Congestion Management System for the Mid-Hudson Valley Transportation Management Area

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1. Forward

Federal law requires that a Metropolitan Planning Organization situated within a designated Transportation Management Area establish a Congestion Management System. Such a system institutes a process within the organization for identifying, evaluating, and managing congestion along the region's transportation network. In essence, the process empowers Metropolitan Planning Organizations to develop viable strategies to mitigate the causes and effects of congestion, and to press forward with implementing these strategies by working with the region's elected officials, private citizens, and transportation professionals. And given a Metropolitan Planning Organization's inherent role as the forum for addressing the mobility needs of a region, its choice as the lead mechanism to manage congestion seems obvious.

2. The Metropolitan Planning Organization (MPO)

Federal regulations require that all Urbanized Areas[1] be represented by a MPO, which is responsible for ensuring that Federal transportation dollars (highway and transit) are committed through a locally driven, comprehensive planning process. The purpose of a MPO is to provide a forum for state and local officials to discuss transportation issues and, in turn, reach a consensus on transportation plans and specific programs of highway and transit projects. The US Department of Transportation (USDOT) relies on each MPO to make sure that federally funded projects are the products of a credible planning process, meeting the goals and priorities of the metropolitan area. To guide this planning process, a MPO must regularly develop three critical documents: a Long-Range Transportation Plan (usually a twenty-five year plan), a Unified Planning Work Program (UPWP), and a Transportation Improvement Program (TIP). In addition to these base requirements, a MPO located in a Transportation Management Area (TMA) must also develop a Congestion Management System (CMS).

3. CMS History

The CMS requirement first appeared with the enactment of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. ISTEA was a six-year, federal transportation program, which established planning guidelines and allocated federal funding for transportation programs and projects. ISTEA also created a new geographic designation entitled a Transportation Management Area, which it defined as an Urbanized Area with a population exceeding 200,000 people. The reasoning behind this designation centered on the idea that larger communities faced more complicated and unique mobility challenges than those faced by rural areas, with one of those challenges being traffic congestion. The CMS requirement remained with the successor to ISTEA, the Transportation Equity Act of the 21st Century (TEA-21), and will likely continue with the reauthorization bill that will follow TEA-21.

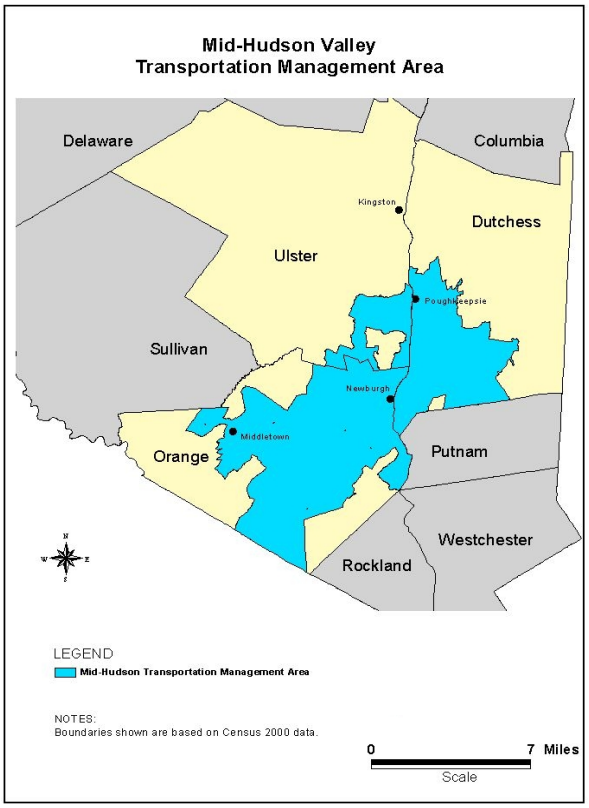
[1] The U.S. Census Bureau defines an Urbanized Area as a central place(s) and adjacent territory with a general population density of at least 1,000 people per square mile of land area that together have a minimum residential population of at least 50,000 people.

4. The Mid-Hudson Valley TMA

The Mid-Hudson Valley TMA encompasses a population of almost 352,000 people spanning the boundaries of three counties: Dutchess, Orange, and Ulster. The designation arose from the creation of the Poughkeepsie-Newburgh Urbanized Area by the U.S. Census Bureau in May 2002. This new Urbanized Area (UA) combined the previously separate Poughkeepsie UA and Newburgh UA, and in turn, formed a single UA with a population exceeding the 200,000 person threshold used to establish a TMA (Figure 1).

In most circumstances a single MPO serves a TMA, but the Mid-Hudson Valley TMA stands as an exception. Prior to the Census 2000 designations, two MPOs, the Poughkeepsie-Dutchess County Transportation Council (PDCTC) and the Orange County Transportation Council (OCTC), served the Mid-Hudson Valley, with each MPO corresponding to its respective Urbanized Area. This changed in 2003 when a third MPO, the Ulster County Transportation Council (UCTC), arose from the newly designated Kingston Urbanized Area. Though each is a separate, independent organization, the three MPOs share varying portions of the larger Poughkeepsie-Newburgh Urbanized Area, which forms the basis of our TMA.

Figure 1



Since the three organizations hold a vested interest in how their transportation networks relate to one another, and recognizing the fact that the transportation systems of the tri-county area are closely linked, it stands to reason that a single CMS should cover the region; besides, congestion knows no boundaries. This decision made even more sense given that the PDCTC and OCTC worked on and subsequently completed a joint Air Quality Conformity Determination Statement for their Long-Range Transportation Plans and Transportation Improvement Programs (TIP) in 2005. The three MPOs therefore agreed to develop and implement a single CMS for the TMA, which would outline the overall commonalities among the three MPOs – such as a single definition for congestion and common types of data collection – but also allow for locally derived methods to manage congestion in their individual communities.

On January 12, 2005, the three MPOs of the Mid-Hudson Valley TMA set forth to complete a single CMS for the region. Throughout the year, the three organizations held a series of joint planning sessions to develop a system that dealt with congestion in the Mid-Hudson Valley - a first of its kind for the region. This report is a result of that collaborative effort.

5. CMS Requirements

This CMS adheres to the requirements set forth in Title 23 CFR (Highways), Part 500 (Management and Monitoring Systems), Section 500.109 (CMS). The regulation identifies the essential components of any CMS, to include a need to define congestion and devise a methodology to frame the discussion. The regulation itself defines congestion as the "level at which transportation system performance is no longer acceptable due to traffic interference." The word "acceptable" alludes to a key aspect concerning our understanding of congestion: how do we identify the point where congestion becomes a problem, or further, how do we know congestion is even a problem? A CMS will help a region determine that congestion threshold, and more importantly, introduce ideas on how to deal with it.

The regulation presents six core components of a CMS. These include: 1) Creating methods to monitor and evaluate the performance of a transportation network; 2) Using quantifiable parameters to identify congestion; 3) Establishing a program for data collection; 4) Identifying and evaluating the benefits of congestion management strategies; 5) Developing an implementation schedule; and 6) Instituting a process to periodically assess the CMS program.

These components aside, the regulation intentionally grants a MPO with significant flexibility in developing the details of a CMS. This flexibility stands as an acknowledgement that each region is unique and that local knowledge of an area will create better congestion management techniques. Such flexibility also allows a MPO to incorporate the latest technologies and techniques as they arise. A CMS is therefore not a static document, but an evolving program that changes with the varying challenges that face a region; a critical aspect of any useable plan.

In addition to these basic tenants, the CMS for a TMA located in a carbon monoxide and/or ozone non-attainment area must meet additional criteria. These include the requirement for an appropriate analysis of all reasonable (including multimodal) travel demand reduction strategies where an increase in Single Occupant Vehicles (SOVs) capacity is proposed. If the analysis shows that the capacity cannot be met through demand strategies, then the CMS must identify strategies to effectively manage the expanded SOV facility. Federal regulations also state that federal funds cannot be programmed for any highway SOV project in a non-attainment area unless it is based on an approved CMS. These requirements apply to the PDCTC and OCTC, since they are part of the U.S. Environmental Protection Agency (EPA) designated Poughkeepsie Moderate Ozone Non-attainment Area; the UCTC lies outside this area.

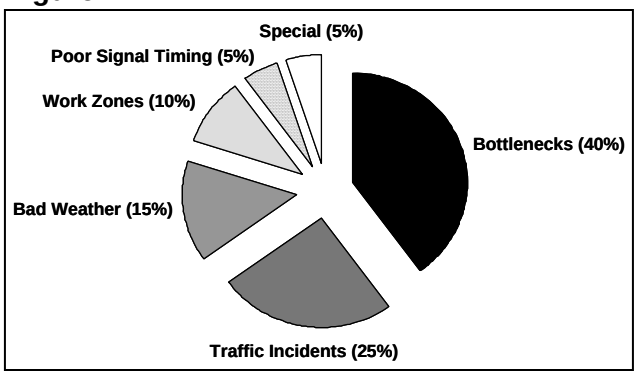
As in any formal MPO policy document, the Executive Committees for each of the three MPOs must approve this joint CMS, where it will then be forwarded to Federal agencies for final review and approval. Federal guidelines require that a CMS be in place when a MPO undergoes a formal Federal certification review – the process by which the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) evaluate a MPOs compliance with Federal transportation planning requirements. For the PDCTC, OCTC, and UCTC, this means that the CMS must be approved no later than October 1, 2005. As with other MPO products, this CMS is available upon request and will be posted to each MPO's web site (see cover).

6. Understanding Congestion

Not all congestion is the same. In general, there are two types: recurring and non-recurring congestion. Recurring congestion refers to congestion that arises on a routine basis at the same place and generally at the same time, a condition that may hint at a systemic imbalance between roadway capacity and existing demand – otherwise known as a "bottleneck." Some refer to this as volume based congestion.

On the other hand, non-recurring congestion describes those atypical times when a vehicle crash, road construction, or poor weather impedes traffic. This also includes traffic resulting from heavy demand associated with a special event, such as a County fair or holiday shopping; this is sometimes referred to as incident based congestion. Figure 2 shows the common causes of congestion.

Figure 2



Source: Federal Highway Administration (FHWA), *Traffic Congestion and Reliability: Linking Solutions to Problems*. July 19, 2004.

Our ability to formulate viable management solutions begins with an understanding of these two types of congestion. It also underscores the complexities of trying to measure and manage congestion, especially with regard to non-recurring or incident based congestion, which can be extremely difficult to predict. Therefore, for this CMS, we will focus on recurring, peak hour congestion in the short term and then work towards addressing non-recurring congestion in the long term.

Mid-Hudson Valley TMA - CMS Mission Statements

Short-Range

Locate and manage severe, recurring congestion on road corridors and intersections in the tri-county, Mid-Hudson Valley Transportation Management Area.

Long-Range

Expand the CMS program to analyze non-recurring congestion, and to also identify congestion related to other modes of transportation (public transit, bicycle, and pedestrian).

7. CMS Strategy

Embracing the flexibility surrounding the CMS process, this report addresses the statutory requirements through a four-step strategy tailored to the Mid-Hudson Valley. The purpose of using this methodology is two-fold: it is hoped that this format will ease the reader's understanding of this new CMS system (whether private citizen, local leader, or trained professional), and accordingly, plant the seed in those individuals to take action and work to manage severely congested areas. As with any program, and especially this CMS, the PDCTC, OCTC, and UCTC will need to balance their desires to effectively manage severe congestion

with the reality that financial and staff resources remain finite and that they must compete with other MPO requirements.

Four step CMS strategy:

Step One. ***Measure and Define: understanding the transportation system***

The first step in this CMS will provide the PDCTC, OCTC, and UCTC with insight in to how the region's transportation system is operating. To do this, the CMS first lays out the system of data collection that will allow the MPOs to measure observed traffic against a set of criteria used to define congestion.

Step Two. ***Locate: finding severe congestion in the Mid-Hudson Valley***

With the appropriate data and a system to define congestion, we arrive at the next step: locating severe congestion. In this step, a priority list of severely congested areas for each county will be created, which will then serve as the focal point for short- and long-range congestion management strategies.

Step Three. ***Manage: identifying realistic solutions and taking action on them***

The true measure of a plan is the tangible actions taken because of if it: real solutions to real problems. It is the goal of this CMS to advance realistic measures to manage the congestion challenges of our communities. The MPOs of the Mid-Hudson Valley TMA understand that there is no single, all encompassing management solution for congestion; instead, it requires the execution of numerous, smaller solutions. We therefore must remain receptive to the full range of methods available to manage congestion.

Step Four. ***Integrate and Evaluate: making this CMS work in existing planning processes***

This section presents how the three MPOs will integrate the CMS into their local planning processes and the regional planning framework; integration forms the focus of the short-range action items. Long-range action items address the need to routinely evaluate the CMS, which is not only a requirement, but also a necessity if it is to adapt to an ever-changing transportation environment. In time, the intent is to test the effectiveness of implemented management actions to verify that they truly mitigate severe congestion.

8. CMS Action Plan

The clear intent of this CMS strategy is to use existing planning efforts and technologies to address severe congestion – e.g. short-range action items. Long-range action items represent those measures, whether planning initiatives or equipment based solutions, whose implementation or purchase will build upon current techniques and technologies. For each of the

steps, the report describes how the PDCTC, OCTC, and UCTC will work to accomplish them, while also including a breakdown, where feasible, by short-range and long-range action items.

Work on the short-range action items for Step One will start upon the effective date of the CMS: October 1, 2005. It will likely require eighteen months from the start of implementation to accomplish the short-range action items of Steps Two through Four; after which, the three MPOs will begin the CMS evaluation and revision process. By the time the MPOs finalize their next Transportation Improvement Programs, the Mid-Hudson Valley TMA will have created a basic program from which to pursue long-range action items. Again, this CMS action plan is a flexible strategy for managing severe congestion, subject to revision as new ideas come about. Though at a minimum, this CMS will be updated every two years, with the first updated CMS effective no later than October 1, 2007.

Step One

Measure and Define: Understanding the transportation system

Measure. Collecting traffic data stands as a key component in understanding how our roads are used, and it is in this first step that the CMS outlines ways to measure traffic not only from within each MPO, but eventually from external partners such as the NYS Department of Transportation. The ultimate goal of Step One is to assess where we are at (short-range) and where we need to go (long-range) with regards to data collection.

Define. Numbers by themselves are of little use without context, and traffic data is no exception. For a CMS, that context deals with how we define congestion. As individuals and communities, we all view congestion in a different light, having varying thresholds for the amount of delay we will tolerate on our roads. Though perceived differently, some common, quantifiable definition of congestion must be agreed upon and used if we are to collectively understand the issue. Accordingly, this section lays out the simple, quantifiable boundaries used by the MPOs of the Mid-Hudson Valley TMA to define congestion, with an understanding that the nuances present in local communities will play a role in how we look at congestion.

Short-Range

Action Item 1-1. *Measure congestion*

The saying "drowning in data, thirsting for knowledge" easily describes the field of transportation planning, and it presents a dilemma for small organizations like ours. Given our limited resources, the short-term challenge lies in trying to find and use the most effective data available or easily garnered to measure congestion. A good starting point is to look at what we already have, and fortunately, there are already some excellent data sources in use by the three MPOs.

As stated earlier, the three MPOs will take advantage of existing programs to meet the near term requirements for a CMS. Travel demand modeling is one such program. This CMS relies heavily on the individual travel demand modeling efforts of the three MPOs, because modeling meets two essential requirements for the short-range: effectiveness and timeliness. And though

two of the MPOs have historically used these models solely in air quality conformity analyses, travel demand modeling also stands as one of the most accurate and feasible methods to measure current and future congestion on the Valley's roadways.

Specifically, travel modeling can provide organizations with basic data on congestion such as Vehicle-to-Capacity (V/C) ratios, which are accepted measures of congestion. By using travel models, the MPOs can identify those locations that are experiencing or expected to experience the highest levels of congestion, allowing regional and local agencies to concentrate their management efforts on the worst locales. The ability to provide a geographical component to transportation data also rests as an important advantage of modeling, but there is another.

An indirect benefit of using existing models centers on the fact that the information requirements for these models already force the organizations to collect critical transportation data on their counties. This data falls under three broad categories: transportation system characteristics (e.g. functional classifications of roads, signal timings, turning lane operations), traffic volume data (e.g. Average Annual Daily Traffic counts on State and County roads), and socio-economic data (e.g. population, housing and employment demographic data). This data presents an excellent picture of the Valley's transportation system when analyzed in a way that can quantify the direct and indirect relationships between population characteristics and travel behavior, and measure their effects on the transportation network, which a travel demand model can accomplish.

Action Item 1-2. *Define congestion*

This appreciation for effectiveness and expediency also characterizes the organizations' approach to defining congestion (one of the Federal requirements of a CMS). Staff from the three MPOs initiated an internal staff review of some of the better CMS practices in place, with a focus on how similarly sized organizations defined and measured congestion in their areas. This review was greatly supported by two studies: 1) The *Congestion Management Systems Practices* report published by the Texas Transportation Institute in January 2002; and 2) A report on innovative practices completed on behalf of the NYS Association of MPOs under a CMS Policy Review Shared Cost Initiative (SCI). Using these reports and information garnered from other MPOs, the PDCTC, OCTC, and UCTC agreed upon two methods to measure congestion: Vehicle-to-Capacity (V/C) ratios and Travel Time Surveys. The first method, V/C ratios, will serve as the short-range method for defining congestion among the three MPOs, while the latter will serve as the long-range method, pursued as time and resources become available.

Measuring traffic against V/C ratios tackles the issue of defining congestion from the perspective of supply and demand. A particular road has a finite physical capacity, a limit to the number of vehicles that can safely travel on the road at any one time. At a given point, the sheer number of vehicles on the road creates congestion and an unacceptable level of service: usually, but not limited to, morning and evening peak commuting periods. To quantify this level of service, a V/C ratio – or percent of use – is calculated for roadways and then translated into a descriptive level of congestion. The travel demand models can calculate current and future V/C ratios by taking traffic volume and dividing it by roadway capacity, which is primarily based on the road type (functional classification); this is a relatively simple calculation for today's modeling software.

V/C ratios do present some limitations, because they do not fully account for speed variations, maneuverability, or travel time; though, in the long term, using travel time data would help mitigate these limitations.

For this initial CMS effort, the MPOs of the Mid-Hudson Valley TMA agreed to use a system of V/C measurements similar to ones employed by other TMAs in the country. These locally derived systems are variants of nationally accepted Level of Service (LOS) designations as defined by the Transportation Research Board in its *Highway Capacity Manual (HCM)*. In general, the *HCM* rates the efficiency of transportation facilities on a scale of A through F, with LOS A representing the ideal of free flow traffic and LOS F the worst with forced or breakdown flow. Building upon this type of rating system, many MPOs translate numeric V/C ratios into qualitative terms that better convey the level of congestion on a facility. A typical and effective approach classifies congestion into three general categories such as moderate, high, and serious, with each category equated to a range of V/C ratios. For example, the New York Metropolitan Transportation Council (NYMTC), the MPO for the New York City metropolitan area, translates V/C ratios into three categories: un-congested (<0.8), congested (0.81-1.0), and severely congested (>1.0); other MPOs begin their definition of congestion at the 0.8 threshold level, which roughly corresponds to a LOS D (high density, but stable flow).

Accordingly, this CMS uses a system that classifies recurring weekday, peak hour (e.g. 4-5 p.m.) congestion into three categories: moderate, heavy, and severe (Table 1). The categories relate to three simple ranges of V/C ratios. A facility operating between 80 to 89-percent of its capacity during peak periods is classified as having moderate congestion, while a facility operating at 90 to 99-percent of capacity is classified as experiencing heavy congestion. When the measured V/C ratio exceeds the 100-percent threshold, the facility is classified as having severe congestion. The over 100-percent threshold equates to LOS F. The benefit of using such a classification system is that it makes it easier for individuals and organizations to understand the levels of congestion on the region's roadways, and consequently easier to prioritize problem locations and better focus management strategies. It is also similar to a previous system used by NYSDOT-Region 8 to define congestion.

Table 1. Vehicle-to-Capacity Ratio Designations for the Mid-Hudson Valley TMA CMS

Level of Congestion	Vehicle-to-Capacity Ratio[1]
Moderate	V/C ratio = 0.80 – 0.89
Heavy	V/C ratio = 0.90 – 0.99
Severe	V/C ratio >= 1.00

[1] As calculated for weekday peak hour volume.

By adopting these simple standards to define congestion and, in turn, measuring the outputs of the three travel demand models against these definitions, the PDCTC, OCTC, and UCTC satisfy the key requisites for a CMS – understanding the region's system through a program of data collection, and the defining and measuring of congestion.

A Review of MPO Travel Demand Modeling

Poughkeepsie-Dutchess County Transportation Council (PDCTC)

The PDCTC will use an existing three-step, gravity-based model, processed through *TransCAD*, to measure and identify severe congestion in Dutchess County. The model attempts to quantify the relationship between the existing transportation network and different land uses, which are spatially represented in the model by Traffic Analysis Zones (TAZ). For example, in the 2005 model the PDCTC uses 190 different TAZ geographies. Each TAZ is populated with a range of socio-economic data such as: average household size, number of housing units and households, total number of vehicles available, and the number of retail and non-retail jobs. The 2000 Census, the Census Transportation Planning Package, and NYS Department of Motor Vehicles provide the base data for these demographic characteristics, while various internal and external demographic forecasts are used for future scenario years. In addition, the model uses travel statistics from the 2001 National Household Travel Survey (NYS Add-On) and National Cooperative Highway Research Program (NCHRP) reports, which are accepted data sources in the field of transportation planning.

To further gauge how Dutchess County's transportation system functions and to calibrate the travel demand model, the PDCTC administers an annual traffic count program, which feeds critical traffic volume data into the model. The count program, initiated in 1999, collects Average Annual Daily Traffic (AADT) and peak hour traffic information for all county roads and covers counts at approximately 200 locations per year; individual locations are counted every three years. This counting cycle is sufficient enough to allow the PDCTC to compare counts at the same location over time and to identify significant trends - of the 600 locations measured in the count program, all have been measured at least twice if not more. The PDCTC makes the data available to the public through the publication of an annual Traffic Count Report and its website.

Orange County Transportation Council (OCTC)

The OCTC will use a four-step, gravity-based model, utilizing *Visum* travel demand modeling software to measure congestion in Orange County. As in other models, the creation and identification of TAZs within the county remains an essential component in linking population and land use characteristics to the transportation network. To facilitate this connection, the OCTC established 550 TAZs in its model. Each of these TAZs is populated with socio-economic characteristics, including population, employment, housing, and vehicle availability. Data sources include the 2000 Census, the Census Transportation Planning Package, the NYS Department of Labor, and NYS Office of Real Property. The model also uses internal forecasts from the Orange County Department of Planning, based upon proposed development projects throughout Orange County, growth trends in housing and employment, and commutation patterns into surrounding counties, as well as the availability of sewer and water facilities and highway infrastructure.

Ulster County Transportation Council (UCTC)

The UCTC will use a four-step, gravity-based model, utilizing *TransCAD* software to measure congestion in Ulster County. The model is currently in development and uses many of the same types of data used in the PDCTC and OCTC models. The UCTC will incorporate 397 different TAZ geographies into its model. For each TAZ, base socio-economic data – number of housing units and the number of retail and non-retail employees – will be included. As the model is developed, information on the number of vehicles per household and household size will also be added. The 2000 Census Transportation Planning Package will provide additional information

for updating the land use inputs of the model. Besides current 2000 household and employment information, the UCTC model also incorporates 2020 and 2030 household and employment projections, which enables the model to replicate existing and future conditions.

The model uses data associated with each road (e.g. link) in the network: number of lanes, speed, and capacity. UCTC staff will ensure the link network follows the contours of existing road configurations to make it compatible with other GIS coverages. Once completed, other data (such as demographics and existing traffic counts) can be used to calibrate the model, along with transportation operations data such as turn penalties. To further calibrate the model, counts from NYSDOT on state roads, as well as counts on county roads (at railroad crossings and on bridges) from the last 5 years, have been digitized into GIS and will be used as comparison data for calibrating the model. Also, traffic counts will be taken on selected county roads over the next 3 years, which will provide more important reference information. After completion of these counts, UCTC will publish a Traffic Count Report similar to the PDCTC's annual traffic count report.

Long-Range (Measuring and Defining Congestion)

A CMS is a living document that should adjust not only to the social and physical changes taking place in a region and its local communities, but also to the technological advances that provide planning field with new ways to monitor how the system serves the mobility needs of travelers. This idea drives how the Mid-Hudson Valley TMA will measure and define congestion in the long-term, because it is here that technology can have a great impact. The following action items showcase some of the ideas and programs that will be pursued to expand our understanding of the region's transportation network

Action Item 1-3. ***Explore the use of Travel Time Surveys to measure and define congestion***. In addition to using V/C ratios to identify congestion, the three MPOs agreed to pursue a second approach that incorporates travel time measurements in defining congestion. Incorporating the time component in our understanding of congestion acknowledges the importance of time to travelers, which can often be a better gauge of real-time congestion than traditional V/C calculations.

A report on innovative practices, written for the NYSMPO CMS Shared Cost Initiative (SCI), identified four possible congestion calculations stemming from Travel Time Surveys:

- *Total Travel Time*: the total time needed to travel a road or transit segment.
- *Observed Travel Speed*: total segment length divided by total travel time.
- *Observed Delay*: the difference between travel time and free flow travel time.
- *Travel Time Index*: the ratio of peak period travel time to non-peak travel time.

Initial efforts to use Travel Time Surveys in the Mid-Hudson Valley TMA will focus on those road segments identified as having severe, recurring congestion (Step Two). The surveys will provide finer detail on the extent of real-time congestion on these priority locations.

When implementing this action item, the PDCTC, OCTC, and UCTC will need to address the question of how the time surveys will be taken. One popular approach involves the use of

Global Positioning System (GPS) technology, which provides a great deal of accuracy and flexibility. GPS technology can be coupled with various software applications to meet specific data needs, with transportation planning being one. Specifically, GPS based applications can provide data on travel times, vehicle speeds, and excess delays, which can play a pivotal role in measuring congestion. As with any new technology, funding and training will be required to fully develop GPS tools, but the three organizations remain committed to investigating their application in the Mid-Hudson Valley. Also, the purchase of equipment, software, and training could occur under a Shared Cost Initiative among other New York State MPOs that must maintain a CMS.

Action Item 1-4. ***Incorporate NYSDOT Congestion Needs Analysis Model into the CMS***. The Mid-Hudson Valley TMA intends to pursue other modeling programs to measure congestion in the Mid-Hudson Valley. One such program is the NYSDOT Congestion Needs Analysis (CNA) model. Originally created to complete the State's Congestion Management Plan in the mid-Nineties, the model can forecast future Vehicle Miles Traveled (VMT) on a regional basis. All three MPOs have expressed interest in capitalizing this tool to assist in developing a comprehensive CMS. As the three organizations progress through the CMS process, we expect to gather congestion data from the CNA to broaden our understanding of the region, while also comparing these results with our individual models.

Action Item 1-5. ***Measure and define transit congestion***. Congestion is not limited to just highways and roads, but can occur along rail lines and bus routes. To better gauge how mass transit operations are functioning, the MPOs will seek passenger service data from transit providers such as Metro-North Railroad, Dutchess County LOOP, and Ulster County Area Transit (UCAT). The long-range goal is to establish performance measures for transit service, similar in fashion to how we measure congestion on roads, so that we can provide solutions to serious transit congestion. One possible approach may entail the use of passengers per mile statistics, which may be a good tactic for the Valley. Additionally, travel time surveys can also be conducted on transit routes to better comprehend transit operations.

Action Item 1-6. ***Pursue advanced travel demand modeling***. As the three organizations develop their individual models and staff becomes more familiar with travel demand modeling software, the MPOs will explore the potential of these models to analyze congestion along specific corridors and to also test the outcomes of congestion management techniques. Staff will also participate in travel modeling training when available.

Action Item 1-7. ***Adapt to changing trends and integrate new technology***. As this CMS progresses and the MPOs of the Mid-Hudson Valley TMA become more familiar with the subject, staff will incorporate other measuring techniques as they become available or feasible. This is especially true in the case of emerging Intelligent Transportation Systems (ITS), which have already proven themselves as effective transportation system management tools (Step Three discusses ITS in greater detail).

Step Two

Locate: finding severe congestion in the Mid-Hudson Valley

Having established clear benchmarks for measuring congestion, we now find ourselves at the point of looking at the results of those efforts. The simple, overarching goal of collecting data and engaging in the process of modeling is to identify the locations encountering severe congestion. Once the PDCTC, OCTC, and UCTC travel demand models are established to measure congestion, a list of congested areas in the Mid-Hudson Valley TMA will be developed and issued as a separate follow-on report to this CMS. The three planning organizations will then focus congestion management efforts on these priority locations.

Action Item 2-1. Identify severely congested roads and intersections. As results from the three models become available, the Mid-Hudson Valley TMA will create a single listing of severely congested roads and intersections in the three counties, based on the criteria established in Step One. This listing, along with individual county maps showing congested areas, will be published as a follow-on report to this CMS. The OCTC completed a preliminary analysis of congestion in Orange County, which provides an example of the results that will be presented in the follow-on report (Table 2).

Existing Information on Congestion

The following areas have been identified as experiencing high levels of congestion through a previous New York State CMS program and individual MPO modeling efforts. It should be noted that in the case of small to mid-sized urbanized areas, congestion might not be a problem in the strict quantifiable sense – though anecdotal evidence may hold the opposite to be true.

Poughkeepsie-Dutchess County Transportation Council (PDCTC)

Most of the major highway and road facilities in Dutchess County currently operate at acceptable Levels of Service. The NYSDOT-Region 8 Congestion Management System, completed in the mid-1990's, identified V/C ratios greater than 0.9 on the following routes: Route 9 in Hyde Park and Wappingers Falls, Route 9D in Wappingers Falls and Fishkill, Route 9G in Hyde Park, Route 44 in Poughkeepsie and Pleasant Valley, Route 52 in the Village of Fishkill, Route 55 in La Grange, Route 376 in Poughkeepsie, and Interstate 84 in Fishkill and East Fishkill.

Ulster County Transportation Council (UCTC)

Most of the major highway and road facilities in Ulster County operate at acceptable Levels of Service. The last NYSDOT-Region 8 Congestion Management System identified V/C ratios greater than 0.9 on the following routes: Route 9W through the Towns of Marlborough, Lloyd, Esopus, and Ulster, as well as in the City of Kingston and the Village of Saugerties; Route 209 in the Village of Ellenville, at Leggett Rd in Marbletown, and at the traffic circle in Kingston; Route 299 in the Village of New Paltz; Route 32 in the hamlet of Rosendale; the intersection of Routes 375 and 212 in Woodstock; Ulster/Albany Ave. in Kingston; and Route 199 at the Kingston-Rhinecliff Bridge.

Orange County Transportation Council (OCTC)

For the most part, Orange County roads and highways facilitate the efficient and safe flow of people and goods, with a few exceptions during the pm peak hour, which coincides with people leaving work and making their way home. Table 2 lists the highway segments and intersections experiencing V/C ratios of 0.9 or greater during the pm peak hour of typical weekdays, as calculated in the 2005 Orange County Travel Demand Model. It does not account for periodic delay along stretches of NYS Route 17, US Route 6, and the NYS Thruway (I-87) during Friday and Sunday evenings, which are attributable to spikes in traffic from people traveling to and from second homes in the Catskills and destinations beyond. It also does not account for traffic congestion around Orange County's regional shopping malls at select times of the year (e.g. holiday shopping).

Table 2. Orange County PM Peak Hour Traffic Congestion (2005 Model Results)

Facility Type	Beginning Location	Ending Location	V/C Ratio	Mid-Hudson TMA Classification
Highways				
US Route 6	Queensboro Circle	Route 32	0.92	Heavy
US Route 6	Route 17	I-84	0.91	Heavy
NYS Route 32	Woodbury Common N	Smith Clove Rd. (CR 9)	0.90	Heavy
US Route 9W	I-84	Ulster County Border	0.91	Heavy
NYS Route 32	US Route 9W	I-84 Exit 10 WB Ramps	0.92	Heavy
Intersections				
NYS Route 300 & NYS Route 17K			0.93	Heavy
NYS Route 17K & Rockcut Rd. (CR 23)			0.99	Heavy
NYS Route 17K & Lakeside Rd.			0.97	Heavy
NYS Route 300 & NYS Route 207			0.90	Heavy
NYS Route 32 & I-84 WB Exit 10 ramps			0.98	Heavy
NYS Route 300/32/94 (Vails Gate)			0.93	Heavy
NYS Route 32 & CR 107			0.94	Heavy

Step Three

Manage: identifying realistic solutions and taking action on them.

Managing congestion in the Mid-Hudson Valley will require a multi-faceted, broadminded strategy. The days of simply building our way out of congestion are no longer realistic, at least from the standpoint of transportation funding, environmental degradation, and air quality conformity. This hardly means that all engineering solutions are off the table; on the contrary, the only solution for some locations is a physical one such as a new turning lane or traffic signal. Yet, there are other situations where congestion can be mitigated through altering peoples' habits or by providing more mobility options such as ride-sharing opportunities or new transit services.

Transportation Systems Management (TSM) and Transportation Demand Management (TDM) are two accepted approaches to managing congestion that, used in tandem, can help communities and organizations tackle congestion.

- Transportation Systems Management (TSM) – This approach looks at maximizing the existing capacity of a transportation network by improving its operating efficiency.

Examples of such an approach include improved traffic signal timing, timely incident management, additional turning lanes, and Intelligent Transportation Systems (ITS). The latter technique refers to technology based management tools like Variable Message Signs (VMS) and electronic toll collection (e.g. E-Z Pass), which improve traffic flow and are steadily gaining popularity.

- Transportation Demand Management (TDM) – This approach attacks congestion by reducing the demands placed on the existing transportation network; in most cases, this means decreasing the number of vehicles using the system. Examples of this include the use of high-occupancy vehicle lanes, more ride-sharing opportunities, additional mass transportation alternatives, and flexible work hours for employees.

These approaches set the framework for how the PDCTC, OCTC, and UCTC will manage locations experiencing severe, recurring congestion. The specific action items listed for this step suggest how the MPOs would likely address congestion; obviously, they are not all inclusive and the nuances of each situation will dictate how the MPOs try to solve individual problems. A clear benefit of using existing programs is that they already have sources of funding.

One may notice that these strategies focus strictly on the transportation aspect of congestion. A more comprehensive congestion strategy should acknowledge the connection between land-use practices and travel behavior; specifically with regard to how development can limit or expand the transportation options available to travelers. It stands to reason that sustainable land use practices – Transit Oriented Development (TOD), mixed-use zoning, and walkable communities – can play an important role in shifting the demands on our transportation system. And given this fact, this CMS supports such land use measures and the organizations that promote them.

Congestion Management Tools

Action Item 3-1. ***Congestion Mitigation and Air Quality (CMAQ) Program.*** The CMAQ program provides federal funding for projects that can demonstrate a reduction in air quality emissions or demands on the system, by reducing the number of single-occupant vehicle trips. Examples of such projects include new public transit services, signal timing projects, ride sharing projects, park and ride lots, and pedestrian improvements that reduce trips. The PDCTC and OCTC already use this program to lessen congestion and improve air quality, while the UCTC has expressed interest in it, though it sits outside the Poughkeepsie Moderate Ozone Non-attainment Area.

Action Item 3-2. ***Intersection improvement programs/traffic signal management.*** Some causes of congestion, most often recurring congestion caused by "bottlenecks," can be mitigated through the use of additional turning lanes or improved signal timing. Such intersection improvements can be accomplished through relatively low-cost investments and are thus an attractive option for transportation agencies and local municipalities. For example, the PDCTC continues to pursue a task established in 2003 to help local agencies and municipalities evaluate traffic operations at key intersections. The program, which deals solely with non-state facilities, initially focused on signalized intersections, but was later expanded to include non-signalized intersections. To date the program has analyzed thirteen intersections. The UCTC is pursuing a similar program.

Action Item 3-3. ***Incorporate recommendations from the NYSMPO CMS Shared Cost Initiative***. One clear example of how this CMS will adapt to the latest management techniques will occur when a formal CMS Policy Review is completed in late 2005. The review is a Shared Cost Initiative (SCI), administered by the Syracuse Metropolitan Transportation Council on behalf of other NYSMPOs, which seeks to identify the relevant CMS best practices of small and medium sized MPOs. The PDCTC, OCTC, and UCTC eagerly await the results of this review, and look forward to integrating some of the industry's best practices into this developing CMS.

Action Item 3-4. ***Promote sustainable land use practices***. The PDCTC, OCTC, and UCTC recognize the close relationship between land use policy and the workings of the transportation system. The implementation of sustainable land use practices such as those recommended by the County Planning Departments and State programs such as the Hudson River Valley Greenway can help tremendously with preventing congestion. Compact, dense land uses can better sustain transit services and often provide improved pedestrian facilities, which can contribute to reducing auto congestion and provide more mobility options.

Towards this effort, the three MPOs will encourage communities within the TMA to take advantage of sustainable development initiatives. For instance, the Hudson River Valley Greenway Compact program provides planning assistance and funding to member communities. So far, of the 30 municipalities in Dutchess County, 26 are members of the Greenway Compact. In Orange County, 28 of its 40 municipalities are members. And in Ulster County, 24 of 25 eligible communities are members; five Ulster communities located in the Catskill Park are not eligible for membership.

Action Item 3-5. ***Expand travel options***. Providing travelers with mobility options beyond the single occupant vehicle is an obvious strategy in the fight against congestion; and equally obvious is the role that public transit and ride-sharing can play in expanding personal mobility. The MPOs of the Mid-Hudson Valley TMA understand this fact and are motivated in making public transit and ride sharing more attractive to regional travelers, whether it is through the purchase of new equipment, improved scheduling, or expanded outreach. And though these services will never replace the private automobile as the preferred mode of transportation, their growth can only serve to help reduce single occupant vehicle trips, while also serving a segment of the population that does not own an automobile – or, as the trend lines show, an ever increasing older population.

Action Item 3-6. ***Integrate with NYSDOT Intelligent Transportation Systems (ITS) Architecture.*** ITS is a transportation management technique that seeks to improve the efficiency and operation of the existing transportation network through the use of advanced technologies. One example includes Variable Message Signs (VMS) that are linked to a central command center, as in the case with the Transportation Management Center (TMC) in Hawthorne, Westchester County. This capability enables traffic managers to quickly inform drivers of approaching delays (e.g. accidents, construction) and present them with possible route alternatives. The TMC is a multi-agency center staffed by the NYSDOT, State Police, NYS Thruway Authority, and Westchester County that operates 24 hours a day, 365 days a year. Future ITS projects will include the deployment of surveillance and control equipment on major corridors (freeways, parkways, and arterials) over the next 5 to 10 years, allowing the TMC to eventually manage all major corridors in the lower Hudson Valley. As NYSDOT gradually

expands their ITS architecture, the three MPOs will explore ways to integrate the technologies into the local transportation network.

Step Four

Integrate and Evaluate: making the CMS work in existing planning processes.

Putting this CMS into practice requires that the PDCTC, OCTC, and UCTC each integrate it into existing transportation planning processes and programs. It further requires that the organizations regularly review its effectiveness and completeness to manage congestion, not only at the macro, policy level, but also at the micro, project level. Since this is the first CMS for the region, the three organizations recognize that implementing such a program will need to progress gradually. Accordingly, the MPOs will first concentrate on integrating the CMS into existing transportation planning processes and then focus on evaluating the tenants of this CMS strategy. The CMS will be updated two years after its initial implementation.

Short-Range (Integration)

Action Item 4-1. ***Mid-Hudson Valley TMA Quarterly Meetings***. PDCTC, OCTC, and UCTC staff will meet on a quarterly basis to discuss progress on CMS implementation. When possible, these meetings will be attended by representatives from the Federal Highway Administration, Federal Transit Administration, and NYSDOT Program Management Division (MPO Bureau).

Action Item 4-2. ***Unified Planning Work Programs (UPWP)***. At a minimum, integration starts with creating a specific CMS task item in the UPWP, which the PDCTC, OCTC, and UCTC did for their 2005-2006 Federal Fiscal Year UPWPs; these documents outline the work to be done by each MPO for the upcoming program year. Inclusion of a task item in the UPWP allows for the dedication of staff time and funding towards developing a CMS.

Action Item 4-3. ***Transportation Improvement Programs (TIP).*** The three organizations will integrate this CMS into their individual TIP project selection processes; accordingly, the implementation of this CMS is intended to coincide with the TIP project solicitation cycle of the MPOs and NYSDOT-Region 8. The TIP project selection process may include the use of a point system to rank-order projects as they relate to their impact on severely congested areas; such an evaluation would likely measure the positive and negative impacts of a project on congestion. In the case of Dutchess and Orange County, both of which lie in the Poughkeepsie Moderate Ozone Non-attainment Area, the CMS will need to provide an analysis of travel demand reduction or operational management strategies for a corridor in which a new capacity building project (e.g. new travel lanes or new road) is planned.

Action Item 4-4. ***Long-Range Transportation Plans***. The concept of identifying and measuring congestion directly ties into the seven regional planning factors promoted by TEA-21, the Transportation Equity Act for the 21st Century. These factors act as a guide for all MPOs in their efforts to provide effective transportation planning services to their respective communities. With regard to congestion management, many of the planning factors, such as enhancing the integration and connectivity of the transportation system or promoting efficient system

management and operation, can be accomplished through the implementation of a CMS. Therefore, the Long-Range Transportation Plans for each MPO will address congestion as it relates to their respective counties and discuss the role of this CMS in long-range planning efforts.

Long-Range (Evaluation)

Action Item 4-5. ***CMS Evaluation***. The PDCTC, OCTC, and UCTC will informally evaluate the efficacy of the CMS program throughout its implementation. However, a formal evaluation of the program cannot occur until this CMS has been fully integrated into the regional transportation planning process. This is also true for evaluating the results of specific management strategies such as a signal timing project or new turning lane; this type of project specific evaluation can only occur after actual implementation. Again, this CMS is a dynamic document that will change according to the needs of the region and local communities, and represents a planning framework to guide the organizations as they embark upon this new requirement. Upon completing their evaluation of the program, the three MPOs will update the CMS; the first full update will occur no later than October 1, 2007.

9. Next Steps

The PDCTC, OCTC, and UCTC will implement this CMS at the start of the 2006 Federal Fiscal Year – October 1, 2005 (Table 3). The initial focus will center on completing Step One within six-months of implementation. This will require the individual MPOs to perfect their travel demand models and employ them to measure and locate congestion in their respective counties. The six-month timetable will be shortened if modeling conditions permit.

Step Two will likely require a shorter amount of time and should be completed within three months after Step One. Once congested roads and intersections have been identified, the three MPOs will develop a follow-on report to this CMS, which will include a listing and maps of severely congested roads and intersections in the Mid-Hudson Valley TMA.

The MPOs will then begin Step Three by identifying and selecting possible congestion management solutions in their respective counties. To ensure implementation, this step will occur in conjunction with the TIP project solicitation and selection process, with the next round scheduled for the fall of 2006. Step Three will require at least six months to accomplish.

The actual selection of projects resulting from the CMS process will provide a clear demonstration that the CMS is integrated into existing planning efforts – the short-range goal of Step Four. The long-range goals of evaluating and revising the CMS will then proceed, encompassing a staff evaluation of this CMS to measure its effectiveness at the macro and micro scale. Individual transportation management solutions will be evaluated on a project-by-project basis after they have been implemented; although an assessment of the entire CMS process, macro-scale, will start immediately after the TIP process is completed in early 2007. An updated CMS will be published no later than October 1, 2007.

Table 3. CMS Implementation Schedule

Short-Range Action Items	2005			2006												2007		
	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CMS Adoption	X																	
Step 1. Measure & Define	→	→	→	→	→	→												
Step 2. Locate						→	→	→	→									
Step 3. Manage									→	→	→	→	→	→	→			
Step 4. Integrate (ongoing)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	→	→	→	→
Start CMS Update																		X

10. Closing

This Congestion Management System sets out a strategy to measure, define, and manage severe, recurring congestion in the three-county, Mid-Hudson Transportation Management Area. It does this by capitalizing on existing programs, internal and external to the MPOs, to assist with managing congestion, which is the best course of action given the many important, though competing, requirements of MPOs such as ours. And in doing so, it achieves our original intent of creating a simple, flexible strategy that can be broadened as we gain experience in understanding and managing congestion in the region.