YAMPO

2005

CONGESTION MANAGEMENT SYSTEM

Approved June 23, 2005

Prepared by

York County Planning Commission
for the
York County Metropolitan Planning Organization

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CHAPTER 1
INTRODUCTION

Chapter 1
Introduction

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 required all states to develop and implement a Congestion Management System (CMS). The 1998 Transportation Equity Act for the 21st Century (TEA-21) removed this requirement. However, the Pennsylvania Department of Transportation (PennDOT) chose to continue to develop, maintain, and implement the management system through the Metropolitan Planning Organizations (MPO).

The York County Planning Commission (YCPC) staff, on behalf of the York Area Metropolitan Planning Organization (YAMPO) was assigned this task under the direction of the Unified Planning Work Program (UPWP). This Congestion Management System is an attempt at a county-wide approach to identify congestion in York County.

The YAMPO Congestion Management System is designed to feed into the update of the 2007-2030 YAMPO Long Range Transportation Plan (LRTP) as well as the Transportation Improvement Program (TIP). In the 2003-2023 LRTP , a recommendation was made to update the CMS plan. The YAMPO CMS is designed to support the transportation planning factors/goals of the LRTP.

The CMS Working Group was comprised of representatives from seven regions in the county, rail, transit, trucking, emergency management service, PennDOT, FHWA, and the York County Planning Commission transportation staff. On August 31, 2004 a "kick-off" meeting was held with the CMS Working Group to develop the CMS. The working group held follow up meetings for the development of the CMS plan. The following people made up the Working Group:

- Region 1 (South Central) - Patricia Schaub; Jason Snyder P.E.
- Region 2 (Greater York East) - Theresa Craley; Mike Nazmack
- Region 3 (Greater York West) - Madelyn Shermeyer; Art Smith
- Region 4 (Northern) - Mike Fleming; Dianne Price
- Region 5 (South Western) - Ron Orndorff P.E.
- Region 6 (City of York) - Brad Smith
- Region 7 (South Eastern) - Lester Hanson; William Scott
- FHWA - Matt Smoker
- PennDOT - Glen Rowe P.E. (District 8-0); Pharon Bertsch (District 8-0);
- Dan Walston (Central Office)
- Rail - Thomas Lanni; Kim Smith
- Transit - Rich Farr, Kristen Heisey
- Trucking - Glen Longstreth
- York County Emergency Management Agency - Kay Carman
- York County Planning Commission - Heather Bitner; Donald Bubb P.E.; Will Clark; Beth Nidam; Jephrey Rebert; Michael Welt

The YAMPO committees were given updates as to the progress of the plan.

CHAPTER 2
GOALS/OBJECTIVES

Chapter 2
Goals/Objectives

This Chapter discusses the recommended goals and objectives that assisted the CMS working group in the decision making process.

Goals provide an effective approach to solving problems and provide a clear sense of direction and a basis for comparison for what a congestion management system is at the present time and what it should be in the future. Whereas goals are the ideal state of development, objectives are at the second level, which makes them more measurable. Combined together, goals and objectives provide the basis for the development of criteria and standards for evaluation.

The CMS working group developed the following goals and objectives:

Goal 1
Identify congested corridors for further study.

Objective

Develop and utilize performance measures to identify corridors for candidate corridor studies that will then be developed into specific projects along the corridor.

Goal 2
Identify special events and non-recurring congestion that typically create delay.

Objective

Utilize performance measures to identify these areas.

Goal 3
Develop Mitigation Strategies to be examined in CMS corridor studies.

Objective

Include all modes of transportation in the mitigation strategies.

Goal 4
Measure the effectiveness of project implementation.

Objective 1

Establish a time frame to remeasure a project after construction.

Objective 2

Use performance measures to collect the data.

CHAPTER 3
CMS PARAMETERS

Chapter 3
CMS Parameters

Just about every driver in York County experiences being delayed in traffic. The reasons though can vary as to why this happens. The most common reason is peak hour traffic as people travel to and from their work place. As an example, Route 30, York County's major east/west corridor, has eleven signal lights within a four mile stretch. Poor signal timing can result in severely congested conditions along this corridor. Another reason for delays is events such as, crashes, disabled vehicles, and work zones.

What is Congestion?

The CMS Working Group defined congestion as follows:

> Congestion is an impediment to optimal driving conditions/vehicle movements that includes goods as well as people, at a level of service (LOS) that is no longer acceptable varies by the type of transportation facility, geographic location, and time of day. Acceptance of the transportation system is measured in time loss, or inconvenience, or delays, and is expressed as driver frustration.

Congestion is classified into recurring and non-recurring traffic conditions as follows:

> **Recurring congestion** is caused by demands that exist virtually every day where traffic demand use exceeds existing roadway capacity.
>
> **Non-recurring congestion** is caused by traffic incidents that are unexpected or traffic impediments that are present for a limited time.

The Working Group developed standards as to what is considered recurring and non-recurring congestion in York County. Capacity, signal timing, poor roadway condition and design, uncontrolled growth, and construction projects that exceed a one year construction season were deemed to be recurring congestion. Non-recurring congestion was labeled as crashes, disabled vehicles, weather, delivery vehicles, special events, and work zones.

CHAPTER 4
PERFORMANCE MEASURES

Chapter 4
Performance Measures

Performance measures were used to determine which roadway sections would eventually become the sections of the CMS. The goal of the performance measures was to take available data and have the working group identify levels of congestion based on the data. If a performance measure could not be utilized, it was either deleted or is being used as a **tracking measurement**. In future updates of the CMS plan, the goal of using the tracking measurements is to see if a trend develops with the additional data that could be used as a performance measure. The thresholds for each of the performance measures are listed within the specific performance measure.

Data for some performance measures had already been collected. Other performance measures required the collection of data. Finally, some measures will need to be evaluated in future updates based on acquiring data at a later date. Following each performance measure is *a Refinement Of Performance Measure* that lists changes that will be applied to the performance measure in the next update. To begin the process of CMS roadway section identification, the YCPC staff presented available information to the Working Group in order to reduce the number of corridors needing study and minimize the amount of data collection required. This process also identified different levels of congested roads based on meeting an increased number of performance measure thresholds.

The following performance measures were chosen by the transportation staff of the YCPC and were reviewed by the working group, to identify recurring congestion.

#1 - Volume over Capacity (V/C)
#2 - Perception
#3 - Historic Volumes
#4 - Peak Hour Volume
#5 - Truck Percentage
#6 - Annual Average Daily Traffic (AADT)
#7 - Transit Ridership
#8 - Land Use
#9 - Percent Under Posted Speed
#10 - Crashes
#11 - V/C of the Transportation Model
#12 - Future Projected V/C
#13 - Transit Route Delay
#14 - Intersection Turning Movements
#15 - Education

No performance measures were identified to measure non-recurring congestion.

PERFORMANCE MEASURE #1

VOLUME OVER CAPACITY (V/C)

The following steps identify the process used in calculating the V/C performance measure.

16. Volume over Capacity (V/C)- This performance measure looks at the ratio between the roadway's capacity and the traffic volumes using the roadway. Capacity is different for every area of the country. For example, in major urban areas such as Philadelphia and Pittsburgh, people's driving habits can lead to increased capacity through reduced headway distances. In smaller urban and rural areas, the capacity for the same functional class would be much lower. Below is a chart of the planning link capacities utilized by the York Area Metropolitan Planning Organization (YAMPO) in 1991 for the York County transportation model. Since this chart was adopted in 1991, the transportation staff of the YCPC researched updated information for the functional classification capacities, this information is contained in Table#1.

Table #1
YORK MPO
1991 PLANNING LINK CAPACITIES
(VEHICLES/HOUR) LOS E

	Functional Class	CBD/City	Urban/ Suburban	Rural
1.	Interstate	1950	1950	2000
2.	Principal Arterial	600	750	1150
3.	Minor Arterial	410	550	770
4.	Collector	400	500	700
5.	Local	400	500	700
6.	Ramps	540	540	540

17. Based on the 2004 Technical Report of the Lancaster County Model Update, updated capacities were developed and assigned for each of the links in the PennDOT Roadway Management System (RMS) based on the functional classification, identified in Map #1. These assignments are listed in Table #2.

Table #2 YORK MPO 2004 PLANNING LINK CAPACITIES* (VEHICLES/HOUR)		
	Functional Class ("CMS_Join" # ID Number)	**Capacity**
1.	Rural Principal Arterial Interstate (01)	2000
2.	Rural Principal Arterial Other (02)	1800
3.	Rural Minor Arterial (06)	1700
4.	Rural Major Collector (07)	1700
5.	Rural Minor Collector (08)	1400
6.	Rural Local (09)	1200
7.	Urban Principal Arterial Interstate (11)	1800
8.	Urban Principal Arterial Other Freeways (12)	1800
9.	Urban Other Principal Arterial(14)	1600
10.	Urban Minor Arterial(16)	1525
11.	Urban Collector (17)	1525
12.	Urban Local(19)	1100
13	Ramps(99)	1150

* Based on the information in the Lancaster County Travel Demand Model, June 2004.
# "CMS_Join" is the GIS layer obtained from PennDOT in August 2004.

18. Two GIS point layers were created and called "HPMS _2003" and "HPMS 2004". The fields were filled in with information gathered at count locations from the 2003 count season (May- September). The 2003 count season did not have a count in Region 7 (Southeastern) or Region 1 (Southcentral). Counts from the 2004 count season were used in these regions. The database contained total daily volume, peak hour volume and peak hour time period for both AM and PM. Each count location was used to determine the percentage of traffic occurring during the highest volume hour of the day compared to the entire day. Table #3 shows the sum of all the count locations in each region for the AM and PM Peak Hour volumes along with the total daily count and the percentage for the count that occurred in the peak hour. The staff of the YCPC first looked at the County as a whole and determined the peaks needed to be broken into regions.

19. The higher of the AM and PM percentage was assigned to each link in that region (highlighted in Table #3).

20. The RMS data includes an estimated Annual Average Daily Traffic (AADT) count for each roadway segment. The AADT for each segment was multiplied by the regional peak percentage to determine the peak volume for each roadway segment.

Table #3
2003-2004 HPMS COUNT LOCATIONS

Region	Total Volume	PM Volume	AM Volume	PM %	AM %
1	36,725	3,133	2,321	**8.53**	6.32
2	313,681	28,600	23,477	**9.12**	7.48
3	379,973	33,130	24,498	**8.72**	6.45
4	55,649	3,403	4,284	6.12	**7.70**
5	39,150	3,611	2,901	**9.22**	7.41
6	143,948	11,213	8,843	**7.79**	6.14
7	22,776	1,970	1,499	**8.65**	6.58

21. The peak volume for each roadway segment was divided by the capacities coded in Step 2. The result was the Volume to Capacity ratio (V/C).

The higher the V/C ratio the more congested the roadway. A number over 1.0 indicates the roadway handles more traffic than the roadway was intended to accommodate and is considered over capacity. Table #4 indicates how many roadway links are within each of the V/C ratios ranges.

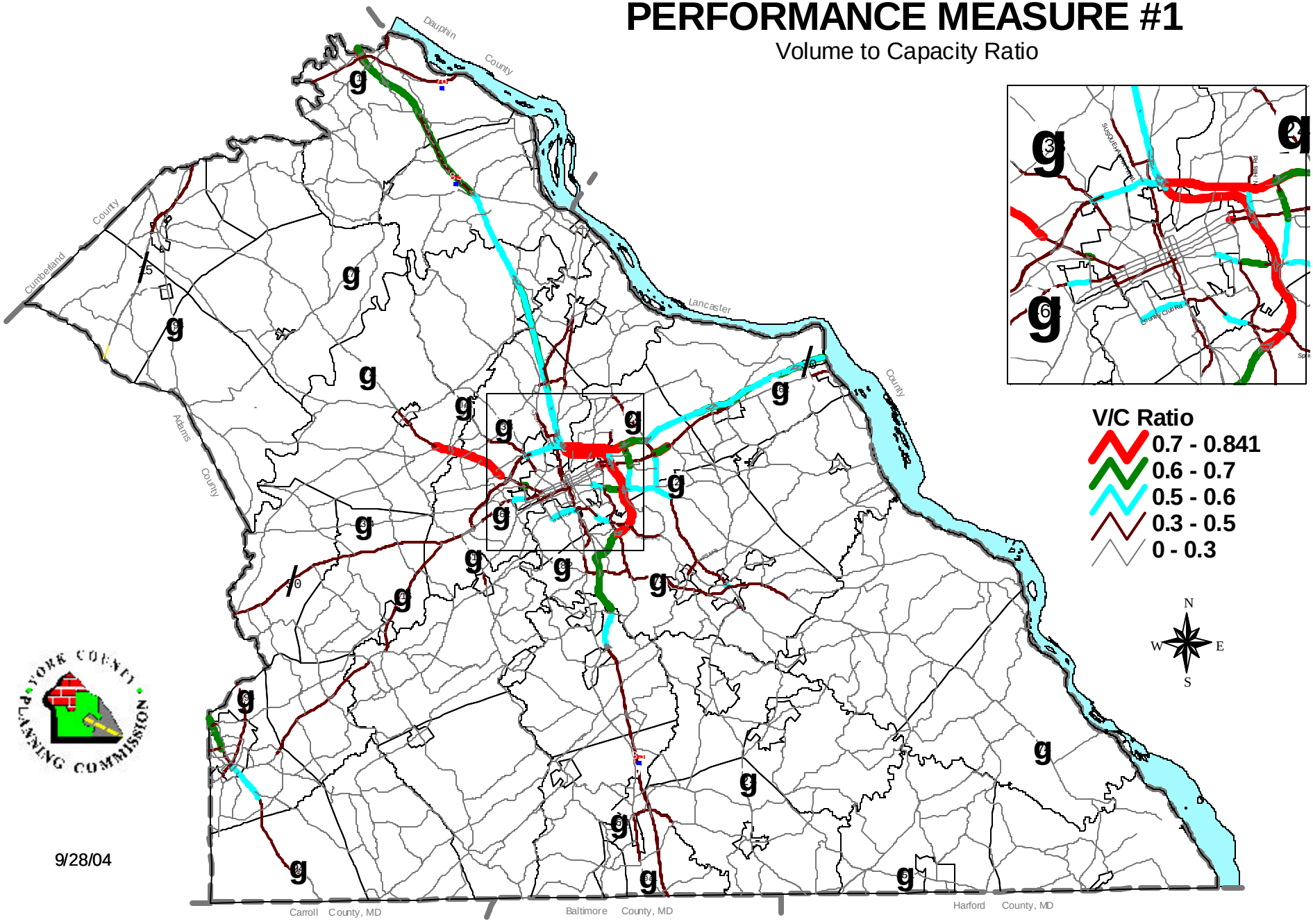
Table #4
RANGE OF V/C VALUES

V/C Ratio	Number of Roadway Segments
0.7-0.841	61
0.6-0.7	100
0.5-0.6	167
0.3-0.5	645

The working group reviewed the information for the V/C performance measure at the initial kickoff meeting. The V/C information was presented to them through Map #2 "Volume to Capacity Ratio". After discussion, the working group agreed to continue to evaluate any corridor with a V/C over .5, which are the red, green and blue corridors identified on Map #2.

Refinement Of Performance Measure - None

Map #2
PERFORMANCE MEASURE #1
Volume to Capacity Ratio



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PERFORMANCE MEASURE #2

PERCEPTION

1. After the V/C ratio was explained and shown to the working group, the group was asked whether there were any areas that were not identified within the V/C threshold that should be included. Table #5 lists the corridors recommended by the working group from their real world experiences to be further analyzed by other performance measures.

2. The transportation staff of the YCPC reviewed the selected corridors and extended some corridors to make them more complete. The staff of the YCPC also added some corridors to the list based on their real world and professional experiences.

Once the first two performance measures and their thresholds were agreed upon, the working group decided that these two performance measures would establish a **Level One** CMS network. The level one corridors are identified on Map #3.

Table #5
ROADWAY SECTIONS ADDED TO CMS THROUGH PERCEPTION

Roadway	From	To	Who
E Market Street	Locust Grove Road	Sherman St	Richard Farr
E/W Market Street	Richland Ave	Sherman St	Richard Farr
E/W Philadelphia Street	Harrison St	Carlisle Ave	Richard Farr
SR 851	Susquehanna Trail	SR 24 (Stewartstown Borough)	Pat Schaub
Board Rd	Church Rd	Canal Rd	Glen Rowe
N. George St	Emig Rd	Maple St (Manchester Borough)	Working Group
Church Rd	Farmtrail Rd	N. George St	Mike Nazmack
Susquehanna Trail	Sinking Springs	Farmbrook La	Mike Nazmack
Susquehanna Trail	Canal Rd	I-83 (Exit 28)	Kim Smith
Rathton Rd	S. George St	Edgar St	Jason Snyder
S. George St	Springettsbury Ave	Tri Hill Rd	Jason Snyder
Cape Horn Rd	Windsor Rd	Lombard	YCPC
SR 74	Jackson St	Windsor Rd	YCPC
Leader Heights Rd	Susquehanna Trail	S. Queen St	YCPC
George St	I-83 (Exit 21)	Rathton Rd	YCPC
Richland Ave	W. Market St	Country Club Rd	YCPC

Roadway	From	To	Who
US 15	Adams County Line	Cumberland County Line	YCPC
SR 74	Davidsburg Rd	Canal Rd	YCPC
US 30	Roosevelt Ave	W. Market St	YCPC
SR 74	Taxville Rd	W. Market St	YCPC
SR 194	Adams County Line	Adams County Line	YCPC
SR 94	Black Rock Rd	Md State Line	YCPC
Mt Zion Rd	E. Market St	Pleasant Valley Rd	YCPC

Refinement Of Performance Measure - None

PERFORMANCE MEASURE #3

HISTORIC VOLUMES

3. Estimated annual average daily traffic (AADT) volumes for 2000 and 2002 were collected from the PennDOT Roadway Management System(RMS) report. The percent change between 2000 and 2002 was calculated.

4. This data was shown to the working group and is shown on Map #4. The measurement ranged from 56% decrease in traffic to a 145% increase in traffic. The mean of the corridor segments experienced a 5.6% increase over the three- year period.

5. The working group discussed the information and agreed that the information should be incorporated into the CMS plan as a **tracking measurement**. This information alone could not show where congestion was occurring. The working group expressed concern that high growth needs should be evaluated with existing V/C measurements.

Refinement Of Performance Measure - None

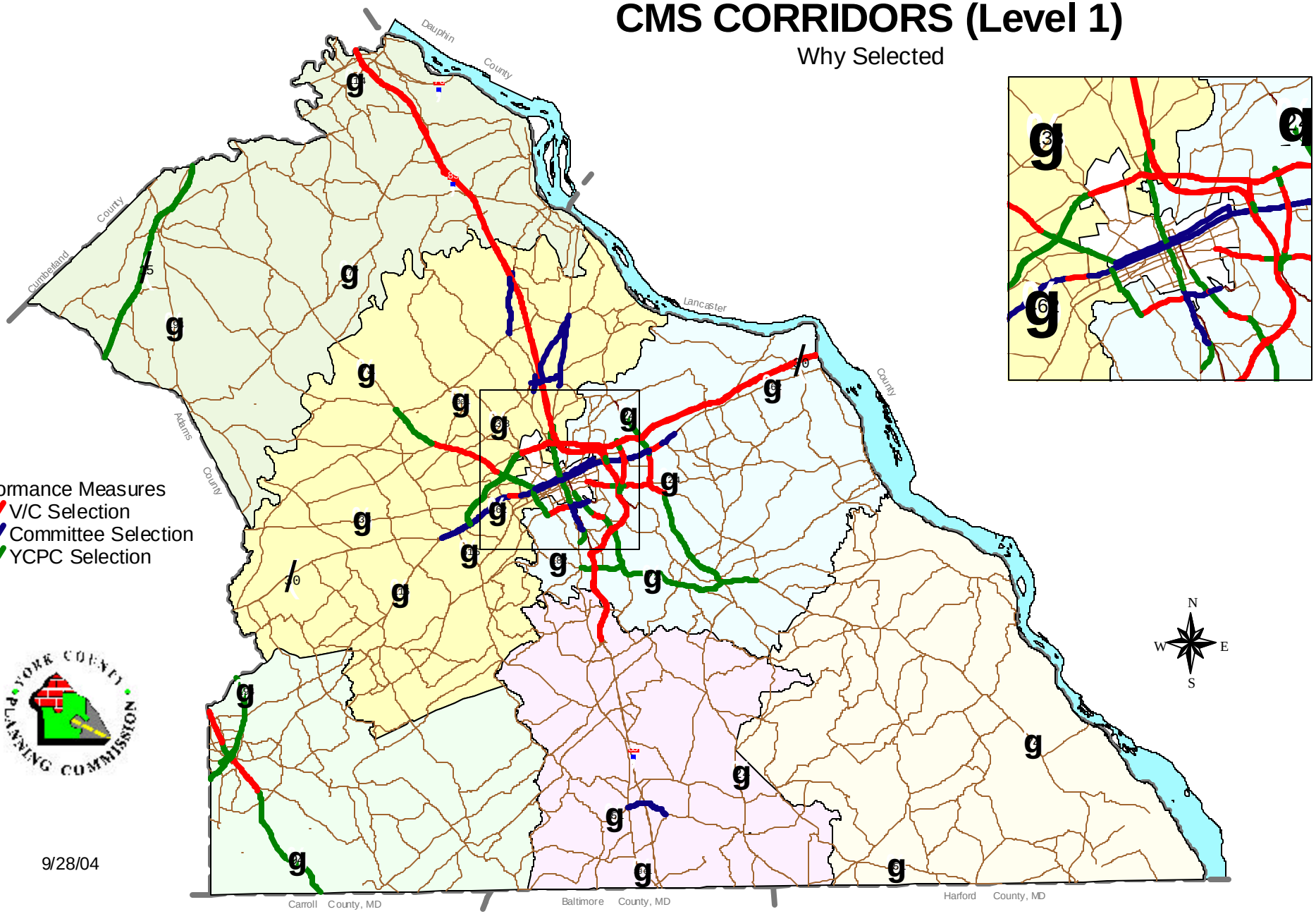
PERFORMANCE MEASURE #4

PEAK HOUR VOLUME

1. Estimated AADT volumes for 2002 were collected from the PennDOT RMS.

2. The estimated 2002 AADT was multiplied by the highlighted AM or PM peak hour percentage identified in Table #3 entitled, “2003-2004 HPMS Count Locations”. This information identified a projected peak hour volume. This is the same peak hour volume used to determine the volume to capacity ratio performance measure.

Map #3
CMS CORRIDORS (Level 1)
Why Selected



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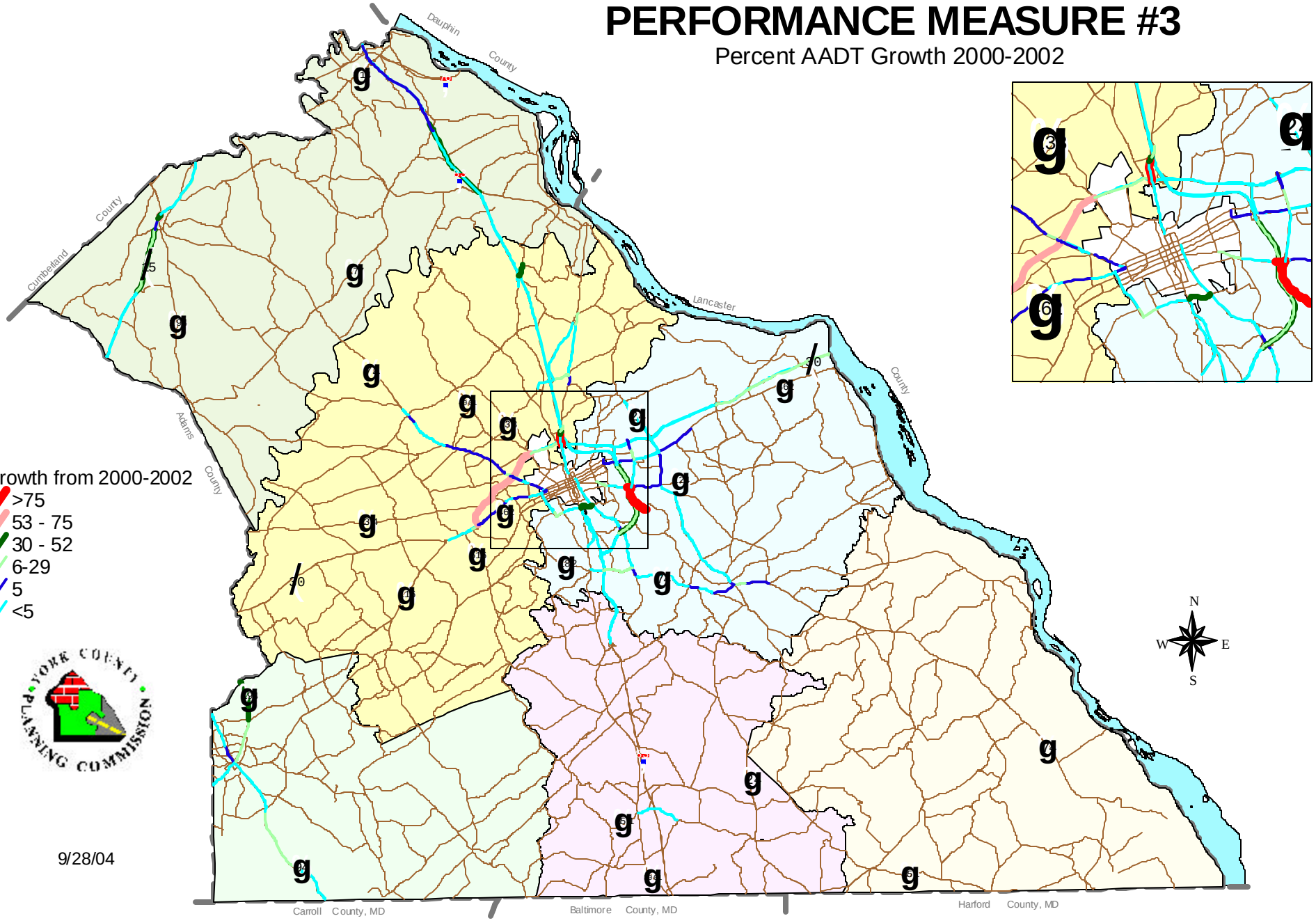
Map #4
PERFORMANCE MEASURE #3
Percent AADT Growth 2000-2002



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3. The working group was shown the information on Map #5. The working group discussed the information and agreed that the information should be incorporated into the CMS plan as a **tracking measurement**. This information alone could not show where congestion was occurring. The working group expressed concern that the volume does not take into consideration the capacity of the roadway.

Refinement Of Performance Measure - None

PERFORMANCE MEASURE #5

TRUCK PERCENTAGE

1. The 2002 estimated truck percentage for each segment was collected from the PennDOT RMS. No calculations were performed on the data set.

2. The working group was shown the information on Map #6. The working group discussed the information and agreed that the information should be incorporated into the CMS plan as a **tracking measurement**. This information alone could not show where congestion was occurring. The working group expressed concern that the volume of truck traffic does not reflect congestion.

Refinement Of Performance Measure - None

PERFORMANCE MEASURE #6

ANNUAL AVERAGE DAILY TRAFFIC (AADT)

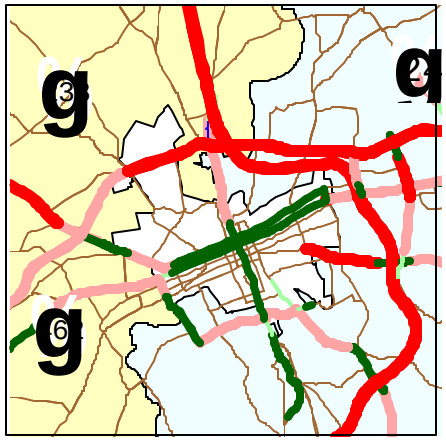
The AADT is defined as the typical daily traffic on a road segment for any day in the week, over a one-year period. The AADT is identified in the PennDOT RMS data.

1. The working group was shown the information on Map #7. The working group discussed the information and agreed that the information should be incorporated into the CMS plan as a **tracking measurement**. This information alone could not show where congestion was occurring. The working group expressed concern that the volume does not take into consideration the capacity of the roadway.

The performance measures #3 through #6 were identified by the working group as tracking measurements. The working group applied performance measure "#2 Perception" while looking at these tracking measurements to reduce the number of corridors for further examination. This reduction generated sixteen corridors which became the **Level Two** CMS network. The Level Two corridors are identified on Map #8.

Refinement Of Performance Measure - None

Map #5
PERFORMANCE MEASURE #4
Peak Hour Volume (2002)



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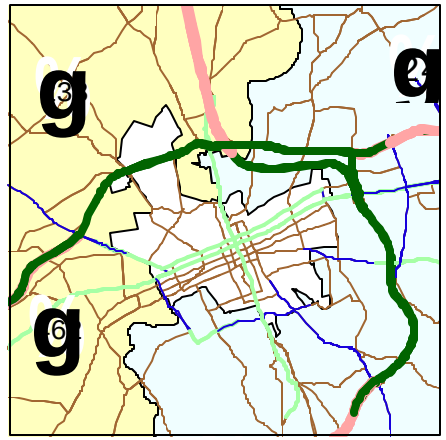
Map #6
PERFORMANCE MEASURE #5
Truck Percentage (2002)



Truck Percentage
- 20 - 24
- 15 - 19
- 10 - 14
- 5 - 9
- 1 -4

Dauphin County
Cumberland County
Adams County
Lancaster County
Carroll County, MD
Baltimore County, MD
Harford County, MD

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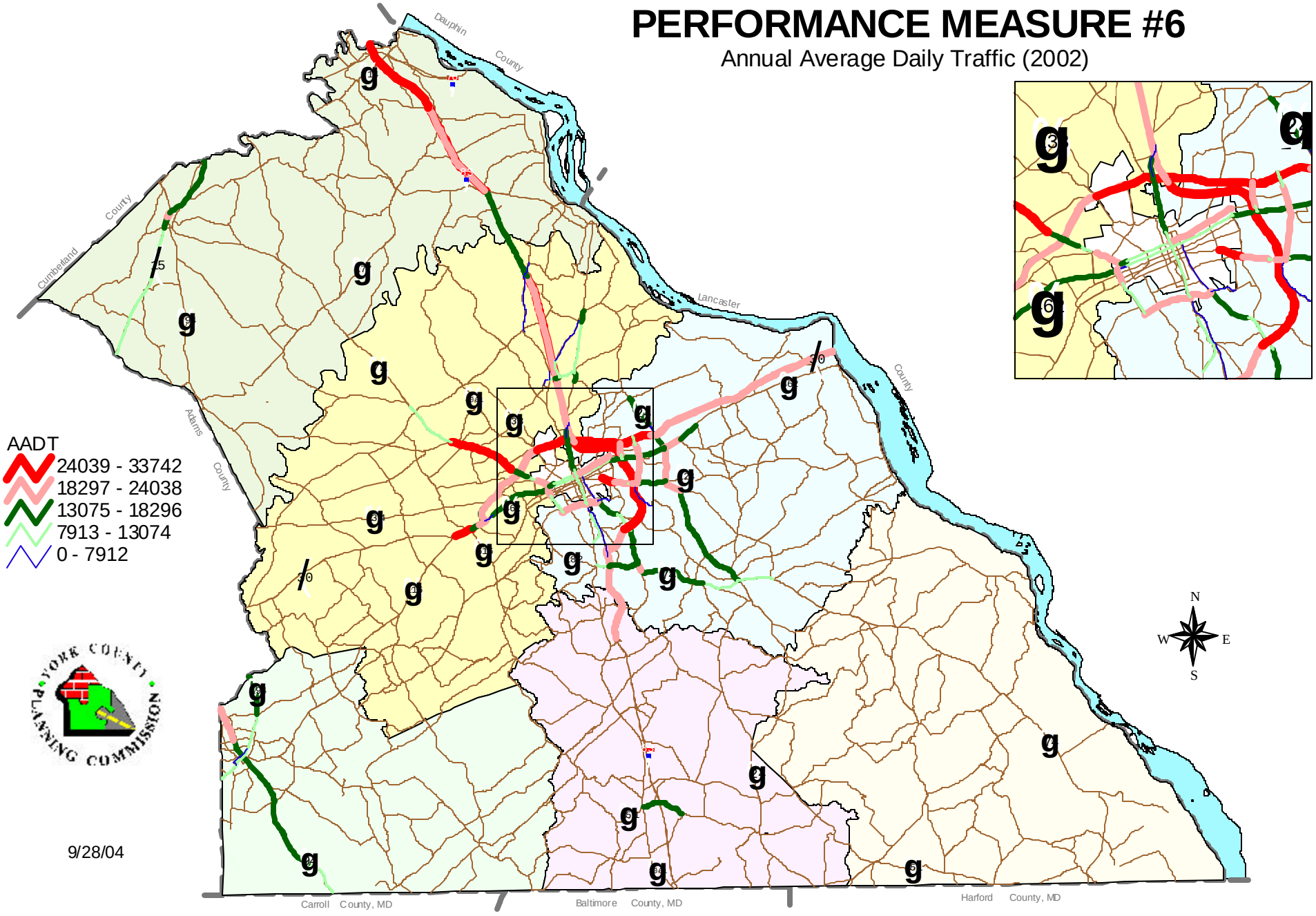
Map #7

PERFORMANCE MEASURE #6

Annual Average Daily Traffic (2002)



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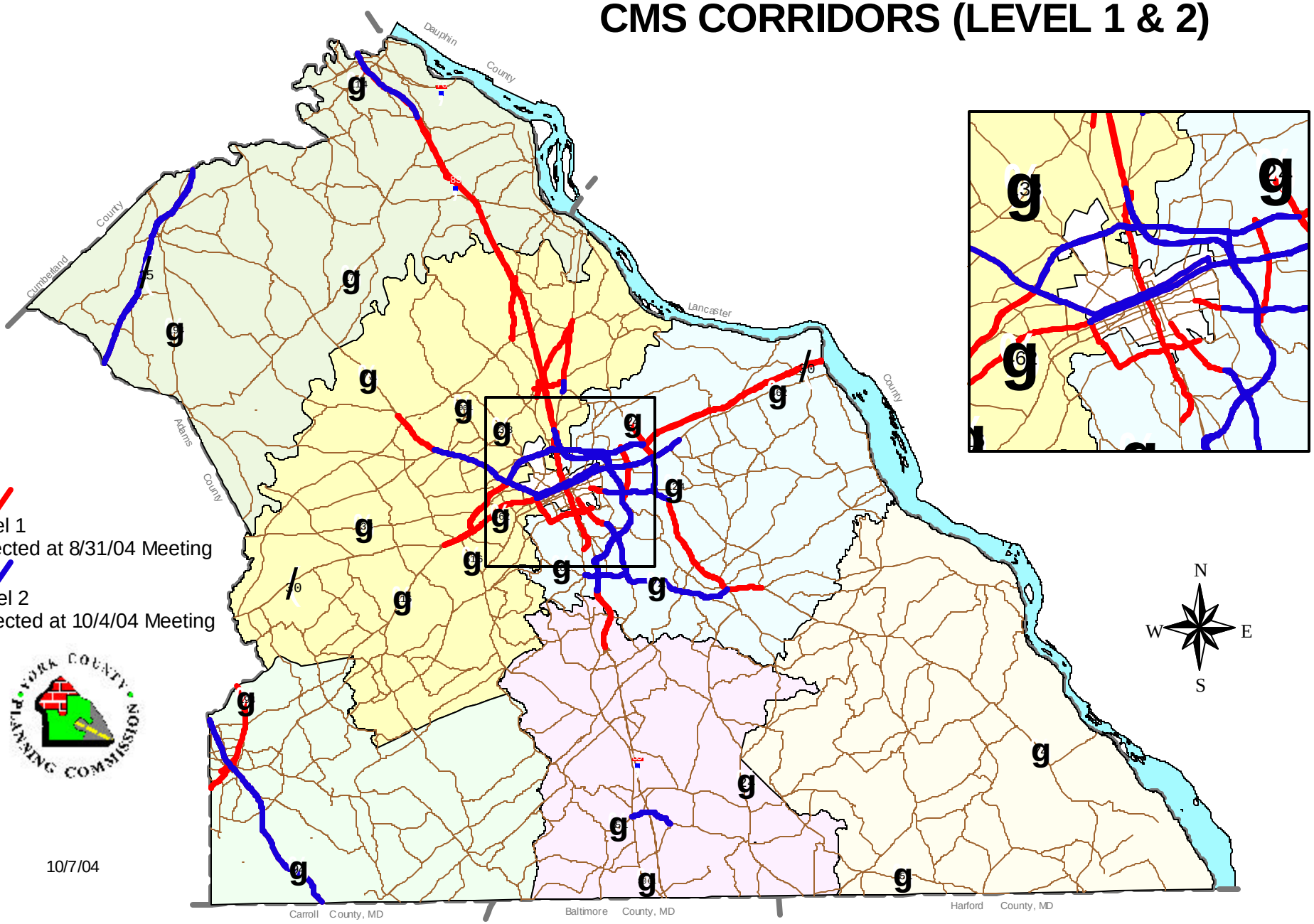
Map #8
CMS CORRIDORS (LEVEL 1 & 2)



Level 1
Selected at 8/31/04 Meeting

Level 2
Selected at 10/4/04 Meeting

YORK COUNTY PLANNING COMMISSION

10/7/04

PERFORMANCE MEASURE #7

TRANSIT RIDERSHIP

The information for this performance measure was provided by *rabbittransit*. The data received was comprised of transit ridership for the months of January and July 2004. These figures were added together and presented to the working group for their review. The working group looked at ridership by time of day and ridership on all fixed routes operated by *rabbittransit*. They were given some options on how to apply this measurement to evaluate if one corridor is more attractive than another corridor (e.g. jobs, retail services, etc.).This measurement was also used to determine whether or not people ride the bus instead of driving on a congested corridor. The working group's conclusion was that transit ridership in York County was dependent upon the individual's *need* for transportation not as a choice for public transportation. However, as the county grows in population, this perception may change. Thus, transit ridership will remain in the CMS plan as a **tracking measurement.**

Refinement Of Performance Measure - None

PERFORMANCE MEASURE #8

LAND USE

A quarter mile buffer was applied to each corridor. Within this buffer, York County Assessment Office data was used to determine the percentages of vacant land, residential land, and non-residential land. The working group concluded that the buffer area was too small to determine effectively whether congestion is present. The group also questioned how vacant land is defined. Vacant land is simply land on which no development has occurred and includes agricultural land. However, an objection was made stating agricultural land could be identified as a final use. It was suggested to use zoning in place of the current land use. The majority of the group, however, decided to keep using current land use instead of zoning because the zoning of a property can change without the property ever being developed. Another possible addition to this performance measure was population density. Unfortunately the data that is available is based on the U.S. 2000 census blocks. Due to the way census blocks are configured, it is not practical to apply the population density to the quarter mile buffer. Thus, the working group agreed to use the land use data as a **tracking measurement**. The land use data is provided on the individual corridor maps in Chapter 5.

Refinement of Performance Measure - None

PERFORMANCE MEASURE #9

PERCENT UNDER POSTED SPEED

The data for this performance measure was obtained by the YCPC transportation staff. The transportation staff conducted time delay studies for twelve of the sixteen Level Two corridors that are shown in Table #6. Two corridors did not meet the recommended length of two miles for the LOS criteria to be meaningful. The remaining two corridors were not included due to construction within the corridors. When construction is completed the *percent under posted speed* performance measure will be completed for these corridors.

Table #6
Time Delay Study Level Two Corridors

Roadway	From	To
I - 83 North	Fishing Creek Road	County Line
SR 181 *(insufficient length)	Emig Road	Church Road
SR 30	Carlisle Road	Mt Zion Road
I - 83 Central *(construction)	George Street	Leader Heights
SR 462 East	Harrison Street	Locust Grove Road
SR 24	Market Street	Windsor Road
SR 124	Wheatlyn Street	Meadow Hill Drive
SR 74 South	Vine Street	Chancellor Road
SR 182 *(construction)	George Street	Queen Street
Philadelphia Street	Harrison Street	Richland Avenue
Market Street	Overbrook Avenue	Harrison Street
SR 851	Windy Hill Road	Susquehanna Trail
SR 94	Maryland State Line	Adams County Line
SR 74 North	Market Street	Davidsburg Road
SR 15	Adams County Line	Cumberland County Line
North Hills Road *(insufficient length)	Route 30	Market Street

** This list does not represent priority order of corridors.*

The transportation staff conducted the time delay studies on average between 3:00 P.M. to 6:30 P.M.. An average of twenty- three runs in each direction were computed on these corridors. The information obtained from the studies consisted of percent under posted speed and level of service (LOS) for each of the corridors. In addition, the percent under posted speed, and LOS for each *section* was also calculated. In order to attain the analysis, certain steps needed to be taken. First, the corridors needed to be classified by Urban Street LOS by Class found in the Highway Capacity Manual 2000 in Table #7.

Table #7
EXHIBIT 15-2 URBAN STREET LOS BY CLASS*

Urban Street Class	**I**	**II**	**III**	**IV**
Range of free-flow speeds (FFS)	55 to 45 mi/h	45 to 35 mi/h	35 to 30 mi/h	35 to 25 mi/h
Typical FFS	50 mi/h	40 mi/h	35 mi/h	30 mi/h
LOS	Average Travel Speed (mi/h)			
A	>42	>35	>30	>25
B	>34-42	>28-35	>24-30	>19-25
C	>27-34	>22-28	>18-24	>13-19
D	>21-27	>17-22	>14-18	>9-13
E	>16-21	>13-17	>10-14	>7-9
F	≤16	≤13	≤10	≤7

* Highway Capacity Manual 2000

The corridors were classified using the Free Flow Speed (FFS) which was interpreted to be the posted speed limit. Next, a matrix was setup inputting all the data obtained from the time delay studies. The following equation was used in the matrix to determine the percent under posted speed and the average travel speed which translates into:

$$S = \frac{60 * N * D}{\Sigma T}$$

Where S = mean travel speed (in MPH)
D = length of section
N = number of test runs
Σ = sum of time of all test runs

The final results for this performance measure was broken down for each corridor in Table #8 and for each corridor section in Chapter 5, “Corridor Characteristics”.

Table #8
Performance Measure #9 Summary

Corridor	Direction	% Under Posted Speed	AVERAGE SPEED	LOS
1 I-83 North	NB	16%	48	A
	SB	0%	59	A
3 SR 30	EB	37%	25	C
	WB	37%	25	C
5 SR 462 East	EB	**48%**	18	C
	WB	**41%**	18	C
6 SR 24	NB	35%	25	C
	SB	**57%**	16	**E**
7 SR 124	EB	**69%**	12	**F**
	WB	**52%**	18	**D**
8 SR 74 South	NB	23%	23	B
	SB	27%	23	B
10 Philadelphia St	WB	20%	20	B
11 Market St	EB	27%	18	C
12 SR 851	EB	35%	24	B
	WB	34%	25	B
13 SR 94	NB	34%	25	B
	SB	33%	25	B
14 SR 74 North	NB	38%	21	C
	SB	34%	22	C
15 SR 15	NB	17%	44	A
	SB	17%	44	A

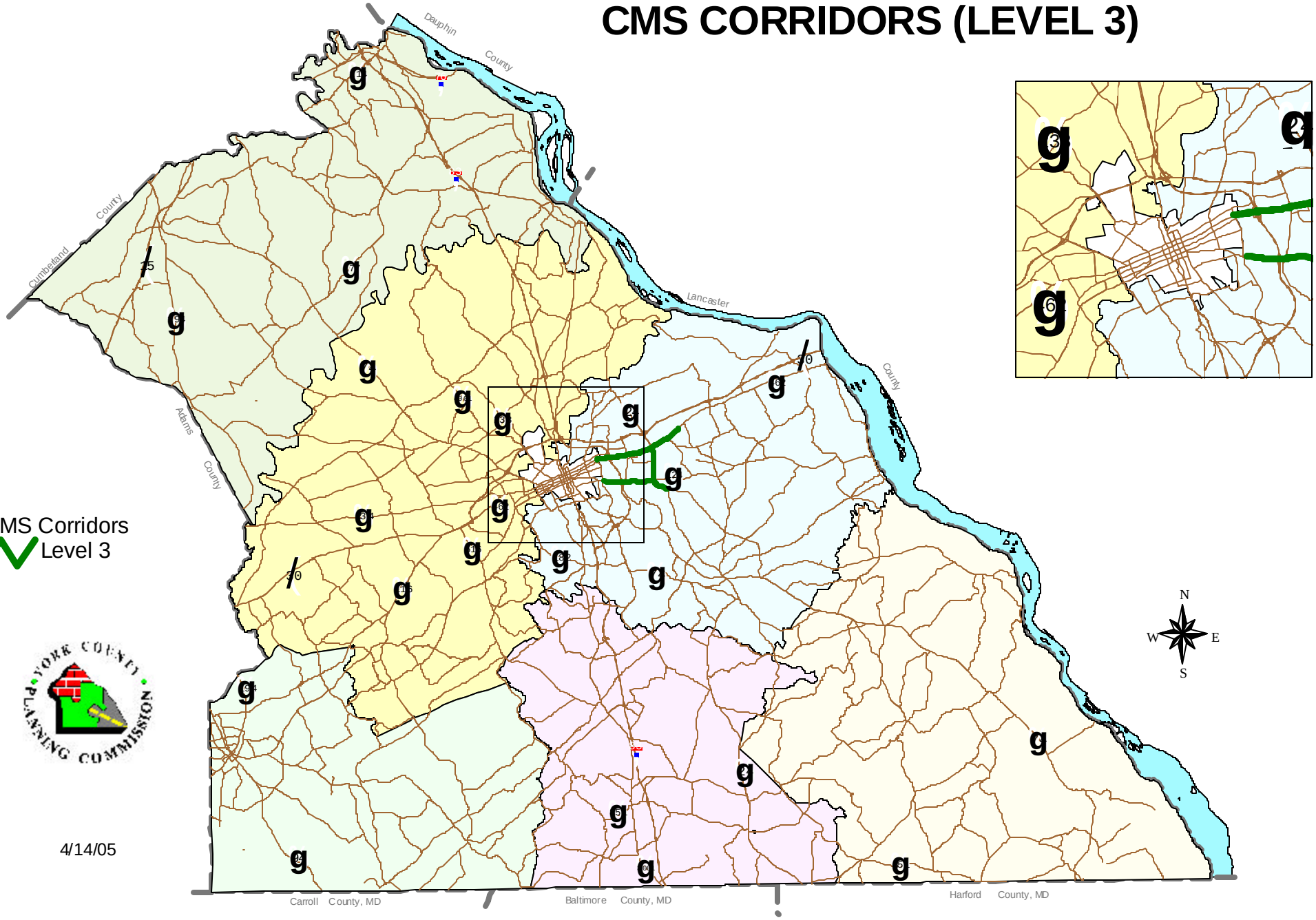
The working group determined the acceptable threshold for level of service (LOS) of a corridor should be "C". Also, the acceptable threshold for percent under posted speed should be below 40%. Any corridor that does not meet one or both criteria will be considered the **Level Three** CMS network. Level Three corridors are identified on Map #9.

Historical time delay studies from 1999 are listed in Chapter 5, "Corridor Characteristics". The 1999 data was not associated with the CMS network and uses different corridor lengths than the 2004 delay studies. However, the corridors were similar enough to use the intersection-to -intersection data which include additional signalized intersections since the 1999 data.

Refinement Of Performance Measure

- *Use historical data to compare changes in percent under posted speed for sections.*
- *Include potential new signalized intersections as new sections.*

Map #9
CMS CORRIDORS (LEVEL 3)



PERFORMANCE MEASURE #10

CRASHES

The information for this performance measure was obtained from the 1997-2002 crash data for all state roads in York County and includes all *reportable crashes* only. A *reportable crash* is one that has a vehicle towed from the scene or a person is taken by ambulance.

Crash data was extracted from the 1997-2002 information for the crashes that occurred along the sixteen corridors from Level Two. All weekend crashes were removed from the data set. The working group reviewed several charts depicting types of crashes, comparison of crashes to average daily traffic (ADT), and number of crashes per corridor. The group agreed that angle and rear-end crashes were the only relevant types of crashes that could be related to peak hour congestion. In addition, they found a correlation between all crashes and ADT. Although these two conclusions were achieved, the working group's opinion was that too many variables play a part in how and why crashes happen. For this reason, the performance measure is not going to be used in evaluating the corridors at this time. However, the working group suggested that different methods of analyzing the data should be looked into for future use of this performance measure.

Refinement Of Performance Measure - Compare corridors to State-wide crash data.

PERFORMANCE MEASURE #11

VOLUME OVER CAPACITY OF THE TRANSPORTATION MODEL

The York County Planning Commission is in the process of updating the transportation model. The next update of the CMS plan will include this performance measure.

Refinement Of Performance Measure - None

PERFORMANCE MEASURE #12

FUTURE PROJECTED VOLUME OVER CAPACITY

This performance measure will use the York County Planning Commission's transportation model that is in the process of being updated. The next update of the CMS plan will include this performance measure.

Refinement Of Performance Measure - None

PERFORMANCE MEASURE #13

TRANSIT ROUTE DELAY

Data was not available for this performance measure. If and when the data becomes available, it will be evaluated for its effectiveness of measuring congestion.

Refinement Of Performance Measure - None

PERFORMANCE MEASURE #14

INTERSECTION TURNING MOVEMENTS

This data was not readily available for the specific corridors. The data will be incorporated into Chapter 5, "Corridor Characteristics" when it becomes available.

Refinement Of Performance Measure - None

PERFORMANCE MEASURE #15

EDUCATION

The working group could not establish criteria on how education could be a performance measure for congestion. Therefore, this performance measure will be excluded from any future updates of the CMS plan.

Refinement Of Performance Measure - Exclude measure from next update

CHAPTER 5
CORRIDOR CHARACTERISTICS

LIST OF LEVEL TWO CORRIDORS

Corridor 1 - I-83 North Corridor (Fishing Creek Rd to County Line)

Corridor 2 - Route 181 Corridor (Route 238 to Emig Rd)

Corridor 3 - Route 30 Corridor (Route 24 to Route 74)

Corridor 4 - I-83 Central Corridor (George St to Route 182)

Corridor 5 - Route 462 East Corridor (Harrison St to Locust Grove Rd)

Corridor 6 - Route 24 Corridor (Route 462 to Windsor Rd)

Corridor 7 - Route 124 Corridor (Wheatlyn St to Meadow Hill Rd)

Corridor 8 - Route 74 South Corridor (Chancellor Rd to Vine St)

Corridor 9 - Route 182 Corridor (George St to Route 74)

Corridor 10 - Philadelphia St Corridor (Harrison St to Richland Ave)

Corridor 11 - Market St Corridor (Overbrook Ave to Harrison St)

Corridor 12 - Route 851 Corridor (Windy Hill Rd to Susquehanna Trail)

Corridor 13 - Route 94 Corridor (County Line to County Line)

Corridor 14 - Route 74 North Corridor (Davidsburg Rd to Route 462)

Corridor 15 - Route 15 Corridor (County Line to County Line)

Corridor 16 - North Hills Rd Corridor (Route 462 to Route 30)

CORRIDOR 1

I-83 North Corridor (Fishing Creek Rd to County Line)

CORRIDOR 2

Route 181 Corridor (Route 238 to Emig Rd)

CORRIDOR 2 info

CORRIDOR 3

Route 30 Corridor (Route 24 to Route 74)

CORRIDOR 3 info

CORRIDOR 4

I-83 Central Corridor (George St to Route 182)

CORRIDOR 4 info

CORRIDOR 5

Route 462 East Corridor (Harrison St to Locust Grove Rd)

CORRIDOR 5 info

CORRIDOR 6

Route 24 Corridor (Route 462 to Windsor Rd)

CORRIDOR 6 info

CORRIDOR 7

Route 124 Corridor (Wheatlyn St to Meadow Hill Rd)

CORRIDOR 7 info

CORRIDOR 8

Route 74 South Corridor (Chancellor Rd to Vine St)

CORRIDOR 8 INFO

CORRIDOR 9

Route 182 Corridor (George St to Route 74)

CORRIDOR 9 info

CORRIDOR 10

Philadelphia St Corridor (Harrison St to Richland Ave)

CORRIDOR 10 info

CORRIDOR 11

Market St Corridor (Overbrook Ave to Harrison St)

CORRIDOR 11 info

CORRIDOR 12

Route 851 Corridor (Windy Hill Rd to Susquehanna Trail)

CORRIDOR 12 INFO

CORRIDOR 13

Route 94 Corridor (County Line to County Line)

CORRIDOR 13 info

CORRIDOR 14

Route 74 North Corridor (Davidsburg Rd to Route 462)

CORRIDOR 14 info

CORRIDOR 15

Route 15 Corridor (County Line to County Line)

CORRIDOR 15 info

CORRIDOR 16

North Hills Rd Corridor (Route 462 to Route 30)

CORRIDOR 16 info

CHAPTER 6
CONGESTION MITIGATION STRATEGIES

Chapter 6
Congestion Mitigation Strategies

A "Toolbox" of mitigation strategies was assembled that includes all strategies that could be used to address both recurring and non-recurring congestion. The mitigation strategies in the "Toolbox" include measures utilizing all modes of transportation, as well as ways to encourage more efficient patterns of land use and development.

Table #9
MITIGATION STRATEGIES TOOLBOX

Growth Management
Land Use Policies/Regulations Encourage more efficient patterns of commercial or residential development in defined growth areas. Specific land use policies and/or regulations that could significantly decrease both the total number of trips and overall trip lengths, as well as making transit use, bicycling and walking more viable include, but are not limited to the following: • Encourage development in existing communities • Discourage development outside of designated growth areas • Promote higher density and mixed uses in proximity to existing or planned transit service • Establish a policy for new and existing subdivisions to include sidewalks, bike paths, and transit facilities where appropriate • Develop and adopt Official Maps
Employer Work Base Options
Telecommuting Encourage employers to consider telecommuting options.
Employer Flextime Benefits/Compressed Work Week Encourage employers to consider allowing employees to maintain a flexible schedule allowing employees the option to commute during non-peak hours.
Parking Management Encourage the utilization of alternative commute modes, such as carpooling and vanpooling, by providing preferential parking as a low-cost incentive.
Rideshare/Employer Shuttle Programs Organize groups of commuters to travel together in a passenger van or employer-provided shuttle on a regular basis.
Employer Trip Reduction Programs Organize groups that offer tax incentives or transit subsidies on a regular basis.

Alternative Modes Capital Improvements
New Rail Service Include freight, heavy rail, commuter rail, and light rail services.
New Bus Facilities Include Bus Only Lanes and Transfer Facilities.
New/Improved Intermodal Connections Address new locations and improve the efficiency and functionality of intermodal connectors where several modes of transportation are physically and operationally integrated.
New/Improved Park-n-Ride Facilities Identify locations along corridors to provide park-n-ride facilities, and improve existing facilities.
Public Transit Operational Improvements
Service Expansion Improve service frequency and service area.
Traffic Signal Priority Improve traffic flow for transit vehicles traveling through signalized intersections.
Transit Fare Reduction/Reduced Rate of Fare Include system-wide reductions, peak discounts and subsidized programs.
Transit Information Systems Improve in-vehicle and station information systems, by that, improving the dissemination of transit-related information to the user.
Rideshare Matching Services Provide carpool/vanpool matching and ridesharing information resources and services.
Bicycle and Pedestrian Modes
Improved/Expanded Commuter Bicycle Network Include on-road facilities, pathways, and greenways, and connection to transit.
Bicycle Storage Systems Provide safe and secure places for bicyclists to store their bicycles.
Improved/Expanded Pedestrian Network Include sidewalks, overpasses/tunnels, pedestrian only streets, greenways, and walkways.
Encourage High Occupancy Vehicle (HOV) Use
Add HOV Lanes Most appropriate use on freeways and expressways.

HOV Toll Savings Preferential pricing to multi-occupant vehicles. Needs infrastructure to administer toll collection.
Traffic Operational Improvements
Intersection Geometric Improvements Improvements to intersection geometrics to improve overall efficiency and operation.
Intersection Channelization Infrastructure improvements that provide physical separation or delineation of conflicting traffic movements.
Intersection Turn Restrictions Provide intersection turn restrictions (time of day) to reduce conflicts and increase overall intersection performance.
Truck Restrictions Restrict trucks to a designated lane where practical.
Coordinated Intersection Signals Improve traffic signal progression along identified corridors.
Intersection Signalization Improvements Improve signal operations through re-timing signal phases.
Work Zones Lane closures should occur outside of peak hours.
Traffic Calming A variety of techniques used to reduce traffic speeds and increase safety, although no techniques should decrease capacity.
Freeway Operations and Management
Elimination of Bottlenecks Eliminate high-traffic areas where one or more travel lane(s) is dropped.
Ramp Metering Meter vehicular access to a highway during peak periods to optimize the operational capacity of the highway.
Incident Management-Detection, Response & Clearance Utilize traveler radio, travel alert notification (ITS signs), and general public outreach to enhance incident related alternatives routes and emergency management response.

Access Management
Access Control Reduction or elimination of "side street friction", especially from driveways via traffic engineering, regulatory techniques, and purchase of access rights.
Median Control Reduction of centerline and "side street friction", via traffic engineering and regulatory techniques.
Frontage Roads Auxiliary roadways which provide a separated lane or lanes for access to abutting land use along freeways or arterials.
Land Use Access management regulations should be addressed in Subdivision/Zoning Ordinances.
Addition of General Purpose Lanes
Freeway, Interstate, and Arterial Lanes Increase the capacity of congested arterials through additional travel lanes.
Interchanges Any programmed/scheduled interchange addition.
Reversible Lanes Change lane direction according to peak hour traffic.
Truck Climbing Lanes Add lanes where trucks encounter significant grades.
New/Improved Shoulders To reduce driver friction, emergency pull off for vehicles, and to facilitate non-motorized modes of travel. The recommended width is eight feet, this is supported in the Long Range Transportation Plan.
Incident Management/Work Zones* (*Less than one year)
Warning Beacons/Strobes Install on traffic signals.
Central Computer Control/Traffic Control Centers For use on principal highways, CB radios and Cellular telephones have a connection with control centers, using a * plus two-digit number.
Incident Management/Control Teams Teams that travel during peak hours on principal highways to remove disabled vehicles from the roadway. Also, when incidents occur, have a team that is equipped with drinking water and gasoline.

HazMat Mitigation
Coordinate State Police, PennDOT, and first responders to better inform each other during a HazMat incident.

Mile Markers
Install signs measured in tenths for more accurate reporting of where incidents have occurred.

Municipal Web Sites
Encourage Municipalities to post work zones on web site, and inform motorists of duration of the work zone and alternative routes.

In Chapter 4, the performance measures were defined and applied to the CMS transportation network to arrive at specific congested corridors. Three corridors were identified; SR 124, SR 24 and SR 462 East. When financial availability on the TIP permits for improvements on these corridors, the next step is to advance the specific congested corridors into a planning study. The Mitigation Strategies Toolbox was reviewed to identify viable mitigation strategies. Table #10 identifies the viable mitigation strategies for the level 3 corridors. The planning study's scope of work will be required to incorporate the viable mitigation strategies identified in Table #10.

Table #10
MITIGATION STRATEGIES FOR LEVEL 3 CORRIDORS

Mitigation Strategies	SR 124	SR 24	SR 462 East
Growth Management			
Land Use	X	X	X
Employer Work Based Options			
Telecommuting			
Employer Flextime Benefits/Compressed Work Week			
Parking Management			
Rideshare/Employer Shuttle Programs			
Employer Trip Reduction Programs			
Alternative Modes Capital Improvements			
New Rail Service			
New Bus Facilities			X
New/Improved Intermodal Connections			
New/Improved Park-n-Ride Facilities	X		X
Public Transit Operational Improvements			
Service Expansion	X	X	X
Traffic Signal Priority	X		X
Transit Fare Reduction/Reduced Rate of Fare			
Transit Information Systems	X		X
Rideshare Matching Services	X	X	X

Mitigation Strategies	SR 124	SR 24	SR 462 East
Bicycle and Pedestrian Modes			
Improved/Expanded Commuter Bicycle Network	X	X	X
Bicycle Storage Systems	X	X	X
Improved/Expanded Commuter Pedestrian Network			
Encourage High Occupancy Vehicle (HOV) Use			
Add HOV Lanes			
HOV Toll Savings			
Traffic Operational Improvements			
Intersection Geometric Improvements	X	X	X
Intersection Channelization	X	X	X
Intersection Turn Restrictions	X	X	X
Truck Restrictions			
Coordinated Intersection Signals	X		X
Intersection Signalization Improvements	X	X	X
Work Zones	X	X	X
Traffic Calming			
Elimination of Bottlenecks	X	X	X
Expressway Operations and Management			
Ramp Metering			
Incident Management-Detection, Response & Clearance			
Access Management			
Access Control	X	X	X
Median Control	X	X	X
Frontage Roads			X
Land Use	X	X	X
Addition of General Purpose Lanes			
Expressway, Interstate, Arterial Lanes	X		
Interchanges			
Reversible Lanes	X	X	
Truck Climbing Lanes	X	X	
New/Improved Shoulders	X	X	X
Incident Management/Work Zones*(less then one year)			
Warning Beacons/Strobes	NA	NA	NA
Central Computer Control/Traffic Control Centers	NA	NA	NA
Incident Management/Control Teams	NA	NA	NA
HazMat Mitigation	X	X	X
Mile Markers			
Municipal Web Sites	X	X	X

CHAPTER 7

SYSTEM MONITORING

Chapter 7
System Monitoring

As a last step in the development of the Congestion Management System, the task of monitoring the system shall serve two main purposes:

1) to continue data collection using the performance measures defined in Chapter 4 to support/refine the CMS, and

2) to track the effectiveness of implemented improvements within the corridors.

The working group selected a six year cycle for the monitoring of the CMS. It is as follows:

Year Two (2007) - Evaluate Level Three Corridors from Map #9
Year Four (2009) - Evaluate Level Three Corridors from Map #9 and the Level Two Corridors from Map #8.
Year Six (2011) - Revisit the entire CMS Plan

In addition, the working group decided on a one year time frame for reevaluating a corridor once a roadway project has been completed on all or part of the corridor to track the effectiveness of the improvement. A chart depicting current projects on the Transportation Improvement Program (TIP) is located in Chapter 5, "Corridor Characteristics" for each corridor.

Refinement of CMS Plan

3) All tracking measurements will be included in the corridor characteristics section.

4) Develop performance measures to identify non-recurring congestion.