Ext	Garrett Rd	Hope Valley Rd	$2	7.4	7.8	0.0	0.0	77.3
19	*Light rail system from UNC Hospital in Chapel Hill to Alston Avenue in downtown Durham*		TTA Durham - Orange Co Light Rail FY 2016			$1,821	5.5	8.1	13.2	0.0	56.8
20	*Construct additional lane for northbound to eastbound entry movement*		US-501 Fordham Blvd	NC 54, NC 86 (S. Columbia Street)		$2	4.4	6.7	0.0	2.7	65.1
21	*Orange Grove Road Extension (Orange Grove Road to US 70) with Sidewalks and Bicycle Lanes*		SR-1006 New Route - Orange Grove Road	SR 1006 (Orange Grove Road)	US 70A	$5	2.7	6.7	0.0	0.0	68.7
22	*Widen to Multi-Lanes with Bicycle, Pedestrian, and Transit Accommodations*	*U-5324C*	NC-54	NC 751	SR 1118 (Fayetteville Road)	$22	2.0	7.5	0.0	0.7	60.5
23	*Add Additional Lanes*	*I-3306A*	I-40	I-85	US 15/501	$77	1.9	6.5	0.0	2.3	60.2
24	*Improve NC 54 to a Superstreet design and construct interchange at Barbee Chapel Road*		NC-54 Raleigh Road	Burning Tree Drive	Barbee Chapel Road	$32	1.7	6.1	0.0	10.0	65.1
25	*Construct Roundabout and Related Safety Improvements at the Existing intersection of Mount Carmel Church Road and Bennett Road*		SR-1771	SR 1008 (Mount Carmel Church Road)	1913 (Bennett Road)	$1	1.6	5.0	0.0	0.0	64.8
26	*Upgrade Roadway to Freeway*	*U-4720A*	US-70	Lynn Road	Miami Blvd	$109	1.1	9.2	0.0	8.6	63.1
27	*Widen Roadway to 6 Lanes and Rehabilitate Pavement*	*FS-1205C*	NC-147 Durham Freeway	I-40	East End Connector	$52	1.0	6.5	1.8	0.9	31.7
28	*Construct 1 Managed Lane Per Direction (Additional 16Ft of Pavement - 12Ft Lanes + 4Ft Pavement For Separation with General Purpose Lanes)*		I-40	NC 147	US 15/501	$497	0.8	6.0	5.1	6.9	48.8
29	*I-40 to Eno River. Widen to Multi-Lanes with Landscaped Median, Bicycle Lanes, and Sidewalks, Widen Bridge No. 240 Over Southern Railroad*	*R-2825*	SR-1009 South Churton Street	I-40	Eno River	$26	0.7	7.0	0.0	0.0	68.9
30	*Widen to 6 lanes*		NC-147 Durham Freeway	East End Connector	US 15-501	$88	0.6	7.1	1.8	1.1	31.7
					DEGREE OF DIFFERENCE BETWEEN PROJECTS, BY SCORING MEASURE:						

Table 5c. Unfunded, Not-prioritized Project-Level Recommendations

Map ID	Project Recommendations	Route	From / Cross Street	To
31	***Safety/Access Management Improvements***	Roxboro and Avondale near I-85	Interchange Vicinity	Club Boulevard
32	***Safety/Access Management Improvements***	I-40 and NC 55/NC 54	Interchange Vicinity	Interchange Vicinity
33	***Safety/Access Management Improvements***	I-40 and Fayetteville Road/NC 54	Interchange Vicinity	Interchange Vicinity
34	***Creation of parallel routes, Increase Bus Frequency, Add Park-and-Ride***	Smith Level Road and NC 54	Interchange Vicinity	Interchange Vicinity
35	***Widen from three to four lanes, improve access management***	NC 98 (Holloway St)	Alston Avenue	East End Connector
36	***Restripe markings, pavement rehabilitation, new marking considerations, extend acceleration lanes***	Chapel Hill Road and Cornwallis Road	Interchange Vicinity	Interchange Vicinity



HOW WE DID IT – KEYS TO UPDATING THIS REPORT

In order to satisfy the ongoing monitoring element of the Congestion Management Process, this report has to be updated periodically and the results compared over time. The following section describes the key data sources and actions needed to make updates to the CMP and this report.

How We Did It – Keys to Updating this Report

One of the most important aspects of the Congestion Management Process (CMP) requirements is that it is a process – and therefore the transportation system has to be monitored and this report updated periodically to be of maximum use.

As future updaters take on the task of gathering and manipulating information to prepare new iterations of the report, a few recommendations are in order, and a number of important notes on how challenges with various performance measures were addressed are at right. Note that the nuances of sophisticated spreadsheet dashboards are not covered in this summary.

New Updates Require New Data Collection

The recommendation is that travel time data be collected on approximately the same cycle as the long-range transportation plan – about every four years. The travel demand model and daily traffic counts are on similar cycles as well, or are updated/maintained even more frequently.

Updates will Require New Graphics

Since it is very desirable to see how the system is changing over time, the next iteration (second generation) of this report will require considerable work in terms of developing new graphics that communicate those changes between the time that this report (and its data to support it) was prepared and the next update. The DCHC MPO should prepare its staff and/or budget line items appropriately in the 2016 (data collection) and 2017 (report generation) Unified Planning Work Program.

Notes on Individual Performance Measures and Addressing Specific Technical Challenges

The next update of this report will be conducted more efficiently and quickly if the following notes are reviewed prior to initiating the report development (including manipulation of data to create maps and other graphics). These notes are arranged according to the four main sections of this report and by individual performance measure.

How Others See Us

Since this section is all about how business leaders, visitors, and others research this community, the data is readily available – although with greater variations in quality - via third-party sources:

- *Common Denominators/Commute Stress Index: Sourced from the TTI Congestion Report (annual update). This report should also be consulted for the list of peer regions.*
- *Walkability Score: www.walkscore.com*
- *Commute Times: Use www.trulia.com for this data, creating a spreadsheet of origin-destination pairs with times between each.*

How We See Ourselves

This section was also relatively easy to prepare in terms of data collection, although only land lines can be surveyed, providing some bias to rural areas or older populations. Public Policy Polling (Jim Williams, Jim.Williams@PublicPolicyPolling.com) converts user-supplied questions to telephone-ready text and conducts the random (land-line only) telephone survey, providing cross-tabulated results in about 3-4 days. Zip codes for the polling areas are needed to be supplied as well. Ten questions, plus several free questions concerning demographic information, are provided at no addition cost to the $2,500 survey fee.

Roadway Performance

Floating car studies (cars that record speeds as they move with traffic) were used to identify congested and free flow travel times were calculated for the 12 study corridors. Subtracting the median from the maximum values for peak and off-peak travel time runs determined the median amount of delay per corridor per trip in seconds. The average wage rates per hour from the fourth quarter 2013 data provided by the Bureau of Labor Statistics at the county level were used to monetize the cost of congestion.

Alternative Mode Performance

The **transit-roadway travel time** comparison is made much easier by the on-line route finder application, TripPlanner (http://tripplanner.gotriangle.org) to get transit travel times, which were compared to congested times in Google (and checked against travel time runs in these corridors to ensure accuracy). The **Connectivity Index**, or Beta Index, compares the number of links in a district to the number of intersection points – a task which requires all "shape" points and non-intersection nodes to be removed in GIS, as well as discounting freeway (full access-control) facilities. In theory, the Beta Index can exceed 2.0, but in practice that level of connectivity is hard to achieve. The **Transit Share in Major Corridors** figure requires a manual examination of AADTs in the 12 corridors and the total transit ridership. The former is acquired through NCDOT databases, and the latter from each of the three transit companies (DATA, CHT, and Triangle Transit). **The Sidewalk to Street Centerline Ratio** provides an analysis of pedestrian amenities versus overall total streets. Also calculated for each

subarea, the lengths of each street were summed and then divided by the summed sidewalk total to determine the ratio. The highest ratio would be "2", though all subareas had a ratio of under 0.5. C**hanges Over Time** used primarily data from the annual Texas Transportation Institute's annual Congestion Report (http://mobility.tamu.edu/ums/) and the National Transit Database (www.ntdprogram.gov/ntdprogram/profiles.htm), although the first year (2002, in this case) transit trip costs have to be inflation-adjusted to the "out" year (2012) using the Consumer Price Index, and both trip costs have to be weighted by the number of unlinked trips reported by the four biggest public transit companies. A **Connectivity Index** was calculated by comparing the number of links, or segments of roadway between intersections or between intersections and dead-ends, to the number of nodes, or intersections (dead-ends not included). The **Environmental Justice Populations and Transit Analysis** was derived from transit stop data and Census Data (2010) at the block group level. Calculations were performed at both the regional level as well as on the subarea level to determine the location of predominantly minority communities and communities with high instances of poverty. We calculated the average and standard deviations at the regional and subarea levels and determined which block groups exceeded one standard deviation above the mean. These were identified as having high minority or high poverty populations at the block group level.

Data Sources

Much of the data presented in the previous sections is publicly available, though some required substantial analysis to develop a meaningful format. The data sources are presented below.

Report Data

- Commute Times, 2014, *www.trulia.com*
- Floating Car Studies, 2013, *DCHC MPO*
- Survey Results, 2014, *Public Policy Polling*
- Transit Ridership Data, 2013, *Triangle Transit, DATA, CHT*
- Transit System Performance, 2013, *FTA National Transit Database*
- Transit Travel Times, 2014, *http://tripplanner.gotriangle.org*
- TTI Congestion Report, 2013, *Texas Transportation Institute*
- United States Census 2000 and 2010 Summary Files 1, 2014, *United States Census Bureau <factfinder2.census.gov>*.
- Walkability Score, 2014, *www.walkscore.com*

GIS Data

- AADT Shapefile, NCDOT Traffic Survey Group
- Aerial Imagery, ArcGIS Online
- Census Block Groups Tigerline File, United States Census Bureau
- County Boundary, NC OneMap
- Hillshade, Contour and Elevation Data: Connect NCDOT
- LRS Routes, Connect NCDOT
- Major Intersections, City of Durham
- DCHC Metropolitan Planning Organization Boundary, City of Durham
- Municipal Boundaries, NC OneMap
- Sidewalks, City of Durham
- DCHC Street Centerline File, DCHC MPO.
- Three County Crash Data, NCDOT Transportation Mobility and Safety Division
- Transit Shapefiles, Triangle Transit Developer Resources
- Triangle Regional Model Outputs, DCHC MPO

The **Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC-MPO)** is the regional organization responsible for transportation planning for the western part of the Research Triangle area in North Carolina.

The DCHC urbanized area, first designated by the 1980 Census, covers all of Durham County, a portion of Orange County including the Towns of Chapel Hill, Carrboro, and Hillsborough, and Northeast Chatham County. DCHC is also designated as a Transportation Management Area (TMA), urban areas with a population of over 200,000 people.

The DCHC-MPO is an umbrella organization comprised of the MPO Board, the Technical Committee (TC), local governments, and the State. The MPO Board, designated by the Governor, is a policy body that coordinates and makes decisions on transportation planning issues using a Continuing, Comprehensive, and Cooperative (3-C) transportation planning process. An integral element of this 3-C process is the development of a long-range transportation plan, in part based on an active **Congestion Management Process** (CMP) to identify, assess, make recommendations for resolving, and monitoring congestion and congestion-related issues across all forms of travel in the MPO's planning region. This report has been prepared by the DCHC MPO to present key information for the Congestion Management Process in a form that is readily accessible so that everyone can participate in our ongoing transportation process.

DURHAM-CHAPEL HILL-CARRBORO
METROPOLITAN PLANNING ORGANIZATION

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