ITEM # 7

METROPOLITAN WASHINGTONCOUNCIL OF GOVERNMENTS
COMMUTER CONNECTIONS PROGRAM

TRANSPORTATION EMISSION REDUCTION MEASURE (TERM) ANALYSIS REPORT FY 2003-2005

Prepared for:

National Capital Region Transportation Planning Board
Metropolitan Washington Council of Governments
777 North Capitol Street, NE, Suite 300
Washington, DC 20002-4239

Prepared by:

LDA Consulting
Washington, DC
202-548-0205

In association with:

CIC Research, Inc., San Diego, CA
ESTC, San Diego, CA
Elham Shirazi, Los Angeles, CA
Cheryl Collier, Los Angeles, CA

Revised
January 17, 2006

EXECUTIVE SUMMARY

BACKGROUND

This report presents the results of an evaluation of seven Transportation Emission Reduction Measures (TERMs), voluntary Transportation Demand Management (TDM) measures implemented by the National Capital Region Transportation Planning Board's Commuter Connections program at the Metropolitan Washington Council of Governments (COG) to support the Washington, DC metropolitan region's air quality conformity determination. This evaluation documents transportation and air quality impacts for the 36-month period between July 1, 2002 and June 30, 2005, for the following TERMs:

- **Metropolitan Washington Telework Resource Center (TRC)** – Provides information and assistance to commuters and employers to further in-home and telecenter-based telework programs
- **Expanded Telecommuting** – Provides individual assistance to selected employers to assist them to implement more extensive telework programs
- **Guaranteed Ride Home** – Provides free rides home in the event of a personal emergency or unscheduled overtime to commuters who use alternative modes to eliminate a barrier to the use of alternatives
- **Integrated Rideshare** – Improves access to alternative mode information through use of information kiosks, and provides transit and Park & Ride information to all commuters who receive a matchlist
- **Employer Outreach** – Provides regional outreach to encourage large, private sector employers voluntarily to implement worksite TDM strategies that will contribute to reducing vehicle trips to worksites
- **Employer Outreach for Bicycling** – Provides regional outreach to encourage employers to implement strategies that could increase employees' use of bicycling for commuting.
- **Mass Marketing** – A large-scale, comprehensive media campaign to inform the region's commuters of services available from Commuter Connections as one way to address commuters' frustration about the commute.

COG's National Capital Transportation Planning Board (TPB), the designated Metropolitan Planning Organization (MPO) for the Washington, DC metropolitan region, adopted these TERMs, among others, in recent regional Transportation Improvement Programs (TIP) to help the region reach emission reduction targets that would maintain a positive air quality conformity determination for the region. It is also important to note that the regional travel demand model was calibrated and validated against the year 2000 traffic counts and regional emission credits are only taken for TERM benefits that occurred after the year 2000 in the regional TERM tracking sheet and may not be consistent with results in this report.

COG's Commuter Connections program, which also operates an ongoing regional rideshare program, is the central administrator of the seven noted above. Commuter Connections elected to include a vigorous evaluation element in the implementation plan for each of the adopted TERMs to develop information to be used to guide sound decision-making about the TERMs. This report summarizes the results of the TERM evaluation activities and presents the transportation and air quality impacts of the TERMs and the Commuter Operations Center (COC).

This evaluation represents a quite comprehensive evaluation for these programs. It should be noted that the evaluation still remains conservative in the sense that it includes credit only for impacts that can be reasonably documented with accepted measurement methods and tools. However, we also note that many of the calculations used survey data from surveys that are subject to statistical error rates.

A primary purpose of this evaluation was to develop useful and meaningful information for regional transportation and air quality decision-makers, COG staff, COG program funding agencies, and state and local commute assistance program managers to guide sound decision-making about the TERMs. The results of this evaluation will provide valuable information for regional air quality conformity, improve the structure and implementation procedures of the TERMs themselves, and to refine future data collection methodologies and tools.

SUMMARY OF RESULTS

The objective of the evaluation is to estimate reductions in vehicle trips (VT), vehicle miles traveled (VMT), and tons of Nitrogen Oxides (NOx) and Volatile Organic Compounds (VOC) resulting from implementation of each TERM and compare the impacts against the goals established for the TERMs. The goals were based on stated preference surveys conducted in the early 1990's and anecdotal observations of other Transportation Demand Management programs in other parts of the country. Emission goals were originally set based on the Mobile 5 model which provided higher estimates for emission reductions compared to the recent Mobile 6 model.

The impact results for these measures are shown in Table A for each TERM individually. Results for all TERMs collectively and for the Commuter Operations Center (COC) are presented in Table B. Table C shows comparison's of results from the 2002 TERM Analysis Report to the 2005 report. As shown, the TERMS combined fell short of the goals set for the TERM programs combined: -27,415 vehicle trips reduced, -99,728 VMT reduced, -0.244 tons NOx, and -0.229 tons VOC reduced. However, it should be noted that several of the TERMS met or exceeded the original program participation estimates.

When the COC results were added to the TERM impacts, it made up some, but not all, of the TERM deficits for vehicle trips and emissions reduced. The COC VMT reduction did make up for the TERM deficit, resulting in VMT impacts that exceeded the overall goal for the TERMs plus the COC. The totals for all Commuter Connections programs, compared to the goals, were: -20,352 daily vehicle trips, +96,123 daily VMT reduced, -0.107 daily tons of NOx reduced, and -0.169 tons of VOC reduced.

Several TERMs met their individual impact goals, however. Estimated impacts for Employer Outreach were more than six times the goal for this TERM, due to both the large number of employers participating and the strong worksite commute programs implemented. Impacts for Employer Outreach for Bicycling and Integrated Rideshare also were well above the goals, although the goals for these TERMs were smaller than that for Employer Outreach. The COC also exceeded its goal, by more than 350%.

But impacts were well below the goals for the Telework Resource Center and Guaranteed Ride Home. The two new TERMs, Expanded Telecommuting and Mass Marketing, also missed their estimated targets.

The reasons for the shortfalls from the goals vary by TERM and are discussed in individual report sections on each TERM. As mentioned earlier, shortfalls were generally <u>not</u> due to low numbers of commuters participating in the TERM programs. Rather, shortfalls can be attributed primarily to lower than

expected levels of trip reduction realized by each participating commuter. At the time the goals were established, generally in 1997 or 1998, these assumptions were commonly used by TDM practitioners, so seemed reasonable for the TERM projections. But commute research conducted by Commuter Connections since that time has shown that these assumptions appear now to have been optimistic, with participating commuters reducing few trips per commuter, on average.

It is recommended that the transportation and emission goals for the Commuter Connections TERMS be reviewed and revised in light of cleaner vehicle, changes to vehicle technology, changes to the Mobile emissions model, and updated travel behavior information.

Table A
Summary of Results for Individual TERMs (7/02– 6/05) and Comparison to Goals

TERM	Participation [2]	Daily Vehicle Trips Reduced	Daily VMT Reduced	Daily Tons NOx Reduced	Daily Tons VOC Reduced
Metropolitan Washington Telework Resource Center [1]					
2005 Goal	21,606	26,000	435,550	0.364	0.198
Impacts (7/02 – 6/05)	29,966	11,129	226,913	0.187	0.097
Net Credit or (Deficit)	**8,266**	**(14,871)**	**(208,637)**	**(0.177)**	**(0.101)**
Expanded Telecommuting					
2005 Goal	113,000	33,660	550,368	0.461	0.252
Impacts (7/02 – 6/05)	4,884	1,848	36,859	0.030	0.016
Net Credit or (Deficit)	**(108,116)**	**(31,812)**	**(513,509)**	**(0.431)**	**(0.236)**
Guaranteed Ride Home					
2005 Goal	35,000	44,070	661,150	0.558	0.312
Impacts (7/02 – 6/05)	34,800	11,847	334,088	0.239	0.105
Net Credit or (Deficit)	**(200)**	**(32,223)**	**(327,062)**	**(0.319)**	**(0.207)**
Integrated Rideshare					
2005 Goal	4,070	4,070	100,300	0.082	0.041
Impacts (7/02 – 6/05)	5,574	5,574	146,612	0.107	0.050
Net Credit or (Deficit)	**1,504**	**1,504**	**46,312**	**0.025**	**0.009**
Employer Outreach					
2005 Goal	251	13,100	196,400	0.166	0.093
Impacts (7/02 – 6/05)	886	81,150	1,339,818	1.036	0.526
Net Credit or (Deficit)	**635**	**68,050**	**1,143,418**	**0.871**	**0.433**
Employer Outreach-Bicycling					
2005 Goal	N/A	130	567	0.001	0.001
Impacts (7/02 – 6/05)	85	343	3,431	0.003	0.002
Net Credit or (Deficit)	**85**	**213**	**2,864**	**0.002**	**0.001**
Mass Marketing					
2005 Goal	15,527	25,575	375,975	0.318	0.179
Impacts (7/02 – 6/05)	10,370	7,299	132,861	0.101	0.050
Net Credit or (Deficit)	**(5,157)**	**(18,276)**	**(243,114)**	**(0.217)**	**(0.129)**

1) Impact represents portion of regional telecommuting attributable to TRC activities. Total telecommuting credited for conformity is higher than reported for the TRC.

2) Participation refers to number of commuters participating, except for the Employer Outreach and Employer Outreach-Bicycling TERMs. For these TERMs, participation equals the number of employers participating.

Table B
Summary of TERM and COC Results (7/02 – 6/05) and Comparison to Goals

TERM	Participation [1]	Daily Vehicle Trips Reduced	Daily VMT Reduced	Daily Tons NOx Reduced	Daily Tons VOC Reduced
TERMS (seven TERMs collectively)					
2005 Goal		146,605	2,320,310	1.949	1.074
Impacts (7/02 – 6/05)		119,190	2,220,582	1.705	0.845
Net Credit or (Deficit)		**(27,415)**	**(99,728)**	**(0.244)**	**(0.229)**
Commuter Operations Center					
2005 Goal	60,000	2,720	83,204	0.067	0.032
Impacts (7/02 – 6/05)	143,326	9,783	279,055	0.204	0.092
Net Credit or (Deficit)	**83,326**	**7,063**	**195,851**	**0.137**	**0.060**
All TERMS plus COC					
2005 Goal		149.325	2,403,514	2.016	1.106
Impacts (7/02 – 6/05)		128,973	2,499,637	1.909	0.937
Net Credit or (Deficit)		**(20,352)**	**96,123**	**(0.107)**	**(0.169)**

1) Participation refers to number of commuters participating, except for the Employer Outreach and Employer Outreach-Bicycling TERMs. For these TERMs, participation equals the number of employers participating.

Table C
Summary of Results for Individual TERMs 7/02– 6/05 Compared to 7/99 – 6/02 [1]

TERM	Daily Vehicle Trips Reduced	Daily VMT Reduced	Daily Tons NOx Reduced	Daily Tons VOC Reduced
Metropolitan Washington Telework Resource Center				
July 2002 – June 2005	11,129	226,913	0.187	0.097
July 1999 – June 2002	12,590	279,692	0.389	0.195
Change [2]	**(1,461)**	**(52,779)**	**(0.202)**	**(0.098)**
Expanded Telecommuting				
July 2002 – June 2005	1,848	36,859	0.030	0.016
July 1999 – June 2002	N/A	N/A	N/A	N/A
Change [2]	**1,848**	**36,859**	**0.030**	**0.016**

Table C
Summary of Results for Individual TERMs 7/02– 6/05 Compared to 7/99 – 6/02 [1)]

TERM	Daily Vehicle Trips Reduced	Daily VMT Reduced	Daily Tons NOx Reduced	Daily Tons VOC Reduced
Guaranteed Ride Home				
July 2002 – June 2005	11,847	334,088	0.239	0.105
July 1999 – June 2002	6,803	202,058	0.240	0.105
Change [2)]	**5,044**	**132,030**	**(0.001)**	**0.000**
Integrated Rideshare				
July 2002 – June 2005	5,574	146,612	0.107	0.050
July 1999 – June 2002	3,418	117,940	0.159	0.074
Change [2)]	**2,156**	**28,672**	**(0.052)**	**(0.024)**
Employer Outreach				
July 2002 – June 2005	81,150	1,339,818	1.036	0.526
July 1999 – June 2002	71,267	1,107,698	1.473	0.755
Change [2)]	**9,883**	**232,120**	**(0.437)**	**(0.229)**
Employer Outreach-Bicycling				
July 2002 – June 2005	343	3,431	0.003	0.002
July 1999 – June 2002	284	1,225	0.002	0.002
Change [2)]	**59**	**2,265**	**0.001**	**0.000**
Mass Marketing				
July 2002 – June 2005	7,299	132,861	0.101	0.050
July 1999 – June 2002	N/A	N/A	N/A	N/A
Change [2)]	**7,299**	**132,861**	**0.101**	**0.050**
Commuter Operations Center				
July 2002 – June 2005	9,783	279,055	0.204	0.092
July 1999 – June 2002	1,970	66,056	0.079	0.034
Change [2)]	**7,813**	**212,999**	**0.125**	**0.058**

1) Comparisons are not shown to impacts for 1996 – 1999, due to significant methodology changes between the 1999 evaluation and the 2002 evaluation.
2) Change in emissions is due in part to changes in emission factors from 2002 to 2005. 2005 emission factors reflect lower emissions calculated in Mobile 6 mode.

TABLE OF CONTENTS

Table of Contents (cont.)

SECTION 1 INTRODUCTION

PURPOSE OF THE REPORT

This report presents the results of an evaluation of seven Transportation Emission Reduction Measures (TERMs), voluntary Transportation Demand Management (TDM) measures implemented by the National Capital Region Transportation Planning Board's Commuter Connections program at the Metropolitan Washington Council of Governments (COG) to support the Washington, DC metropolitan region's air quality conformity determination. This evaluation documents transportation and air quality impacts for the 36-month period between July 1, 2002 and June 30, 2005, for the following TERMs:

- **Metropolitan Washington Telework Resource Center (TRC)** – Provides information and assistance to commuters and employers to further in-home and telecenter-based telework programs
- **Expanded Telecommuting** – Provides individual assistance to selected employers to assist them to implement more extensive telework programs
- **Guaranteed Ride Home** – Provides free rides home in the event of a personal emergency or unscheduled overtime to commuters who use alternative modes to eliminate a barrier to the use of alternatives
- **Integrated Rideshare** – Improves access to alternative mode information through use of information kiosks, and provides transit and Park & Ride information to all commuters who receive a matchlist
- **Employer Outreach** – Provides regional outreach to encourage large, private sector employers voluntarily to implement worksite TDM strategies that will contribute to reducing vehicle trips to worksites
- **Employer Outreach for Bicycling** – Provides regional outreach to encourage employers to implement strategies that could increase employees' use of bicycling for commuting.
- **Mass Marketing** – A large-scale, comprehensive media campaign to inform the region's commuters of services available from Commuter Connections as one way to address commuters' frustration about the commute.

The TPB, the designated Metropolitan Planning Organization (MPO) for the Washington, DC metropolitan region, adopted these TERMs in recent regional Transportation Improvement Programs (TIP) to help the region reach emission reduction targets that would maintain a positive air quality conformity determination for the region. The United States Environmental Protection Agency has designated the Washington, DC metropolitan region as a "moderate" ozone non-attainment area. No regional mandates have been adopted that would require the reduction of nitrogen oxides (NOx) or the implementation of any specific mitigation measure. But COG's Travel Management Subcommittee developed and analyzed regional TERMs and the TPB adopted these TERMs in annual TIPs.

COG's Commuter Connections program, which operates an ongoing regional rideshare program, was given responsibility for implementation of the seven regional Transportation Demand Management (TDM) TERMs. Commuter Connections is the central administrator of the TERMs, but works with partner organizations, such as local jurisdiction commuter programs and transportation management associations (TMAs) to implement them. Commuter Connections directly provides some client services, such as the regional rideshare database matching service, which are most cost-effectively provided by a central agency. But other services are offered by local organizations and coordinated regionally by the Commuter Connections Subcommittee, a coordinating body comprised of state and local government agencies in the region, several large federal employers, a number of TMAs, and other partner organizations.

At the early stages of implementation of the TERMs, the Commuter Connections Subcommittee elected to include a vigorous evaluation element in the implementation plan for each of the adopted TERMs. The purpose of the evaluation was

to develop timely, useful, and meaningful information to be used by regional transportation and air quality decision-makers, COG staff, COG program funders, and state and local commute assistance program managers to guide sound decision-making about the TERMs.

This report summarizes the results of the TERM evaluation activities and presents the transportation and air quality impacts of the TERMs. The report also documents impacts of the commuter assistance activities of the Commuter Operations Center, which COG operates to provide a basic level of commuter information and ridesharing assistance services throughout the Washington region. Results from this report will be included in the region's conformity analysis determination.

In June 1997, a consultant team was retained to assist Commuter Connections to define an evaluation methodology. This methodology was used for the first triennial evaluation of five TERMs. In 2001 and again in 2004, the consultants, along with Commuter Connections, expanded and enhanced the methodologies, data collection tools, and data sources to expand the coverage, corroborate assumptions, and enhance the reliability of the evaluation estimates. Section 3 presents highlights of the changes made to the methodology in this updated framework. Readers who desire additional details on the methodology are directed to the report entitled, "Commuter Connections' Transportation Demand Management Evaluation Project: Transportation Emission Reduction Measures (TERMs) Revised Evaluation Framework, July 2002 – June 2005." This document is available from COG's Information Center or on-line at www.commuterconnections.org.

The data collection activities recommended in the Evaluation Framework report were undertaken by COG or by data collection consultants retained by COG. This report summarizes the results of the evaluation activities and analysis. The report also summarizes the transportation and air quality impacts of commuter assistance activities of the Commuter Operations Center, which COG operates to provide a basic level of commuter information and ridesharing assistance services throughout the Washington region. The COC is not an adopted TERM, but is included in this analysis because its operation supports the operation of most of the TDM TERMs.

ORGANIZATION OF THE REPORT

This TERM Analysis Report is divided into 11 sections following this Introduction section:

- Section 2 Overall Summary of Results
- Section 3 Highlights of Revised Evaluation Methodology
- Section 4 Metropolitan Washington Telework Resource Center
- Section 5 Expanded Telecommuting
- Section 6 Guaranteed Ride Home
- Section 7 Integrated Rideshare
- Section 8 Employer Outreach
- Section 9 Employer Outreach for Bicycling
- Section 10 Mass Marketing
- Section 11 Commuter Operations Center
- Section 12 Conclusions About TERM Impacts

Section 2 summarizes the overall results for each TERM individually and for all TERMs plus the Commuter Operations Center collectively. Section 3 presents highlights of the revised evaluation methodology developed in 2004 for the 2002-2005 evaluation period. Sections 4 through 10 present for the each individual TERM, a brief description of the TERM and its purpose, an overview of the methodology used to estimate the TERM's impacts and the data used in the analysis, and a comparison of the measured impacts against the goals set for the TERM. Section 11 presents similar information for the Commuter Operations Center. The final section, Section 12, presents general conclusions from the analysis.

Summaries of the calculations of transportation and air quality impacts of individual TERMs also are included, in appendices following the body of the report.

SECTION 2 OVERALL SUMMARY OF RESULTS

The objective of the evaluation was to estimate the reductions in vehicle trips, vehicle miles traveled (VMT), and tons of Nitrogen Oxides (NOx) and Volatile Organic Compounds (VOC) resulting from the implementation of each regional Commuter Connections TERM between July 2002 and June 2005 and to compare these measured impacts against the goals established for the TERMs. The Revised Evaluation Framework document finalized in March 2001 also recommended that other performance measures be tracked for these TERMs to assess levels of program participation, utilization, satisfaction, and cost-effectiveness. These measures are tracked by Commuter Connections on a monthly and annual basis for the TERMs and are reported in other documents.

Program goals were based on stated preference surveys conducted in the early 1990's and anecdotal observations of other Transportation Demand Management programs in other parts of the country. Emission goals were originally set based on the Mobile 5 model which provided higher estimates for emission reductions compared to the recent Mobile 6 model.

The impact results for these measures are shown in Table A for each TERM individually. Results for all TERMs collectively and for the Commuter Operations Center (COC) are presented in Table B. As shown, the TERMS combined fell short of the goals set for the TERM programs combined: -27,415 vehicle trips reduced, -99,728 VMT reduced, -0.244 tons NOx, and -0.229 tons VOC reduced. However, it should be noted that several of the TERMS met or exceeded the original program participation estimates.

When the COC results were added to the TERM impacts, it made up some, but not all, of the TERM deficits for vehicle trips and emissions reduced. The COC VMT reduction did make up for the TERM deficit, resulting in VMT impacts that exceeded the overall goal for the TERMs plus the COC. The totals for all Commuter Connections programs, compared to the goals, were: -20,352 daily vehicle trips, +96,123 daily VMT reduced, -0.107 daily tons of NOx reduced, and -0.169 tons of VOC reduced.

Several TERMs met their individual impact goals, however. Estimated impacts for Employer Outreach were more than six times the goal for this TERM, due to both the large number of employers participating and the strong worksite commute programs implemented. Impacts for Employer Outreach for Bicycling and Integrated Rideshare also were well above the goals, although the goals for these TERMs were smaller than that for Employer Outreach. The COC also exceeded its goal, by more than 350%.

But impacts were considerably below the goals for the Telework Resource Center and Guaranteed Ride Home. Results for the two new TERMs, Expanded Telecommuting and Mass Marketing also missed their targets. The reasons for the shortfalls from the goals vary by TERM and are discussed in individual report sections on each TERM. As mentioned earlier, shortfalls were generally not due to low numbers of commuters participating in the TERM programs. Rather, shortfalls can be attributed primarily to lower than expected levels of trip reduction realized by each participating commuter. At the time the goals were established, generally in 1997 or 1998, these assumptions were commonly used by TDM practitioners, so seemed reasonable for the TERM projections. But commute research conducted by Commuter Connections since that time has shown that these assumptions appear now to have been optimistic, with participating commuters reducing few trips per commuter, on average.

The shortfalls in the TRC and Expanded Telecommuting goals could be related, in part, to a difficulty in capturing all of the impact of employers' actions that lead to eventual telecommuting. Another possible contributor to shortfalls in these TERMS is the time it takes many employers, especially large employers, to develop telecommute programs. It is not uncommon for employers to spend more than a year to develop and test a telecommute program, prior to implementing a broad scale program.

It is recommended that the transportation and emission goals for the Commuter Connections TERMS be reviewed and revised in light of cleaner vehicle, changes to vehicle technology, changes to the Mobile emissions model, and updated travel behavior information.

Table 1
Summary of Individual TERM Results (7/02 – 6/05) and Comparison to Goals

TERM	Participation [2]	Daily Vehicle Trips Reduced	Daily VMT Reduced	Daily Tons NOx Reduced	Daily Tons VOC Reduced
Metropolitan Washington Telework Resource Center [1]					
2005 Goal	21,606	26,000	435,550	0.364	0.198
Impacts (7/02 – 6/05)	29,966	11,129	226,913	0.187	0.097
Net Credit or (Deficit)	**8,266**	**(14,871)**	**(208,637)**	**(0.177)**	**(0.101)**
Expanded Telecommuting					
2005 Goal	113,000	33,660	550,368	0.461	0.252
Impacts (7/02 – 6/05)	4,884	1,848	36,859	0.030	0.016
Net Credit or (Deficit)	**(108,116)**	**(31,812)**	**(513,509)**	**(0.431)**	**(0.236)**
Guaranteed Ride Home					
2005 Goal	35,000	44,070	661,150	0.558	0.312
Impacts (7/02 – 6/05)	34,800	11,847	334,088	0.239	0.105
Net Credit or (Deficit)	**(200)**	**(32,223)**	**(327,062)**	**(0.319)**	**(0.207)**
Integrated Rideshare					
2005 Goal	4,070	4,070	100,300	0.082	0.041
Impacts (7/02 – 6/05)	5,574	5,574	146,612	0.107	0.050
Net Credit or (Deficit)	**1,504**	**1,504**	**46,312**	**0.025**	**0.009**
Employer Outreach					
2005 Goal	251	13,100	196,400	0.166	0.093
Impacts (7/02 – 6/05)	886	81,150	1,339,818	1.036	0.526
Net Credit or (Deficit)	**635**	**68,050**	**1,143,418**	**0.871**	**0.433**
Employer Outreach-Bicycling					
2005 Goal	N/A	130	567	0.001	0.001
Impacts (7/02 – 6/05)	85	343	3,431	0.003	0.002
Net Credit or (Deficit)	**85**	**213**	**2,864**	**0.002**	**0.001**
Mass Marketing					
2005 Goal	15,527	25,575	375,975	0.318	0.179
Impacts (7/02 – 6/05)	10,370	7,299	132,861	0.101	0.050
Net Credit or (Deficit)	**(5,157)**	**(18,276)**	**(243,114)**	**(0.217)**	**(0.129)**

1) Impact represents portion of regional telecommuting attributable to TRC activities. Total telecommuting credited for conformity is higher than reported for the TRC.

2) Participation refers to number of commuters participating, except for the Employer Outreach and Employer Outreach-Bicycling TERMs. For these TERMs, participation equals the number of employers participating.

Table 2
Summary of TERM and COC Results (7/02 – 6/05) and Comparison to Goals

TERM	Participation [1)]	Daily Vehicle Trips Reduced	Daily VMT Reduced	Daily Tons NOx Reduced	Daily Tons VOC Reduced
TERMS (seven TERMs collectively)					
2005 Goal		146,605	2,320,310	1.949	1.074
Impacts (7/02 – 6/05)		119,190	2,220,582	1.705	0.845
Net Credit or (Deficit)		**(27,415)**	**(99,728)**	**(0.244)**	**(0.229)**
Commuter Operations Center					
2005 Goal	60,000	2,720	83,204	0.067	0.032
Impacts (7/02 – 6/05)	143,326	9,783	279,055	0.204	0.092
Net Credit or (Deficit)	**83,326**	**7,063**	**195,851**	**0.137**	**0.060**
All TERMS plus COC					
2005 Goal		149.325	2,403,514	2.016	1.106
Impacts (7/02 – 6/05)		128,973	2,499,637	1.909	0.937
Net Credit or (Deficit)		**(20,352)**	**96,123**	**(0.107)**	**(0.169)**

1) Participation refers to number of commuters participating, except for the Employer Outreach and Employer Outreach-Bicycling TERMs. For these TERMs, participation equals the number of employers participating.

SECTION 3 HIGHLIGHTS OF REVISED EVALUATION METHODOLOGY

BACKGROUND

In 1997, consultants selected by COG developed an evaluation framework to guide the collection and analysis of data to estimate the travel and air quality impacts of TDM TERMs adopted by COG's TPB. This methodology described evaluation objectives, performance measures for each TERM, data needs and data collection tools and sources, and analysis and calculation steps to be used to estimate travel, air quality, energy, and consumer cost impacts of the TERMs. The framework also presented recommendations for the evaluation schedule, responsibilities, and reporting of results to maintain and utilize information produced through the evaluation process.

The methodology developed in 1997 was designed to collect sufficient data, using recognized and accepted survey and tracking techniques, to allow TERM effectiveness to be measured with confidence. But it also was designed to be practical and efficient to undertake. The first TERM analysis, conducted in the summer of 1999, reinforced the well-established view that data collection and evaluation for TDM programs can be challenging, especially when the programs are voluntary. Reliable data can be difficult to assemble, assumptions may need to be made using little data, and many factors outside the TDM program can influence results.

The first evaluation made recommendations for several data collection changes that could enhance the accuracy, rigor, coverage, and reliability of future TERM evaluations. A revised methodology was prepared in 2001, reflecting these recommendations. In 2004, following the second triennial evaluation of TERMs, the 2001 methodology was updated to enhance the analysis results for several TERMs. The major change from the 1999-2002 methodology was the addition of the methodology for the Mass Marketing TERM. A seventh TERM, which was not included in the 2004 methodology, also is now part of the TERM evaluation.

This section identifies key enhancements that were made to the methodology since the 2002 TERM Analysis Report was completed and discusses the overall rigor of the evaluation framework as compared to other regions. Overall, the Transportation Demand Management evaluation process employed for this analysis is among the most rigorous and comprehensive in the U.S.

EVALUATION METHODOLOGY OVERVIEW

Evaluation Principles

Before discussing the methodology changes in the Revised Evaluation Methodology, it is useful to review several element of the methodology developed in 1997. The TERM evaluation process was founded on several key evaluation principles that formed the foundation for the Evaluation Framework that has guided the process since 1997. Some of those principles, which have since been adopted by other regions evaluating TDM programs, include:

- Provide sound, definitive, and useful information about the results of the program
- Assure objective evaluation by using a third-party (other than a funding or implementing agent)
- Avoid double counting by separating out the impacts of individual program elements or TERMs
- Report only those impacts associated with the TERMs, and not the combined impacts of the TERMs and the basic commuter services that have been in place since the 1970s

- Follow accepted and recognized evaluation techniques
- Be rigorous, ongoing, resource efficient, unobtrusive for COG partners, and compatible with regional, state, and national practices

Evaluation Methodology Steps

The evaluation of CC's TERM program impacts is based on a step-by-step calculation methodology that uses a series of "multiplier factors" to estimate several important program impact measures related to transportation and air quality benefits. The methodology calls for these multiplier factors, which are developed primarily from survey data, to be applied to a known number of commuters in the population that might be influenced or affected by the TERM to make a travel pattern change (population base"). The result of these step-by-step calculations is an estimate of the numbers of vehicle trips, VMT, and emissions reduced through the travel pattern changes made by commuters after contact with the TERM programs or services.

For most TERMs, the population base is commuters who participate in or use TERM services, although in a few cases, the population is broader, such as all regional commuters. Thus, this methodology requires first an accurate documentation of the participation of employers and commuters in each TERM program and an accurate count of other population bases. This is accomplished primarily by program participant tracking performed by Commuter Connections staff and survey results.

As noted earlier, the methodology uses several calculation factors derived from surveys of the populations of interest. The five major factors include:

1) Placement rate (percent of commuters in the population base who shifted to commute alternatives as a result of the TERM)
2) Vehicle trip reduction (VTR) factor (average number of vehicle trips reduced per day by each placement)
3) Average one-way commute trip distance
4) Drive alone access percentage (proportion of ridesharers and transit users that drive alone to the location where they meet their carpool, vanpool, bus, or train)
5) Drive alone access distance (distance commuters travel to rideshare/transit meeting points)

These factors are applied within the basic methodology steps listed below to calculate program impacts for each TERM.

1) Estimate commuter population "base" for the TERM (e.g., all commuters, GRH applicants, rideshare matching applicants, kiosk users, Employer Outreach employees, etc.)
2) Estimate the number of new commute alternative placements – Multiply placement rate by the population base for the evaluation period
3) Estimate vehicle trips reduced – Multiply number of placements by the Vehicle Trip Reduction (VTR) factor
4) Estimate VMT reduced – Multiply number of vehicle trips reduced by average commute distance
5) Adjust vehicle trips and VMT for access mode – Discount vehicle trips reduced and VMT reduced to account for commuters who drive alone to meet rideshare modes and transit
6) Estimate NOx and VOC emissions reduced – Multiply adjusted vehicle trips and VMT reduced by emissions factors consistent with the regional planning process

These steps were established largely in the 1997-99 evaluation framework developed in 1997 and remained unchanged for the 1999-2002 and 2002-2005 evaluations. Two other issues should be noted as background, because they are critical to understanding the high level of rigor build into the evaluation process:

- Prior mode is an important variable in this evaluation; a shift of a commuter to commute alternative mode does not always mean the commuter reduced a vehicle trip. Vehicle trips are reduced only in three cases: 1) if the commuter previously drove alone, 2) if the commuter previously used a commute alternative but increased the frequency of use of this mode, or 3) if the commuter shifted to a higher occupancy commute alternative (e.g., from carpool to vanpool). Section 6 describes the development of vehicle trip reduction (VTR) factors that are used to translate the number of new commute alternatives placements into the number of vehicle trips reduced, taking into account the three change factors listed above.

- For air quality evaluation purposes, it is necessary to know the access mode of ridesharers and transit riders. Access mode refers to the travel mode carpoolers, vanpoolers, and transit riders use to travel from home to Park & Ride lots, to other places where they meet their rideshare partners, or to the bus stop or train station, if they do not walk or are not picked up at home. Access mode is less important for evaluating travel impacts, because access trips generally account for a small portion of the total trip and the alternative mode generally is used in the most congested and longest portion of the trip. However, from an air quality standpoint, a commuter who drives alone to the meeting point still makes a vehicle trip and accumulates some drive alone VMT, which must be subtracted from the total numbers of vehicle trips reduced and VMT reduced in the air quality analysis.

REVISED EVALUATION FRAMEWORK

In general, the TERM analysis approaches documented in the 2002 TERM Analysis Report were used as the basis for the TERM evaluation methods described used in the 2002-2005 evaluation. The 2002 TERM Analysis Report concluded with a few minor recommendations for each TERM regarding enhancements to future evaluations. These enhancements were included, for the most part, in the Revised Evaluation Framework for the current evaluation period (2002-2005). A brief summary of key methodology issues and approaches is presented below for each TERM. More details of each approach are presented in Sections 4 – 10, for each individual TERM.

- Telework Resource Center (TRC) – The TRC is a resource to help employers and program partners initiate or expand telecommuting programs. In evaluating telecommuting, several travel changes need to be assessed, including: trip reduction due to telecommuting, the mode on non-telecommute days, and mode and travel distance to telework centers. Telework impacts are estimated from the State of the Commute survey, through special surveys and counts made at telecenters, and by surveys conducted of employers directly requesting information from the TRC. One change from the 2002 TERM evaluation is the elimination of results of telecommute pilot programs at worksites. This component was removed because no further data collection activity was conducted in these programs between July 2002 and June 2005.

- Expanded Telecommuting – Expanded Telecommuting also is a telework resource for employers, but offers a high level of individual assistance to a selected group of employers that already have a telework program and are willing to expand their program. The evaluation for this new TERM estimates the number of new teleworkers at assisted worksites and the travel and air quality impacts of new telecommuting. The primary source of data for this TERM is a survey of current and past teleworking at assisted sites. These results are combined with regional data on telecommute frequency, mode of travel on non-telework days, and commute travel distance to main workplaces from the State of the Commute survey.

- Guaranteed Ride Home (GRH) – The primary goal of GRH is to encourage commuters who drive alone to shift to ridesharing, transit, and bike/walk. However, since past evaluation results show that a sizeable portion of GRH appli-

cants already were ridesharing before they applied for GRH benefits, the most common benefit of GRH may be the continuation and extension of existing ridesharing arrangements, rather than shifts from drive alone. Thus, the evaluation process for this TERM estimates the influence of GRH availability on both mode shifts and duration of ridesharing arrangements.

Two enhancements were made to the GRH methodology as a result of the 2002 TERM analysis. The first involves adjusting VMT reductions to discount travel made outside the attainment area. The second resulted in the derivation of a single placement rate for both GRH applicants and one-time exception users. This change was made because two GRH surveys showed that one-time exception users had essentially the same travel change patterns as did regular applicants, thus it was not necessary to separate them for calculation purposes.

- Integrated Rideshare – This TERM includes two individual components: 1) software upgrades for enhanced transit and Park & Ride information and 2) regional information kiosks (InfoExpress). In the 2002 TERM analysis, the software upgrade component was evaluated using the rideshare applicant placement surveys conducted annually. The kiosk component was evaluated using data from the regional State of the Commute survey. These methods were carried over to this 2005 evaluation as well.

- Employer Outreach – Employer outreach applies a two-faceted approach employing empirical data on employer programs and modeled impacts. The empirical data come from the ACT! database of employer contacts, including information on the type of worksite (e.g., office or non-office employment and transit accessibility) and trip reduction strategies being implemented at each worksite, and from the Metrochek/SmartBenefits database maintained by the Washington Metropolitan Area Transit Authority (WMATA).

  These empirical data are used as inputs to the EPA COMMUTER model to project the likely change in employee commuting behavior for given change in the employer's program. During the 2002 evaluation period, COG compared the predictive accuracy of the COMMUTER model to that of the FHWA TDM Evaluation Model, which was used in the 1997-1999 evaluation. That comparison showed that the COMMUTER model compared favorably to the FHWA model, but was easier to use. Recently, EPA updated several of the predictive coefficients in the model, to reflect enhanced recent information on trip reduction effects of financial and employer support program strategies. The updated model was used in this 2005 analysis.

- Employer Outreach for Bicycling – Similarly, the Employer Outreach for Bicycling TERM, added during the 1999-2002 evaluation period, uses empirical data from the ACT! database and the Commuter Model to project impact results for employer activities. Additionally, data from follow-up surveys conducted with participants in the regional "Bike-to-Work Day" events are used to estimate travel and emission impacts from these events.

- Mass Marketing – This TERM was added following the 2002 evaluation. The critical issues for this TERM are documenting and attributing changes in attitudes and behavior to the mass marketing campaign. This is accomplished using a variety of data sources, including the regional State of the Commute survey and Commuter Operations Center tracking data. Evaluation of this TERM requires careful attribution of impacts to Mass Marketing, due to likely overlaps with GRH and the Commuter Operations Center.

NATURE OF THE EVALUATION APPROACH AS COMPARED TO OTHER REGIONS

The evaluation approach used in the Washington DC region to assess the impact of the TERMs implemented by Commuter Connection has become recognized as among the most comprehensive and rigorous in the nation. Several regions of a similar size and complexity have looked to this evaluation as a model and adopted similar approaches. For example:

- The evaluation of voluntary trip reduction strategies in Atlanta is using a similar "bottom-up" approach to measure the impact of various program elements individually and carefully sum the results while avoiding double counting from overlapping program influences. The TERM analysis has been held up as a model for this approach.
- A comprehensive evaluation of TDM services in Los Angeles County derived unique placement rates and VTR factors for the programs being evaluated and estimated the cost per person placed and cost per trip reduced of the overall TDM program. This evaluation also explicitly drew from the evaluation experience in Washington DC.

The only other regions that may have data and an evaluation approach comparable to MWCOG's TERM Analysis are Washington State's Commute Trip Reduction (CTR) program and the regional evaluation performed in the Atlanta, GA region. The CTR program performs its evaluation under a legislative mandate and uses data that regulated employers are required to provide. This shifts some of the effort of data collection to employers and allows full capture of data directly from employers, simplifying some data analysis tasks. In Atlanta, data are collected and analyzed to evaluate regional ridesharing, transit and vanpool subsidy programs, and marketing campaigns. The data collection and analysis methods used are similar to those used in the MWCOG evaluation.

The key characteristics of the evaluation approach used in metropolitan Washington that have elevated or enhanced the state of the practice in TDM evaluation include:

- The careful avoidance of double counting between program elements
- The derivation of unique placement rates for each program element and mode
- The inclusion of placement duration in the calculation of impacts
- The derivation of empirically-based Vehicle Trip Reduction (VTR) factors to avoid the document mistaken assumption that every new placement reduces a full vehicle trip every day
- The consideration of access mode to a shared ride arrangement to account for cold starts

For these reasons, the users of these evaluative results should feel confident that the reported impacts are as accurate and reliable as is reasonably possible and are based on what is widely accepted as one of the most comprehensive and rigorous evaluation approaches being used today in the US.

SECTION 4 METROPOLITAN WASHINGTON TELEWORK RESOURCE CENTER

BACKGROUND

The TPB adopted the Metropolitan Washington Telework Resource Center (TRC) as a TERM in the Fiscal Year 1995-2000 TIP and the TRC was implemented in June 1996. The purpose of the TRC is to provide information, training, and assistance to individuals and businesses to further in-home and telecenter-based telework programs. TRC activities during the past few years have included employer and employee telework seminars, preparation and distribution of a telework video and other materials included in a telework information kit, and ongoing marketing and outreach initiatives.

EVALUATION METHODOLOGY AND DATA SOURCES

The goal of the TRC is to increase the number of home-based and telework center-based telecommuters in the region, whether full-time or part-time telecommuters. For 2002-2005, TRC impacts were evaluated by calculating the number of telecommuters in the region who used or were influenced by TRC services and estimating the number of vehicle trips and VMT they did not make, as a result of telecommuting, and the tons of emissions that were reduced by the trip and VMT reductions. Through this method, only impacts that could be traced directly to the TRC were counted in the impacts for this TERM as the contribution of the TRC to regional telecommuting. In other words, it was recognized that some telecommuting would have occurred even if the TRC was not in place.

Three TRC components were evaluated, including:

- Current regional telecommuters who had direct contacts with the TRC (telecommute information, seminars, advertising provided by the TRC) during the evaluation period
- New telecommuters whose employers received assistance from the TRC (brochure/information packet, seminar, other direct assistance) during the evaluation period
- Current telecommuters who used a Metropolitan Washington Telework Center (MWTC)

Data for impacts of these components were obtained from several sources. The sources and the evaluation data collected from each, are described briefly below:

TRC Assistance Survey (new telecommuters at worksites assisted by TRC)

- Percentage of employers with telecommute programs before and after receiving TRC assistance
- Percentage of teleworkers at assisted sites before and after receiving assistance

State of the Commute Survey (regional commuters)

- Number of regional telecommuters and their frequency of telecommuting
- Telecommute locations – the mix between home-based and telecenter-based telecommuting
- Average frequency of telecommuting, telecommuters' commute modes on non-telecommute days, and commute distance they traveled on non-telecommute days
- Telecommuters travel patterns to telecenters
- Sources of information telecommuters had used to learn about telecommuting

Telecenter Occupancy and Telecenter Teleworker Surveys (MWTC telecommuters)

- Number of teleworkers at the centers on an average day

- Average telecommute frequency of teleworkers (the number of days teleworked per week) at the telecenter and at other locations
- Teleworkers travel mode and travel distance to telecenter
- Teleworkers travel mode and travel distance to main worksite (non-telecenter days)

Using results from these surveys and records, the number of telecommuters who had either direct or indirect (through their employers) contact with the TRC during the evaluation period were estimated and divided into "home-based," "MWTC-based," and "other telecenter-based" groups. These numbers of telecommuters were then multiplied by the average VTR factors, as identified by the appropriate survey data, to obtain the number of vehicle trips reduced by their telecommuting.

For this TERM, VTR factors accounted for both the average telecommute frequency of the groups as well as their commute modes on telecommute days (telecenter commuters) and non-telecommute days (all telecommuters). The VTR factor for home-based telecommuters was 0.38 daily trips reduced per telecommuter, reflecting the part-time (1.29 days per week average) telecommute frequency and the elimination of vehicle trips for telecommuters who drove alone, carpooled, or vanpooled on non-telecommute days. VTR factors were smaller for telecenter-based telecommuters, because the majority of these telecommuters drove alone to the telecenter. Thus they did not reduce (and in some cases increased) the number of vehicle trips they made on an average day. However, the benefit of their telecommuting was in the reduction of VMT on telecenter days.

The VMT reduced by telecommuting was calculated for home-based telecommuters by multiplying the number of daily vehicle trips reduced by the average commute distance. In the case of telecenter telecommuters, the VMT reduced was calculated by multiplying the number of telecommuters on an average day by the reduction of VMT for a telecommute day (travel distance to main work location minus travel distance to telecenter).

Tons of emissions removed were calculated by multiplying vehicle trip and VMT reductions by 2005 emission factors developed for NOx and for VOC for the region. Appendix 1 details the calculations made to estimate impacts for the TRC TERM.

TELEWORK RESOURCE CENTER SUMMARY OF GOALS AND IMPACTS

The results of the calculations for TRC are shown in Table 3 below, along with the goals established for the TERM in the TIP. The net credits or deficits, which were equal to the impacts minus goals, also are shown.

Table 3
TRC Goals, Estimated TRC Impacts, and Estimated Regional Telecommute Impacts

	Regional TC Impacts	TRC Goal	TRC Impact*
• Number of telecommuters	318,130	21,600	29,966
• Daily vehicle trips reduced	120,393	26,000	11,129
• Daily VMT reduced	2,400,894	435,550	226,913
• Daily tons NOx reduced	1.983 T	0.364 T	0.187 T
• Daily tons VOC reduced	1.030 T	0.198 T	0.097 T

Impacts vs Goals

Participation Benefit (net over or (under) goal): Telecommuters: 8,266

Transportation Benefit (net over or (under) goal): Vehicle Trips: (14,871)
VMT: (208,637)

Emission Benefit (net over or (under) goal): NOx: (0.177 tons per day)
VOC: (0.101 tons per day)

As shown, in 2005, approximately 318,100 regional workers were telecommuting at least occasionally, about 12.8% of the total regional workforce. This number of teleworkers represented an increase of 210% over the 1996 baseline of 150,900 teleworkers. Telecommute growth is likely the result of several factors, including the use of teleworking by employers to recruit and retain employees in a very competitive labor market. Increasing traffic congestion in the Washington region also might have prompted some commuters to work at home or at a telework center or employer satellite center to avoid fighting traffic. Finally, the desire of employees for a better balance of work and family, a trend occurring nationally, and greater affordability of sophisticated technology, also might have contributed to the growth in telecommuting.

The TRC's expected contribution to regional teleworking is shown in the second column of Table 3 and the impacts are shown in the third column. The TRC exceeded by 8,266 the goal for the number of teleworkers expected from TRC activities. But the TRC impacts for trip, VMT, and emission reductions were below the TRC goals for these measures. This is primarily because the goal calculation assumed a telecommute frequency higher than the 1.29 days per week actually estimated for 2004 from State of the Commute Survey data. Additionally, the regional goal calculation assumed that all telecommuters would eliminate trips on telecommute days, but only about 74% of the telecommuters drive alone on non-telecommute days, thus only these trips and VMT were counted in this evaluation as having been eliminated.

As shown in Table 3, the TRC was responsible for a portion of, but not all of, the regional telecommuting. The TRC is credited with about one tenth of the number of teleworkers and regional telework impacts. One possible area in which the TRC's contribution to the regional telecommute impacts could have been undercounted is in the area of regional telecommute advertising. The State of the Commute Survey indicated that about five percent of telecommuters mentioned the TRC as a source of their telecommute information. These telecommuters were credited to the TRC contribution.

But an additional five percent said they learned of telecommuting through "advertising," newspaper ads, or "other website." Although these sources were not necessarily controlled by Commuter Connections, the TRC has advertised consistently and broadly about telecommuting via radio, television, print media, and the internet. So this response likely indi-

cates additional telecommuters who learned about telecommuting from outreach and promotion conducted by Commuter Connections. Because the source of the advertising could not be clearly documented, only a share of these commuters (1.7% of total teleworkers) was credited to the TRC.

SECTION 5 EXPANDED TELECOMMUTING

BACKGROUND

The TPB adopted the Expanded Telecommuting TERM in the 2003-2007 TIP and the TERM was implemented from July 2003 to June 2005. The purpose of the Expanded Telecommuting TERM is to provide an enhanced level of telework program assistance to selected, large employers to encourage them to expand their respective worksite telework programs. This assistance was provided on-site to the employers by telework consultants and Commuter Connections staff and was tailored to the specific needs and corporate culture of each employer.

EVALUATION METHODOLOGY AND DATA SOURCES

The goal of Expanded Telecommuting is to increase the number of home-based and telework center-based telecommuters at the selected worksites. For 2002-2005, Expanded Telecommuting impacts were evaluated by calculating the number of new telecommuters at the participating worksites and estimating the number of vehicle trips and VMT they did not make, as a result of telecommuting, and the tons of emissions that were reduced by the trip and VMT reductions.

Data for these impacts were obtained from two primary sources, a survey of participating employers and the 2004 regional State of the Commute survey. First, participating employers were surveyed to determine the total employees at the worksites, the number of telecommuters before the assistance and the number of telecommuters after the assistance was provided. Second, the State of the Commute survey was used to estimate additional calculation variables to estimate travel and emissions impacts of telecommuting. These variables included:

- Distribution between home-based and telecenter-based telecommuting
- Average frequency of telecommuting, telecommuters' commute modes on non-telecommute days, and commute distance they traveled on non-telecommute days
- Telecommuters travel patterns to telecenters

The employer survey was used to identify the number of new telecommuters. This number was then multiplied by the average VTR factors, as identified from SOC survey data, to obtain the number of vehicle trips reduced by their telecommuting.

For this TERM, VTR factors accounted for both the average telecommute frequency of the groups as well as their commute modes on telecommute days (telecenter commuters) and non-telecommute days (all telecommuters). The VTR factor for home-based telecommuters was 0.38 daily trips reduced per telecommuter, reflecting the part-time (1.29 days per week average) telecommute frequency and the elimination of vehicle trips for telecommuters who drove alone, carpooled, or vanpooled on non-telecommute days. The VTR factor was smaller for telecenter-based telecommuters, because the majority of these telecommuters drove alone to the telecenter. Thus they did not reduce (and in some cases increased) the number of vehicle trips they made on an average day. However, the benefit of their telecommuting was in the reduction of VMT on telecenter days.

The VMT reduced by telecommuting was calculated for home-based telecommuters by multiplying the number of daily vehicle trips reduced by the average commute distance. In the case of telecenter telecommuters, the VMT reduced was calculated by multiplying the number of telecommuters on an average day by the reduction of VMT for a telecommute day (travel distance to main work location minus travel distance to telecenter).

Tons of emissions removed were calculated by multiplying vehicle trip and VMT reductions by 2005 emission factors developed for NOx and for VOC for the region. Appendix 2 details the calculations made to estimate impacts for the Expanded Telecommuting TERM.

EXPANDED TELECOMMUTING SUMMARY OF GOALS AND IMPACTS

The results of the calculations for Expanded Telecommuting are shown in Table 4 below, along with the goals established for the TERM. The net credits or deficits, which were equal to the impacts minus goals, also are shown.

Table 4
Expanded Telecommuting Goals and Estimated Impacts

	Exp TW Goal*	Exp TW Impacts
• Number of telecommuters	113,000	4,884
• Daily vehicle trips reduced*	33,660	1,848
• Daily VMT reduced	550,368	36,859
• Daily tons NOx reduced	0.461 T	0.030 T
• Daily tons VOC reduced	0.252 T	0.016 T

* Note that the "vehicle trips reduced" goal shows one-way trips, to be consistent with other TERM goals. The goal shown on the TERM tracking sheet shows trips reduced in terms of round-trips.

Impacts vs Goals

Participation Benefit (net over or (under) goal): Telecommuters: (108,116)

Transportation Benefit (net over or (under) goal): Vehicle Trips: (31,812)
VMT: (513,509)

Emission Benefit (net over or (under) goal): NOx: (0.431 tons per day)
VOC: (0.236 tons per day)

Expanded Telecommuting missed the impact goals by a sizeable margin. The shortfall was significant for the number of commuters participating. Further, as was the case for the TRC, the goals for this TERM assumed a telecommute frequency higher than the 1.29 days per week observed in the 2004 State of the Commute (SOC) survey. Further, the goal assumed all telecommuters would eliminate trips on telecommute days, but only about 74% of the telecommuters drive alone on non-telecommute days, thus only these trips and VMT were counted in this evaluation as having been eliminated.

SECTION 6 GUARANTEED RIDE HOME

BACKGROUND

The regional Guaranteed Ride Home (GRH) program was adopted by the TPB in the Fiscal Year 1995-2000 TIP to eliminate a major barrier to using alternative modes, commuters' fear of being without transportation in the case of an emergency. The program provides up to four free rides home per year in a taxi or rental car in the event of an unexpected personal emergency or unscheduled overtime. When the program was implemented, it was offered to commuters who used alternative modes three or more times per week and who would register with Commuter Connections for GRH. In January 1999, to encourage additional participation, the program guidelines were changed to require use of alternative modes only two days per week. This new rule was in place throughout the entire 2002-2005 evaluation period.

EVALUATION METHODOLOGY AND DATA SOURCES

The transportation and emissions impacts of the GRH program were measured through data from the GRH survey conducted in the spring of 2004. This survey polled 1,000 commuters who had registered for GRH at some point between 2001 and 2004, both those currently registered at the time of the survey and those who were "past registrants." Additionally, commuters who had not registered for the program, but had taken a "one-time exception trip" were included in the survey sample.

The survey asked detailed questions needed to define changes commuters made in their travel behavior during their participation in GRH and the influence of GRH on these changes. Information collected from all respondents, included, among other elements:

- Commute patterns: current mode and previous mode (if commuter made a mode shift), frequency of mode use, travel distance, access mode to rideshare/transit pick-up point, and pool occupancy
- Permanence of mode changes: whether change was continued (still in effect) or temporary (commuter had reverted to the original mode)
- Importance of GRH to commuters' decisions to start or continue use of alternative modes

Data from the GRH surveys were used to estimate the calculation multipliers needed to estimate vehicle trips, VMT, and emissions reduced as a result of GRH; placement rate, VTR factor, travel distance, and emission factors. These multipliers were estimated for two sub-groups in the GRH population. The first sub-group included respondents who both live and work within the Washington, DC Metropolitan Statistical Area (MSA); that is within the 12-jurisdiction area covered by the TERM evaluation. The second group included respondents who work within the MSA but live outside it.

This distinction was made because applicants who live outside the MSA traveled a portion of their VMT outside the MSA. During the evaluation, it was decided that the VMT for these "out of MSA" applicants should be discounted to credit VMT reduction only for the portion that occurred within the MSA. Approximately 16% of the total participants lived outside the MSA.

For both sub-groups of survey respondents, the GRH placement rate, that is, the percentage of respondents who registered for GRH and made a mode shift to an alternative mode was calculated. The duration of alternative mode placement was 45 months, longer than the entire evaluation period. Thus, for purposes of the analysis, all placements were considered "continued placements," that is they made a shift to an alternative mode and did not return to the previous mode. Overall, the continued placement rate for GRH was calculated as greater than 50%. The two sub-group populations had the following placement rates:

- Within MSA 50.5%
- Outside MSA 51.8%

To determine the number of commuters placed in alternative modes between July 2002 and June 2005, these placement rates were multiplied by the total number of commuters who participated in GRH during that time period, 27,252, divided into the two sub-groups: 22,919 within the MSA and 4,333 outside the MSA. This calculation resulted in 11,574 placements from within the MSA and 2,245 placements from outside the MSA.

These placement figures were then multiplied by GRH VTR factors derived from the survey data to estimate the number of vehicle trips reduced. The VTR factors for the two sub-groups were as follows:

- Within MSA 0.91 vehicle trips reduced per placement
- Outside MSA 0.81 vehicle trips reduced per placement

As noted earlier, VTR factors represent the average number of vehicle trips reduced by a new alternative mode placement. They combine the vehicle trip reduction contributions of various types of mode changes, such as from transit to rideshare, drive alone to transit, and drive alone to carpool, each of which reduces a different number of vehicle trips per day, into one number. VTR factors of 0.91 and 0.81 indicate a significant number of the changes were to higher occupancy modes, such as transit, and/or were shifts from drive alone to alternative modes. The calculation of vehicle trips reduced produced a total of 12,350 trips reduced; 10,532 from commuters within the MSA and 1,818 from commuters outside the MSA.

Next, VMT reduced by GRH was calculated by multiplying the numbers of vehicle trips reduced by the average trip length for GRH commuters who made a shift to an alternative mode. The one-way trip distance for the within MSA respondents was 28.2 miles. The actual one-way distance for the outside MSA respondents was an average of 52.0 miles. To discount the distance credited to the outside MSA respondents, their one-way travel distance was set equal to that of the distance for the within MSA respondents. This resulted in a loss of 23.8 one-way miles per trip for each outside-MSA respondent. The VMT calculation reflected the following:

(10,532 within MSA trips reduced + 1,818 outside MSA trips reduced) x 28.2 miles per trip

= 348,283 VMT reduced

Estimates of NOx and VOC reductions were calculated using regional emission factors, as described for the TRC. Details of these calculations are shown in Appendix 3.

GUARANTEED RIDE HOME SUMMARY OF GOALS AND IMPACTS

Table 5 presents the transportation and emission impact results for GRH and compares the results against the goals established for the TERM.

Table 5
Guaranteed Ride Home Goals and Estimated Impacts

	TERM Goal	Estimated Impacts
• Number of GRH participants*	35,000	34,800
• Applicants during evaluation period	N/A	27,252
• Daily vehicle trips reduced	44,070	11,847
• Daily VMT reduced	661,150	334,088
• Daily tons NOx reduced	0.558 T	0.239 T
• Daily tons VOC reduced	0.312 T	0.105 T

* Number of participants currently enrolled in GRH

Impacts vs Goals

Participation Benefit (net over or (under) goal):	Participants: (200)
Transportation Benefit (net over or (under) goal):	Vehicle Trips: (32,223) VMT: (327,062)
Emission Benefit (net over or (under) goal):	NOx: (0.319 tons per day) VOC: (0.207 tons per day)

The number of commuters participating in GRH in June 2005 was only 200 commuters shy of the participant goal (about ½ of one percent), but the vehicle trip reduction impact for GRH was only about 27% of the goal. VMT impacts and emissions reduced also fell short of the goals. The goals were based on regional focus groups data, which estimated commuters' level of interest in various "model" GRH programs, with various combinations of program benefits and requirements.

The focus group results suggested that about five percent of drive alone commuters would switch modes if GRH was available and that most of the interest would be outside the central portion (District of Columbia, Alexandria, and Arlington) of the metropolitan area Additionally, COC staff estimated that it would take eight years for the program to reach full potential. June 2005 represented the end of the eight year period.

The GRH impacts were less than expected in part because the goal assumed that all participants would be new alternative mode users. In fact, only 26% of participants said they were driving alone prior to hearing about/registering for GRH. The regional goal used a VTR factor of 1.26, which assumed that nearly all placements would have shifted from drive alone to alternative modes. The actual VTR factors of 0.91 and 0.81 reflect the fact that a portion of the commuters who shifted modes shifted from one alternative to another, rather than from driving alone.

GRH came much closer to reaching the VMT goal (51%), because the actual travel distance of GRH participants, 28.2 miles one way, is nearly twice the projected average of 15.0 miles. This shows that GRH was more important to longer-distance commuters than was expected at the time the goal was developed.

Finally, note that the GRH results were adjusted to eliminate double counting due to overlap between GRH and the Mass Marketing TERM. As described more fully in Section 10 (Mass Marketing), a portion of the GRH program's impacts were assigned to the Mass Marketing TERM to recognize that some GRH applicants were influenced to contact Commuter Connections and apply for GRH after they heard a Mass Marketing ad.

Approximately eight percent of the total new GRH applicants were assigned to Mass Marketing. This share equals about three percent of the total GRH impacts. To avoid double counting of impacts, this MM share was subtracted from the base GRH impacts. The impacts shown in Table 5 account for the adjustment and reflect the net GRH impacts.

SECTION 7 INTEGRATED RIDESHARE

BACKGROUND

The third TERM, Integrated Rideshare, was adopted by the TPB in the FY1995-2000 TIP. This TERM has two components:

1. **Information Kiosks** - Implement InfoExpress traveler information kiosks in the District of Columbia and in Northern Virginia.[1]
2. **Software Upgrades** - Upgrading and maintaining the regional ridematching system to include integrated transit information, information on HOV lanes, Park & Ride lots, and telecommuting, and to provide full-service commuter information through traveler information kiosks.

The goal of this TERM is to improve the quality and delivery of alternative mode information products to commuters and, by providing transit and telecommute information to all commuters who received a matchlist, to encourage commuters to try transit and park & ride lots, even if they did not have these options in mind when they requested assistance from Commuter Connections.

The software upgrade portion of the TERM was implemented in October 1998. The InfoExpress traveler kiosks, were launched in January 1998. Kiosks were placed permanently at two locations in the District of Columbia and at nine locations in Northern Virginia. Two mobile kiosks, one in the District of Columbia and one in Northern Virginia have been temporarily installed at various sites. In addition, Fairfax County has placed Commuter Connections' ridematch applications on its Community Residence Information System kiosks.

The kiosks offer self-service transit schedules and maps and other commute information. Commuters also can apply for ridematching and for the regional GRH program through the kiosk. Requests for ridematches and other information offered by Commuter Connections but not immediately available through the kiosks are then e-mailed directly to the Commuter Operations Center for service delivery.

The kiosks also offer information on weather, real-time traffic, and maps & guides. InfoExpress kiosks located at retail locations in Fairfax County also provide local county information. Kiosks located at retail centers also offer retail information such as maps and lists of special events occurring at the sites. Since they were installed, several design improvements have been made to enhance the ease of use and attractiveness of the displays.

EVALUATION METHODOLOGY AND DATA SOURCES

Information Kiosks

It is technologically easy to track the number of kiosk users for various information screens, but very difficult to follow-up with users to determine their use of the information they received because kiosk use is largely anonymous. Commuter Connections had contact names and phone numbers for only tiny fraction of kiosk users recorded between July 2002 and June 2005. Users who were known had submitted an on-screen Commuter Connections application for a ridematch and/or GRH, completed the on-line survey and included their names and phone numbers, and/or registered with one of the kiosk "ambassadors" who assisted users during promotions held at the major retail locations.

[1] The State of Maryland elected to implement a Transportation Emission Reduction Program (TERP) which included a kiosk component separate from the regional kiosk program.

In past years, Commuter Connections conducted annual surveys of commuters for whom contact information was available. But because the kiosks allow users to obtain some information, notably transit schedules and maps, without any further contact with Commuter Connections, it was important to try to capture kiosk use and mode change information for these commuters as well. To accomplish this objective, a survey module regarding use of kiosks was included in the 2004 State of the Commute survey. This survey asked commuters about the following information:

- Use of the InfoExpress kiosks to obtain travel or commute information
- Changes in travel pattern or trial use of alternative mode after receiving information
- Mode used prior to making the change
- Duration of the change
- Commute distance

About 1.5% of the commuters surveyed in the State of the Commute survey had used a kiosk to obtain transportation information. This represented approximately 34,900 regional commuters. And about 17% of these commuters said they tried or started using an alternative mode with information they received from the kiosk (placement rate). A VTR factor of 1.60 was calculated for these commuters. This high VTR factor, relative to factors for many other TERMs, was due to the substantial use of the kiosks to obtain and use transit information; nearly half (78%) of the commuters who used a kiosk said they obtained transit route or schedule information.

Vehicle trips reduced through the use of the kiosk was calculated by multiplying this kiosk VTR factor by the number of kiosk placements. Finally, as with TRC and GRH, daily VMT reduced was calculated by multiplying the number of vehicle trips reduced by average trip distances calculated from the kiosk survey (19.6 miles per one-way trip). Emission reduction was calculated by multiplying vehicle trips and VMT reduced by the 2005 regional emission factors. Calculation details for kiosk impacts are presented in Appendix 4.

Software Upgrades

Impacts of the software upgrades were assessed using data from three rideshare placement surveys, conducted in November 2002, November 2003, and November 2004. These surveys assessed changes commuters made after receiving a ridematch or other commute service from Commuter Connections. Respondents were asked if they remembered receiving transit and/or park & ride (P&R) information on a matchlist and if they used the information to make any travel changes. The data from the three surveys were weighted by the number of applicants from among which the survey samples were chosen in the three years to obtain weighted averages.

The surveys showed that 5.3% of applicants used the transit and/or P&R information to shift to an alternative mode. More than half (3.2% of 5.3%) said they continued using the alternative mode. The remaining respondents (2.1% of 5.3%) said they used the new alternative only temporarily. These percentages equal the continued (3.2%) and temporary (2.1%) placement rates for software upgrades.
To estimate vehicle trips reduced, placement rates were multiplied by the 113,146 commuters who applied to Commuter Connections or received follow-up assistance from Commuter Connections during the evaluation period and by the VTR factors derived from the placement surveys for commuters who used the information provided. These VTR factors were 0.51 for continued and 0.37 for temporary placements. Temporary placements were discounted to reflect their short duration of five weeks.

VMT reductions were estimated by multiplying the number of trips by the average trip lengths calculated from the placement surveys (35.4 miles per trip for continued placements and 34.8 miles per trip for temporary placements). Emission reduction was calculated using trip-based and VMT-based 2005 regional emission factors. Calculation details for the software upgrade are shown in Appendix 5.

INTEGRATED RIDESHARE SUMMARY OF GOALS AND IMPACTS

Shown in Table 6 below are the evaluation results for the two components of the Integrated Rideshare TERM and their associated goals. As shown, both the kiosks and software upgrade components met their individual goals for all impact measures.

Table 6
Integrated Rideshare Goals and Estimated Impacts

	TERM Goal	Estimated Impacts
Kiosks		
• Daily vehicle trips reduced	2,035	3,197
• Daily VMT reduced	50,150	62,655
• Daily tons NOx reduced	0.041 T	0.052 T
• Daily tons VOC reduced	0.020 T	0.027 T
Software Upgrades		
• Daily vehicle trips reduced	2,035	2,377
• Daily VMT reduced	50,150	83,958
• Daily tons NOx reduced	0.041 T	0.055 T
• Daily tons VOC reduced	0.020 T	0.023 T
Total (Kiosks and Software Upgrades)		
• Daily vehicle trips reduced	4,070	5,574
• Daily VMT reduced	100,300	146,612
• Daily tons NOx reduced	0.082 T	0.107 T
• Daily tons VOC reduced	0.041 T	0.050 T

Impacts vs Goals (Integrated Rideshare combined components)

Transportation Benefit (net over or (under) goal):	Vehicle Trips: 1,504 VMT: 246,312
Emission Benefit (net over or (under) goal):	NOx: 0.025 tons per day VOC: 0.0009 tons per day

Integrated Rideshare as a whole exceeded the goals by about 35%. The largest portion of the vehicle trip impact came from kiosk use (57% of total vehicle trips reduced), but because placements from software upgrades traveled much farther on average than did kiosk placements, software upgrades accounted for 57% of the total VMT reduction for Integrated Rideshare.

SECTION 8 EMPLOYER OUTREACH

BACKGROUND

The Employer Outreach TERM was adopted by the TPB in the Fiscal Year 1995-2000 TIP. This program provides regional outreach to encourage private sector employers voluntarily to implement TDM strategies that will contribute to reducing vehicle trips to their worksites.

The program was designed to increase outreach efforts in ten jurisdictions located in the region. Seventy percent of the funds received by COG for the Employer Outreach program element is passed-through to the jurisdictions for implementation of the program. Sales training and support as well as technical training on the regional sales contact management database and overall administration are provided by Commuter Connections.

EVALUATION METHODOLOGY AND DATA SOURCES

Two variables are important for assessing the impacts of a TDM employer outreach program. First is the number of employers offering TDM services and the level of effort and commitment by the employer; that is the extent of the TDM programs they implement. Second is the level of employee participation in alternative modes as a result of the program. These two variables are strongly linked, as other TDM effectiveness research has shown. Higher levels of employer effort can be expected to offer greater incentive to employees to use alternative modes, leading to reductions in vehicle trips, VMT, and emissions.

The first of these variables was assessed through data collected by Commuter Connections from two sources. First, following sales and outreach contacts with employers, Employer Outreach jurisdiction sales representatives documented the levels of programs implemented by their employer clients in the ACT! contact management database maintained by Commuter Connections. The Employer Outreach program specified services employers offered, for example, transit subsidy, information/promotions, Guaranteed Ride Home, etc.

The Employer Outreach program defined four levels of employer effort: Bronze (Level 1), Silver (Level 2), Gold (Level 3), and Platinum (Level 4), distinguished by the expected increasing trip reduction effectiveness of the services offered and the commitment of the employer, as shown below.

- **Bronze (Level 1) programs** offer only commute information.
- **Silver (Level 2) programs** offer the services of an Employee Transportation Coordinator (ETC) and information, and include one or more of: preferential parking, carpool/vanpool formation meetings, bike racks or lockers, transportation fairs, informal telework, and alternative work hours.
- **Gold (Level 3) programs** include, in addition to the Silver services, services such as financial incentives or parking "cash out," formal telework programs, parking fees, on-site ridematching, employee shuttles to transit stations, showers and lockers for bikers, and company vanpools.
- **Platinum (Level 4) programs** include two or more of the Gold program components and actively promote the program.

In June 2005, the ACT! database included 816 employers with programs that met the Level 3 or 4 definitions. Just under half (373) of these employers had 100 or more employees at their worksites. The remaining 443 employers had fewer than 100 employees at the worksites.

These Level 3 and 4 employers served as the primary employer population on which the regional impact evaluation of Employer Outreach was based. Level 1 and 2 employers were not included in the original regional impact calculation because their level of impact would be very small due to the lack of incentives or enhanced commute alternatives.

A second group of 70 private employers with 100 or more employees, supplemented the employers included in the ACT! database. These employers were not part of the Commuter Connections Employer Outreach program but were participating in the regional Metrochek/SmartBenefits transit discount program. A list of the employers participating in this program and the number of employees at each site was obtained from the Washington Area Metropolitan Transit Authority (WMATA), which administers the program.

Jurisdiction Sales Representatives

The second variable in the impact evaluation, employees' response to the services offered, was more difficult to obtain. Starting mode split data were available for 186 of the program employers that had conducted a baseline commuter survey prior to implementing the TDM program. But as is typical for voluntary programs, only a few had conducted a follow-up survey by the time the evaluation data were being collected. Because baseline data were available, but post-program survey data were not, the researchers elected to estimate employee behavior changes using the US EPA's COMMUTER Model, which estimates worksite mode shifts from inputs on starting mode split and TDM program components.

This was the same methodology as was used in the 2002 evaluation, except that a new version of the COMMUTER model replaced the version used in the 2002 evaluation. EPA recently updated several of the predictive coefficients in the model, to reflect enhanced recent information on trip reduction effects of financial and employer support program strategies. These changes reduced the impact of financial strategies on mode choice, resulting in slightly lower trip reductions from the 2002 model.

The COMMUTER model requires several "scenario" inputs, including starting mode split. Thus, the Level 3 and Level 4 employers in the ACT! database were divided into groups of employers that were expected to have similar starting conditions and whose employees were expected to demonstrate similar responses to TDM program services. These similar employers were then combined for analysis purposes. Employers were first characterized by two employer/site variables: 1) type of employer, either office or non-office, and 2) availability of transit service: low, moderate, or high. Low transit was defined as limited bus service within ½ mile of the worksite. Moderate transit included a higher level of frequency and route availability. To be designated as a "high transit" employer, the site had to be within ½ mile of a Metrorail station and have access to a significant level of bus service.
For each of the six combinations of these two variables, for example, non-office employers with high transit and office employer with moderate transit, an average mode split was calculated from the baseline survey data of employers in that employer group that had conducted commuter surveys. Additionally, the Average Vehicle Ridership (AVR) was calculated for each group.

Employers in each of the six categories were further divided by the specific elements in their commute program. For example, all employers that offered a particular package of services, for example transit subsidies, telework, commute information, and alternative mode support services (e.g., GRH and preferential parking) were grouped together. These employers were kept apart from employers that offered, for example, transit subsidies, shuttles, and vanpools. For each of the total "package" groupings, the total number of employees at all worksites in the category was then calculated, making each category essentially equivalent to a single employer. One hundred thirty-seven combinations of employer type (e.g., non-office, high transit) and program service packages were identified.

For each of the 137 employer and program level combinations, the starting mode split and Average Vehicle Ridership (AVR) were input to the COMMUTER model, along with other information about the program service information. The

model was then used to calculate the final mode split, final AVR, and average percentage trip reduction that would be expected following implementation of the various program combinations.

Next, starting and ending AVRs were used to calculate starting and ending vehicle trips and the number of vehicle trips reduced was calculated by subtracting ending trips from starting trips. VMT reduced was estimated by multiplying the vehicle trips reduced by an average regional one-way trip length for all commuters, 16.5 miles, calculated from the 2005 State of the Commute Survey. Emissions reduced were calculated by multiplying trips and VMT reduced by 2005 regional emission factors. Appendix 6 provides details of the calculations of impacts for the Jurisdiction Sales Representatives component of Employer Outreach.

Metrochek/SmartBenefits

The COMMUTER Model also was used to estimate trip reduction for employers that participated in Metrocheck/SmartBenefits but were not included in the ACT! database. The number of large (100 or more employees), private employers participating in Metrochek/SmartBenefits and the number of their employees currently receiving Metrochek were obtained from WMATA. To avoid double counting employers captured through the jurisdiction sales representatives, WMATA's list was compared to the ACT! database and duplicates were eliminated from the Metrochek/SmartBenefits list.

The remaining 70 employers were then classified in the same six employer/site classifications (office/non-office, high/moderate/low transit) that were used for employers in the ACT! database. Starting mode split data were not available for these employers, so the groups were assigned mode splits equivalent to those calculated for the EO-jurisdiction representative component. A weighted average mode split and weighted average AVR were then calculated for these employers, based on the number of employees in each of the six categories.

The Metrochek/SmartBenefits data files did not indicate what commuter assistance services, other than Metrochek/SmartBenefits, these employers offered, so this information was obtained through a May 2005 survey of employers participating in the program. The results of this survey are described in a report entitled "Metrochek/SmartBenefits Survey Results 2005." Because these results were obtained from a sample of employers, rather than from the specific 70 employers that were included in the analysis, the program service combinations to be tested were distributed among the analysis employers based on the percentage occurrence of the program in the survey. For example, if 10% of the employers surveyed offered transit and carpool information and compressed work schedules, in addition to Metrochek/SmartBenefits, 10% of the employees in the analysis set were assigned to this program combination category. The Metrochek/SmartBenefits database did include the subsidy amount offered by the employer. The average value was $73 per month, thus this value was assigned as the transit subsidy value in each program package. Ten combination packages were identified.

From this point, the evaluation methodology mirrored that used for the ACT! database employers. Appendix 7 details the impact calculations for Metrochek.

EMPLOYER OUTREACH SUMMARY OF GOALS AND IMPACTS

The combined impacts for Jurisdiction Sales Representatives and Metrochek/SmartBenefits, calculated as described above, were compared against the TERM goals. The total goals and impacts are shown in Table 7. As shown, the number of employers participating in Employer Outreach substantially exceeded the goal, 876 participating employers compared to the goal of 251; 816 from the Jurisdiction Representatives component and the remaining 70 from Metrochek/SmartBenefits.

The original employer participation goals were determined from a TDM marketing model that estimated market demand by analyzing private sector employers with 100 or more employees. The model, which was based on 1994-95 research studies of consumers and businesses who received very little marketing effort, predicted a seven percent penetration rate for regional employer participation. This penetration rate was then applied to 1990 employer census information and a portion allocated to each jurisdiction receiving pass-through funds for the Employer Outreach TERM. The participation rate assumed successful outreach efforts by the jurisdictional and WMATA sales representatives.

The trip reduction and VMT reduction impacts for Employer Outreach were more than six times higher than the goals. This was because all the employers included in the analysis had implemented substantial programs, most of them including several of the services that research has shown are likely to produce high levels of trip reduction (e.g., transit and rideshare subsidies, compressed work schedules, telecommuting). Further, the trip reduction goal assumed that all employers would implement a transit or rideshare subsidy of $1 per day. But, nearly all of the employers offered a transit subsidy of at least $1.75 per day, and a significant number offered a subsidy of much more per day.

It should be noted that Employer Outreach overlaps with two other TERMs: Employer Outreach for Bicycling and the Metropolitan Washington Telework Resource Center (TRC). Some employers counted in Employer Outreach could also be counted in Employer Outreach-Bicycling or in the TRC "assisted employer" category. To avoid double counting credits, employers that offered bike strategies or telework strategies were included in the comprehensive Employer Outreach impact calculation. But impacts from the telework or bicycle components of their programs were later removed from Employer Outreach.

These employers were separated from other Employer Outreach employers for further analysis. To estimate the extent of the overlap, the COMMUTER model was run for these employers with and without telecommute and/or bike services, as appropriate. The trip reduction obtained when these services were not included was subtracted from the vehicle trip reduction when the services were included. The difference was considered to be the overlap and was assigned to the TRC or Employer Outreach-Bicycling as appropriate and subtracted from the total Employer Outreach impact. The results presented in Table 7 show the adjusted impacts with the overlap removed.

Table 7
Employer Outreach Goals and Estimated Impacts

	EO Goal	Estimated Impacts
Jurisdiction Sales Representatives		
• Employers participating	251	816
• Daily vehicle trips reduced	13,100	60,683
• Daily VMT reduced	196,400	1,002,115
• Daily tons NOx reduced	0.166 T	0.774 T
• Daily tons VOC reduced	0.093 T	0.392 T
Metrockek/SmartBenefits		
• Employers participating	N/A	70
• Daily vehicle trips reduced	N/A	20,467
• Daily VMT reduced	N/A	37,703
• Daily tons NOx reduced	N/A	0.262 T
• Daily tons VOC reduced	N/A	0.133 T
Total Employer Outreach		

• Employers participating	251	886
• Daily vehicle trips reduced	13,100	81,150
• Daily VMT reduced	196,400	1,339,818
• Daily tons NOx reduced	0.166 T	1.036 T
• Daily tons VOC reduced	0.093 T	0.526 T

Impacts vs Goals

Participant Number (net over or (under) goal): Employers: 635

Transportation Benefit (net over or (under) goal): Vehicle Trips: 68,050
VMT: 1,143,418

Emission Benefit (net over or (under) goal): NOx: 0.871 tons per day
VOC: 0.433 tons per day

SECTION 9 EMPLOYER OUTREACH FOR BICYCLING

BACKGROUND

The Employer Outreach for Bicycling TERM was adopted by the TPB in the Fiscal Year 1997-2002 TIP. This program provides regional outreach to encourage private sector employers with 100 or more employees to implement worksite strategies that will encourage employees to use bicycling for commuting. Additionally, Commuter Connections provides support to the annual Bike-to-Work Day event under this TERM. Services provided under this TERM are implemented by Jurisdiction sales representatives who are administered under the general Employer Outreach TERM.

EVALUATION METHODOLOGY AND DATA SOURCES

As noted above, this TERM is comprised of two components: 1) outreach implemented through the Jurisdiction Sales Representatives and 2) support to Bike-to-Work Day Event. Impacts of both of these components were estimated in this evaluation. Appendix 8 provides details of the calculations of impacts for the Jurisdiction Sales Representatives component of Employer Outreach.

Outreach through Sales Representatives

Similar to the general Employer Outreach TERM, impacts of this component are affected by the number of employers offering bicycle support services, the types of service offered in the programs, and the characteristics of the worksites at which these services are implemented. All of these factors have an impact on the level of employee participation in bicycling as a result of the program.

The ACT! contact management database maintained by Commuter Connections includes some information on the availability of bicycle support services at worksites and the number of employees at these worksites. But, as described in the previous section, it was not possible to measure the impacts of these services directly through employee survey data, because "after" data were not available. Thus, the EPA COMMUTER model was used here as well to estimate the impacts of the Sales Representative component of this TERM. The model uses baseline mode split information, information about the worksite environment, and characteristics of the commute services as inputs and predicts a final mode split and trip reduction expected when the services are implemented.

For this TERM, the 85 employers that offered bicycling services were segmented from the total Employer Outreach employer set. These employers were divided into employer categories based on their work type (office or non-office) and transit accessibility (low, moderate, or high), as explained in Section 8 (Employer Outreach TERM). Starting mode splits and AVRs also were assigned to each employer group, using the method described in Section 8.

Employers in each of the six categories were further divided by the specific elements in their commute program into service package groupings. All of the employers had bicycling services, but offered other services as well. For each of these "package" groupings, the total number of employees at all worksites in each category was then calculated, making each category essentially equivalent to a single employer. Thirty-three distinct combinations of employer type (e.g., non-office, high transit) and program service packages were identified.

For each of the 43 employer and program combinations, the starting mode split and Average Vehicle Ridership (AVR) were input to the COMMUTER model, along with other information about the worksite characteristics and program service information. The model was then used to calculate the final mode split, final AVR, and average percentage trip reduction that would be expected following implementation of the various program combinations. Then, the same employer

groups were run through the model with the exception that the bicycling strategies were removed from the packages. This estimated what the ending mode split and AVR would be if the bicycling strategies were not offered.

Next, for both the "with bicycling" and "without bicycling" cases, the starting and ending AVRs were used to calculate starting and ending vehicle trips and the number of vehicle trips reduced was calculated by subtracting ending trips from starting trips. The trip reduction obtained when bicycle services were not included was subtracted from the vehicle trip reduction when the services were included. The difference was the vehicle trip reduction attributable to this component of Employer Outreach for Bicycling.

VMT reduced was estimated by multiplying the vehicle trips reduced by an average regional one-way trip length for bicycle commuters, 10.0 miles, calculated from three Bike-to-Work Day surveys conducted in 2002, 2003, and 2004. Emissions reduced were calculated by multiplying trips and VMT reduced by 2005 regional emission factors. Details of the calculation are presented in Appendix 8.

Bike to Work Day Event

Impacts for the second component of this TERM, Bike-to-Work Day (BTWD) Event, were calculated using data obtained from three surveys of BTWD participants. These surveys, conducted following the 2002, 2003, and 2004 BTW Day events, examined participants' use of bicycling for commuting before and after the event, and their ongoing level of bicycle commuting.

The impact methodology estimated the trip reduction impacts of new ridership by calculating the number of commuters who started riding to work after the event or who increased the number of days per week they rode to work and the average number of "new" bike days per week. Two periods of time were examined: 1) spring/summer/fall following the event and 2) winter following the event. From these data the number of new "seasonal" use and "continued winter" use days were calculated for a year. This number was then translated to a daily figure.

The number of vehicle trips reduced by new bicycling was estimated by multiplying the percentage of participants who said they drove alone on non-cycling days (41%) by the number of daily bicycle trips. VMT reductions were estimated by multiplying the vehicle trip reduction by the average commute distance of these participants (10.0 miles). Emissions reduced were calculated as for other TERMs.

EMPLOYER OUTREACH FOR BICYCLING SUMMARY OF GOALS AND IMPACTS

The combined impacts for Sales Representatives and Bike-to-Work Day, calculated as described above, were compared against the regional goals for this TERM. The total goals and impacts are shown in Table 8. As shown, the actual results were nearly three times the goals for the TERM, although the goal was small compared to goals for other TERMs.

Table 8
Employer Outreach for Bicycling Goals and Estimated Impacts

	EO-Bike Goal	Estimated Impacts*
Employer Outreach for Bicycling		
• Employers participating	N/A	85
• Daily vehicle trips reduced	130	343
• Daily VMT reduced	567	3,431
• Daily tons NOx reduced	0.001 T	0.003 T
• Daily tons VOC reduced	0.001 T	0.002 T

* Impacts through December 2004

Impacts vs Goals

Transportation Benefit (net over or (under) goal): Vehicle Trips: 213
VMT: 2,864

Emission Benefit (net over or (under) goal): NOx: 0.002 tons per day
VOC: 0.001 tons per day

As was noted in Section 8, the Sales Representative component of this TERM overlaps with the Employer Outreach TERM. To avoid double counting credits, the impacts assigned to Employer Outreach for Bicycling (Sales Representatives) were subtracted from the Employer Outreach TERM.

SECTION 10 MASS MARKETING

BACKGROUND

The Regional Mass Marketing TERM constitutes a new direction for the Commuter Connections program and for the evaluation framework. In July 2003, Commuter Connections embarked on an ambitious effort to educate the region about alternatives to stress-filled solo commuting and to raise awareness of commute assistance services available through Commuter Connections and its partners. This TERM employs radio, television, direct mail, and other mass media to create a new umbrella level of public awareness and to provide a call to action to entice commuters to switch to alternative modes. The objectives of the Mass Marketing TERM are to:

- Raise regional awareness about the Commuter Connections brand
- Address commuters' frustration with congestion
- Induce commuters to try and adopt alternative commute modes

EVALUATION METHODOLOGY

The Mass Marketing TERM has two populations of interest: 1) all commuters in the Commuter Connections service area and 2) Commuter Connections program clients (e.g., rideshare applicants, GRH applicants) who may have been influenced by the marketing campaign to request Commuter Connections services. The Mass Marketing TERM presents two challenges not encountered in most of the other TERMs. First, it is more difficult to assess influence on the general commuting public than it is to identify and track program participants. Second, when commuters who changed travel behavior can be identified, it is still necessary to identify what motivated their change – the media campaign or another influence.

The Mass Marketing evaluation method relies on examining impacts from two types of change, which must be measured separately. The first is "directly" influenced change. These are mode shifts that are made when the ads motivate commuters to change mode with no contact with Commuter Connections. An example of this type of change would be a carpool formed when a commuter hears the ad and asks a co-worker to carpool. Direct influences can only be assessed through a regional survey of commuters that asks about mode change and the reasons for the changes.

The second is "referred change." These are mode shifts that occur among commuters who are influenced to contact Commuter Connections by the ads. This change would include, for example, a commuter who hears the ad, requests a ridematch list from Commuter Connections, then forms a new carpool as a result.

Indirect influences are best measured by tracking changes in the volume of requests of information and services through two Commuter Connections' traditional programs: the Commuter Operations Center and GRH.. A comparison of the volumes of requests received during periods of media activity to periods without media activity can provide an estimate of the changes in requests as a result of the ads. A pro-rated share of the impacts of these other TERM impacts then can be assigned to Mass Marketing.

Evaluation of Direct Influence

Directly influenced change is measured for this evaluation through two regional surveys, the 2004 State of the Commute survey and the 2005 Mini-Household survey. Both surveys explored four relevant questions:

- Ad awareness – Were commuters aware of commute advertising and the specific messages conveyed?
- Changes made after hearing the ads – How many commuters who recalled the ads shifted to alternative modes after hearing the ads and how were they traveling before making the change?

- Reasons for change – Did the ads influence the commuters to make the change?
- Other commute services used – Did the commuters use any commute services provided by Commuter Connections?

The results on these questions were averaged from the two surveys to estimate the number of total regional commuters who were influenced by ads to change mode without any contact with Commuter Connections. The survey results were as follows:

Percentage of commuters who:

• Recalled commute message	39%
• Shifted to an alternative mode after hearing the ads	1.0%
• Said the ad influenced their decision to shift	85%
• Did not use any other commute service	100%
• **Resulting influence percentage**	**0.33%**

Thus, 0.33% of regional commuters were directly influenced to make a change. This percentage was multiplied by the average number of regional commuters (2,422,811) to estimate the number of alternative mode placements.

Further analysis of the survey respondents who had made a change showed that 56% continued using the new mode and 44% were temporary users and these commuters reduced on average 1.25 and 1.0 trips per placement respectively. These factors, and the 16.5 mile per trip regional travel distance were applied to the total number of new alternative mode placements to obtain the numbers of vehicle trips and VMT reduced by direct influence.

Evaluation of Indirect Influence

Indirect influences were estimated through comparison of the numbers of new Commuter Operations Center and GRH applications received in three time periods:

- In the year before Mass Marketing was initiated (July 2002 – June 2003)
- In months between July 2003 and June 2005 when MM ads were aired
- In months between July 2003 and June 2005 when MM ads were NOT aired

As a first step, this analysis calculated the average numbers of applications received during "with MM' and "without MM" periods and compared the numbers. An increase in requests observed during the "with MM" periods could be assumed to result from the ads. However, in some "with MM" months, CC also ran GRH ads for part of the month, thus it is possible that some of an observed increase in GRH and/or ridematch requests could be due to GRH advertising. Thus, the analysis also calculated volumes of requests that were received under various ad scenarios: "with MM" compared to "with GRH," "with any ads" compared to "with no ads," "with MM" compared to "no ads," etc.

The analysis indicated the following:

	Increase in Applications	
	RS Apps	GRH Apps
• With ads compared to no ads	19%	16%
• With MM ads compared to w/o MM	29%	22%
• With GRH ads compared to w/o GRH	2%	10%

These results suggest that ads, whether MM or GRH, increase rideshare applications by about 19% and increase GRH applications by about 16%. When taken as a percentage of total new applications, these increases translate to about 16% of total rideshare applications (19/119) and 13% of total GRH applications (16/116).

But MM ads appear to have a greater influence on the numbers of both ridematch applications and GRH applications than do GRH ads. Essentially all of the increase in rideshare applications and about two-thirds of the increase in GRH applications was assigned to MM. These results translated into assigning 15% of total new-applicant COC impacts and about 8% of the new-applicant GRH impacts to MM.

MASS MARKETING SUMMARY OF GOALS AND IMPACTS

Shown in Table 9 are the evaluation results for the three Mass Marketing components (direct influence, indirect ridematch influence, and indirect GRH influence). The table also shows the results for the TERM as a whole, compared to the goals established for Mass Marketing. Note that no goals were established for any of the individual components that comprised the Mass Marketing impacts.

MM reached about two-thirds of the goal for commuter placements, but fell farther short of the goals for vehicle trips and VMT reduced, meeting 29% and 35% respectively of these two goals. Emissions also fell short, by similar percentages. As was the case for several other TERMs, the shortfall was largely because the trip reduction of each commuter placed in an alternative mode was assumed to be 1.65 daily trips reduced, higher than actually occurred. Among "directly influenced" commuters, the VTR factors was between 1.0 and 1.25. Among "indirectly influenced" commuters, the VTR factors were considerably lower.

The goal assumption that all placements would continue with their new mode also contributed to the assumed trip, VMT, and emissions reductions per placement being higher than actually occurred.

Table 9
Mass Marketing Goals and Estimated Impacts

	MM Goal	Estimated Impacts
Influenced to Contact CC		
• Commuter placements	None	2,011
• Daily vehicle trips reduced	None	489
• Daily VMT reduced	None	14,614
• Daily tons NOx reduced	None	0.010 T
• Daily tons VOC reduced	None	0.005 T
Influenced to Change Mode – no CC contact		
• Commuter placements	None	7,785
• Daily vehicle trips reduced	None	6,306
• Daily VMT reduced	None	104,052
• Daily tons NOx reduced	None	0.081 T
• Daily tons VOC reduced	None	0.041 T
Influenced to Participate in GRH		
• Commuter placements	None	563
• Daily vehicle trips reduced	None	503
• Daily VMT reduced	None	14,195
• Daily tons NOx reduced	None	0.010 T
• Daily tons VOC reduced	None	0.004 T
Total Mass Marketing		
• Commuter placements	15,527	10,370
• Daily vehicle trips reduced	25,575	7,269
• Daily VMT reduced	375,975	132,861
• Daily tons NOx reduced	0.318 T	0.101 T
• Daily tons VOC reduced	0.179 T	0.050 T

Impacts vs Goals

Transportation Benefit (net over or (under) goal): Vehicle Trips: (18,276)
VMT: (243,114)

Emission Benefit (net over or (under) goal): NOx: (0.217 tons per day)
VOC: (0.129 tons per day)

SECTION 11 COMMUTER OPERATIONS CENTER

BACKGROUND

Since the 1970's, COG has offered basic commute information and assistance, such as regional ridematching database, to commuters living and/or working in the Washington metropolitan region. Prior to 1995, when Commuter Connections was established, these services were provided by COG's RideFinders program. Because these services, now provided through the Commuter Operations Center (COC), were available when the emissions baseline was developed for regional conformity, the Center was not established as a TERM, but was included in the region's TIP as an ongoing program.

The function of the COC is to increase commuters' awareness of alternative modes, through general regional marketing programs and to encourage and assist commuters to form ridesharing arrangements. Encouraging commuters who drive alone to shift to alternative modes is a priority for the COC, but the COC also assists commuters who now use alternatives to continue to do so, by offering ridematching and transit assistance when carpools break up, vanpoolers leave a vanpool group, or commuters' travel patterns change and disrupt existing alternative mode arrangements.

Commuter Connections program services include: carpool and vanpool matchlists, transit route and schedule information, information on Park & Ride lot locations and HOV facilities, and TDM and telework assistance. Commuters obtain services by calling a toll-free telephone number or by submitting a ridematch application obtained from COG, an employer, a local partner assistance program, a transportation management association (TMA), through the internet, or through one of the fifteen information kiosks located in Northern Virginia and the District of Columbia.

EVALUATION METHODOLOGY

In past years, the Commuter Operations Center has enhanced the services it offers to commuters and expanded its marketing of alternative modes to raise public awareness of and interest in alternatives. These efforts were designed to increase the number of commuters placed in alternative modes and generate trip, VMT, and emission reduction benefits for the region. Further, the activities of the COC support the implementation of the TERMs administered by Commuter Connections. Thus, although it is not an adopted TERM, the COC is included in this evaluation.

The impacts of the COC were measured using data from three Commuter Connections placement surveys conducted during the evaluation period (November 2002, November 2003, and November 2004). These surveys interviewed a sample of commuters assisted by Commuter Connections in the three-months prior to the survey and collected data to estimate placement rates, VTR factors, drive alone access percentages, and travel and access distances. As was done for GRH, these multipliers were estimated for two sub-groups of applicants. The first sub-group included respondents who both live and work within the Washington, DC Metropolitan Statistical Area (MSA); that is within the 12-jurisdiction area covered by the TERM evaluation. The second group included respondents who work within the MSA but live outside it.

This distinction was made because applicants who live outside the MSA traveled a portion of their VMT outside the MSA. During the evaluation, it was decided that the VMT for these "out of MSA" applicants should be discounted to credit VMT reduction only for the portion that occurred within the MSA. Approximately 16% of the total participants lived outside the MSA.

For each sub-group of survey respondents, the placement rate, that is, the percentage of respondents who switched to an alternative mode, was calculated. Two rates were calculated, a "continued" rate, including respondents who switched and remained in the new alternative mode until the placement survey was conducted, and a "temporary" rate, including re-

spondents who made a switch, but returned to their original mode before the survey. The two sub-group populations had the following placement rates:

	Continued	Temporary
• Within MSA	25.2%	13.6%
• Outside MSA	24.3%	13.6%

To determine the number of commuters placed in alternative modes between July 2002 and June 2005, these placement rates were multiplied by the total number of commuters who received assistance from Commuter Connections during that time period, 143,326, divided into the two sub-groups: 120,537 within the MSA and 22,789 outside the MSA. This calculation resulted in a total of 55,336 placements, with 46,703 placements from within the MSA and 8,634 placements from outside the MSA.

These placement figures were then multiplied by VTR factors derived from the survey data to estimate the number of vehicle trips reduced. The VTR factors, expressed in terms of average vehicle trips reduced per placement, for the two sub-groups were as follows:

	Continued	Temporary
• Within MSA	0.33	0.38
• Outside MSA	0.47	0.42

VTR factors combine the vehicle trip reduction contributions of various types of mode changes, such as from transit to rideshare, drive alone to transit, and drive alone to carpool, each of which reduces a different number of vehicle trips per day, into one number. VTR factors of less than 0.50 indicate a significant number of the changes were to lower occupancy modes, such as carpool and/or were shifts from one alternative mode to another.

The vehicle trip reductions for temporary placements also were discounted to reflect their short duration of 5.1 weeks of the year (10%). The calculation of vehicle trips reduced produced a total of 13,466 trips reduced; 10,732 from commuters within the MSA and 2,734 from commuters outside the MSA.

Next, VMT reduced was calculated by multiplying the numbers of vehicle trips reduced by the average trip length for commuters who made a shift to an alternative mode. The one-way trip distance for the within MSA respondents was 29.9 miles for continued placements and 28.6 miles for temporary placements. The actual average one-way distances for the outside MSA respondents were 54.4 miles for continued placements and 57.9 miles for temporary placements. To discount the distance credited to the outside MSA respondents, their one-way travel distance was set equal to that of the distance for the within MSA respondents, resulting in a loss of more than 25 one-way miles per trip for each outside-MSA respondent. The VMT calculation resulted in a total of 402,019 VMT reduced.

Emission reduction for the COC was calculated using trip-based and VMT-based regional emission factors for 2005. Details of these calculations are presented in Appendix 10.

COMMUTER OPERATIONS CENTER SUMMARY OF GOALS AND IMPACTS

Shown below are the evaluation results for the COC and the goals established for the Center.

Table 10
Commuter Operations Center Regional Goals and Estimated Impacts

	Regional Goal	Estimated Impacts
• New applicants and re-apply	60,000	60,254
• Follow-up applicants	N/A	83,072
• Daily vehicle trips reduced	2,720	9,783
• Daily VMT reduced	83,204	279,055
• Daily tons NOx reduced	0.067 T	0.204 T
• Daily tons VOC reduced	0.032 T	0.092 T

Impacts vs Goals

Applicant Number (net over or (under) goal): New/re-applicants: 254
Follow-up 83,072

Transportation Benefit (net over or (under) goal): Vehicle Trips: 7,063
VMT: 195,851

Emission Benefit (net over or (under) goal): NOx: 0.137 tons per day
VOC: 0.060 tons per day

As shown, the COC fulfilled more than 143,000 requests during the three year period. About 42% of the requests were from new applicants or re-applicants. These 69,254 applicants met the goal of 60,000. The COC also provided follow-up assistance to more than 83,000 commuters. This assistance included providing additional match names for existing car-pools and vanpools that needed or wanted a new or additional rider. Some of this assistance likely helped maintain existing ridesharing arrangements. The COC substantially exceeded the goals for vehicle trips, VMT, and emissions reduced.

The results shown in Table 10 were adjusted results that eliminated double counting due to overlap between the COC and individual TERMs. As was explained in Section 7, a portion of the Commuter Operations Center's impacts were assigned to the software upgrades implemented under the Integrated Rideshare TERM. Additionally, a small portion of the COC's impacts resulted from applications received through the kiosks (0.7% of total applications). And about 13.3% of new CC applicants requested both GRH and other information (5.7% of total COC assisted commuters). Finally, the impacts for about 15% of new COC applicants were assigned to the Mass Marketing TERM, to reflect the impact of this TERM in influencing commuters to contact CC for travel-assistance services.

To avoid double counting of impacts, the impacts of these other TERMs were subtracted from the COC base impacts to determine the net impacts attributable solely to the COC and to account for those impacts covered by TERMs and those attributable to the base operations. These adjustments are shown in Table 11 below. The "Net COC" impacts shown in Table 11 were used in Table 10 as the impacts attributable only to the COC and not to any TERM.

Table 11
Adjustment For Double Counting Among COC and TERMs

Evaluation Measure	COC Base	Mass Mkt	Kiosks	SW Upgr	GRH	Net COC
Placements	55,336	2,011	318	7,323	3,040	42,645

VT reduced	13,466	489	77	2,377	740	9,783
VMT reduced	402,019	14,614	2,310	83,958	22,082	279,055
Tons of NOx reduced	0.287	0.010	0.002	0.055	0.016	0.204
Tons of VOC reduced	0.126	0.005	0.001	0.023	0.007	0.092

Notes:

- Mass Marketing – 15% of new applicants influenced by ads to contact CC, see Section 9
- Kiosks - 0.7% of new COC applications received through kiosks
- Software upgrades – see Section 7
- GRH – 13.3% of new/re-applicants ask for GRH and other commute information = 5.7% of COC total after Mass Marketing adjustment

SECTION 12 CONCLUSIONS ABOUT TERM IMPACTS

The preceding sections of this report documented estimated impacts for individual TERMs and for the Commuter Operations Center. As noted in an earlier section, the combined set of programs administered by Commuter Connections did not meet the goals set for the seven TERMs collectively, although several of the TERMs did meet or exceed their individual goals..

Almost all of the TERMs, even those that did not meet vehicle trip or VMT reduction goals, met goals for levels of participation. Commuters and employers, as appropriate, apparently are aware of and utilizing the services. Where shortfalls did occur against the goals, they primarily were due to goal projection assumptions that appear now to have been overly optimistic regarding the individual contribution of a commuter's travel changes to trip reduction. For example, most goals assumed higher use of drive alone prior to using the TERM service than has actually been the case. And emission reduction goals did not account for drive alone access to rideshare modes, which would reduce the emission benefits due to cold starts. It is also important to note that the regional travel demand model was calibrated and validated against the year 2000 traffic counts and regional emission credits are only taken for TERM benefits that occurred after the year 2000 in the regional TERM tracking sheet and may not be consistent with results in this report. Additionally, it should be noted that many of the calculations in this report used survey data from surveys that are subject to statistical error rates.

Individual sections of this report have discussed factors that affected the achievement of goals. Below are presented highlights of those discussions for the seven TERMs and the COC.

METROPOLITAN WASHINGTON TELEWORK RESOURCE CENTER

Use of telecommuting continues to grow in the Washington. In 1996, about 150,000 regional workers were telecommuting. By 2005, the number had grown to more than 318,000, and increase of 165,000. About 18% of these new teleworkers can be attributed to the efforts of the TRC, either directly through information distributed to commuters, through regional advertising to the public-at-large, or through assistance to employers that want to start a telecommute program. This number of new telecommuters exceeded the goal set for the TRC.

But the TRC's share of regional trip, VMT, and emission reductions from telecommuting were less than the goals for these measures. This was primarily because the regional goal calculation assumed a telecommute frequency of 2.65 days per week, rather than the 1.29 days actually estimated for 2004 from State of the Commute Survey data. Additionally, the goal calculation assumed that all telecommuters would eliminate trips on telecommute days, but only about 74% of the telecommuters drive alone on non-telecommute days, thus only these trips and VMT were counted in this evaluation as having been eliminated.

It is possible the TRC's contribution is slightly underreported. About five percent of regional telecommuters said they learned of telecommuting through "advertising," newspaper ads, or "other website." Although these sources were not necessarily controlled by Commuter Connections, the TRC has advertised consistently and broadly about telecommuting via radio, television, print media, and the internet. So this response likely indicates additional telecommuters who learned about telecommuting from outreach and promotion conducted by Commuter Connections. Because the source of the advertising could not be clearly documented, only a share of these commuters (1.7% of total teleworkers) was credited to the TRC.

EXPANDED TELECOMMUTING

Expanded Telecommuting missed the goals by a sizeable margin, achieving approximately 10% of the goal for each impact measure. Most of the shortfall was due to the lower than expected participation of new telecommuters. Further, the projection of goals for this TERM assumed a telecommute frequency of 1.5 days per week, higher than the 1.29 days per week observed in the 2004 SOC survey.

GUARANTEED RIDE HOME

Like the TRC, the GRH TERM did not meet the adopted goals. The number of commuters participating in GRH in June 2005 came within ½ of one percent of the participant goal, but the vehicle trip reduction impact for GRH was only about 27% of the goal.

The trip reduction impacts were less than expected in part because the goal assumed that all participants would be new alternative mode users. In fact, only 26% of participants said they were driving alone prior to hearing about/registering for GRH. The regional goal used a VTR factor of 1.26, which assumed that nearly all placements would have shifted from drive alone to alternative modes. The actual VTR factors of 0.91 and 0.81 reflect the fact that a portion of the commuters who shifted modes shifted from one alternative to another, rather than from driving alone.

GRH came much closer to reaching the VMT goal (48%), because the actual travel distance of GRH participants, 28.2 miles one way, is nearly twice the projected average of 15.0 miles. This shows that GRH was more important to longer-distance commuters than was expected at the time the goal was developed.

Finally, note that the GRH results were adjusted to assign a portion of the GRH program's impacts to the Mass Marketing TERM to recognize that some GRH applicants were influenced to contact Commuter Connections and apply for GRH after they heard a Mass Marketing ad. Approximately eight percent of the total new GRH applicants, or three percent of total GRH impacts, were assigned to Mass Marketing.

INTEGRATED RIDESHARE

Both the InfoExpress kiosks and the Software Upgrade component met their individual goals for all impact measures. The rideshare database placement surveys used to estimate software upgrade impacts showed that more than three percent of applicants used the unrequested transit information provided on matchlists to make a permanent mode change and slightly over two percent used the information to try transit or make a temporary change to transit. Because the survey is conducted four to six weeks after the quarter ends, it is possible some of these trial users will shift to transit at a later time.

Integrated Rideshare as a whole exceeded the goals by about 35%. The largest portion of the vehicle trip impact came from kiosk use (57% of total vehicle trips reduced), but because placements from software upgrades traveled much farther on average than did kiosk placements, software upgrades accounted for 57% of the total VMT reduction for Integrated Rideshare.

EMPLOYER OUTREACH

Impacts for Employer Outreach were more than six times the goal for this TERM. This impressive result was due to the large number of employers participating in the program, and the large number of employees at these worksites, and the effectiveness of the worksite programs. More than 800 worksites have implemented level 3 or 4 program (including WMATA/Metrochek participants). These worksites cover 218,000 employees, almost 9% of the regional workforce. And these employers have implemented commute programs with strategies that are very effective in encouraging use of alternative modes, including financial subsidies, telecommuting, compressed work schedules and other high level strategies.

The goal for this TERM assumed participating employers would implement moderately aggressive commuter assistance programs, for example, a $1.00 per day transit subsidy. In fact, the majority of participating employers have implemented more aggressive programs, including for example telecommuting, shuttles, compressed schedules, and transit subsidies of at least $1.75 per day. These aggressive programs achieved an average vehicle trip reduction of more than 25%, compared to the "pre-program" baseline conditions. Combined with the large number of employees represented at these worksites, this TERM has produced substantial benefits.

EMPLOYER OUTREACH FOR BICYCLING

Impacts for Employer Outreach for Bicycling also were well above the goals, approximately twice the projected level, although the goals for this TERM was smaller than for the more general Employer Outreach.

Similar to Employer Outreach, this result was due in part to the number of worksites offering bicycle strategies (85) and the relatively large number of employees at these worksites, 33,700, about 15% of the employees who work at participating Employer Outreach worksites. But Bike-to-Work Day events contributed about two-thirds of the total impacts for this TERM.

MASS MARKETING

This new TERM did not meet the goals for travel or emission reductions but reached about two-thirds of the goal for commuter placements. These placements were divided between two groups: directly influenced commuters, who had no contact with Commuter Connections other than through hearing or seeing the ads, and indirectly influenced commuters, who were influenced by the ads to contact Commuter Connections for rideshare or GRH assistance. Directly influenced commuters accounted for about 80% of commuters placed, with indirect placements accounting for about 20% of the total.

Mass Marketing met about 29% of the goal for vehicle trips and 35% of the goal for VMT reduced. As was the case for several other TERMs, the shortfall was largely because the trip reduction of each commuter placed in an alternative mode was assumed to be 1.65 daily trips reduced, higher than actually occurred. Among "directly influenced" commuters, the VTR factors were between 1.0 and 1.25. Among "indirectly influenced" commuters, the VTR factors were considerably lower.

The goal assumption that all placements would continue with their new mode also contributed to the assumed trip, VMT, and emissions reductions per placement being higher than actually occurred.

COMMUTER OPERATIONS CENTER

The Commuter Operations Center is not an adopted TERM, but was included in this evaluation because it supports the success of several of the TERMs, including GRH, Integrated Rideshare, and Employer Outreach. The COC fulfilled more than 143,000 requests during the three year period. More than 69,000 of the requests were from new applicants or re-applicants, well over the goal of 60,000.

But the COC provided follow-up assistance to more than 83,000 commuters. This assistance included providing additional match names for existing carpools and vanpools that needed or wanted a new or additional rider. Some of this assistance likely helped maintain existing ridesharing arrangements. The COC substantially exceeded the goals for vehicle trips, VMT, and emissions reduced, by a factor of two or three, depending on the impact measure.

The base results for the COC were adjusted to eliminate double counting due to overlap between the COC and Integrated Rideshare (Software Upgrades and kiosks) and GRH. This overlap reflects the integral relationship of the COC to the overall CC program. The impacts for about 15% of new COC applicants were assigned to the Mass Marketing TERM, to reflect the impact of this TERM in influencing commuters to contact CC for travel-assistance services.

LIST OF APPENDICES

APPENDIX 1 - CALCULATION OF TELEWORK RESOURCE CENTER IMPACTS

Populations of Interest

• All regional teleworkers (TW)	318,130	(from SOC survey)
• Employees at worksites assisted by TRC	265,250	(from TRC TW assistance survey)
• MWTC teleworkers	343	(from MWTC survey)

Telecommute Placement Rates

• Directly assisted TW	6.4%	(% of TW assisted by TRC, from SOC survey)
• Assisted worksites	3.4%	(% of new TW at sites, from TRC assistance survey)

Placements

Mixed home and TC based

• Directly assisted TW	20,505	(regional TW x directly assisted placement rate)
• TW at TRC asst. sites	9,018	(employees at assisted sites x asst site placement rate)
Total assisted TW	**29,524**	

Telecenter only

• MWTC teleworkers	343	(from MWTC survey)

Breakdown of placements by Location (home-based and telecenter-based)

• % Home-based TW	95%	(from SOC survey)
• % telecenter-based TW	5%	(from SOC survey)
• HB TW	28,048	(total assisted TW x % HB TW)
• TC-based TW	1,476	(total assisted TW x % TC-based TW)
• MWTC teleworkers	343	(from MWTC survey)

Daily Vehicle Trips Reduced

VTR Factors

• Home-based factor	0.38	(from SOC survey)
• TC-based factor	0.26	(from SOC survey)
• MWTC TW factor	-0.13	(from MWTC survey)
• Home-based VT reduced	10,793	(HB TW x HB VTR factor)
• TC-based VT reduced	380	(TC-based TW x TC VTR factor)
• MWTC TW VT reduced	(44)	(MWTC TW x MWTC VTR factor)
Total Daily Vehicle Trips Reduced	**11,129**	

Appendix 1, continued

Daily VMT Reduced

Ave one-way trip distance (mi)

• Home-based TW	19.2	(SOC survey)

Telecenter reductions (TC days) – other than MWTC

• VMT reduction – telecenter days	12.0	(SOC survey)
• Ave. days/wk at TC	1.2	(SOC survey)
• VMT reduction – home TC days	38.4	(SOC survey)
• Ave. days/wk at home	1.0	(SOC survey)
• Total weekly VMT reduction	52.8	(TC days x TC mi)+(home days x home mi)
• Daily reduction per teleworker	10.6	

MWTC net VMT reduction/day	37.4	(Telecenter survey)
Ave days/wk at telecenter	1.6	(Telecenter survey)

VMT reductions on TC days

• Home-based VMT reduced	207,219	(HB VT reduced x ave trip distance)
• Non MWTC VMT reduced	15,593	(TC TW x daily miles reduced)
• MWTC VMT reduced	4,101	(MWTC TW x wkly TC freq / 5 / daily miles reduced)
Total Daily VMT Reduced	**226,913**	

Daily Emissions Reduced

NOx reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	11,129	0.9905			11,024	0.0122
• Running (40 mph)			226,913	0.6995	158,725	0.1750
Total NOx reduced (tons)						**0.1872**

VOC reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	11,129	2.3454			26,103	0.0288
• Running (40mph)			226,913	0.2717	61,652	0.0680
Total VOC reduced (tons)						**0.0968**

APPENDIX 2 - CALCULATION OF EXPANDED TELECOMMUTING

Populations of Interest

• Employers in ET Program	33	
• Ave. employees per worksite	3,700	(COG ET data)
• Total employees at sites	122,100	

Expanded TW Placements
Mixed home and TC based

• New TW at Exp TW sites	4,884	(Expanded TW survey)
Total new TW	**4,884**	

Breakdown of placements by location

• Home based	95%	(SOC survey)
• Telecenter based	5%	(SOC survey)

Placements by location

• Home based	4,640	(Total new TW x HB %)
• Telecenter based	244	(Total new TW x TC-based %)

Daily Vehicle Trips Reduced

VTR Factors	**HomeBased**	**TC Based** (SOC data)
TC days/week	1.3	2.2
• Ave days/wk home	1.3	1.2
• Ave days/wk at TWC	0	1.0
Travel non-HB TC days		
• % DA/RS of non-TC trips	74%	74%
• % DA/RS to TWC		82%
• Wkly trips w/o TW	7.4	7.4
• Wkly trips w/ TW	5.5	6.1
• Wkly trip reduction	1.9	1.3
• Daily trip reduction/TW	0.38	0.26
HB VT reduced	1,785	
TWC VT reduced	63	
Total Daily Vehicle Trips Reduced	**1,848**	

Appendix 2, continued

Daily VMT Reduced

Ave one-way trip distance (mi)

• Home-based TW	19.2	(SOC survey)

Telecenter reductions (TC days) – other than MWTC

• VMT reduction – telecenter days	12.0	(SOC survey)
• Ave. days/wk at TC	1.2	(SOC survey)
• VMT reduction – home TC days	38.4	(SOC survey)
• Ave. days/wk at home	1.0	(SOC survey)
• Total weekly VMT reduction	52.8	(TC days x TC mi)+(home days x home mi)
• Daily reduction per teleworker	10.6	
• Home-based VMT reduced	34,280	(HB VT reduced x ave trip distance)
• TWC VMT reduced	2,579	(TWC TW x daily miles reduced)
Total Daily VMT Reduced	**36,859**	

Daily Emissions Reduced

NOx reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	1,848	0.9905			1,831	0.0020
• Running (40 mph)			36,859	0.6995	25,783	0.0284
Total NOx reduced (tons)						**0.0304**

VOC reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	1,848	2.3454			4,335	0.0048
• Running (40 mph)			36,859	0.2717	10,013	0.0110
Total VOC reduced (tons)						**0.0158**

APPENDIX 3 - CALCULATION OF GUARANTEED RIDE HOME IMPACTS

Populations of Interest		
• GRH registrants	26,702	(GRH database)
• One-time exceptions	550	(GRH database)
Total GRH base	**27,252**	
Within MSA	22,919	
Outside MSA	4,333	
GRH Placement Rates (continued rates only)		
• Within MSA placement rate	50.5%	(GRH survey)
• Outside MSA placement rate	51.8%	(GRH survey)
Placements (continued only)		
• **Within MSA**	**11,574**	(Within MSA base x within MSA placement rate)
• **Outside MSA**	**2,245**	(Outside MSA base x outside MSA placement rate)
Daily Vehicle Trips Reduced		
VTR Factors (continued only)		
• Within MSA	0.91	(GRH survey)
• Outside MSA	0.81	(GRH survey)
VT Reduced (continued only)		
• **Within MSA**	**10,532**	**(**Within MSA placements x within MSA VTR factor)
• **Outside MSA**	**1,818**	(Outside MSA placements x outside MSA VTR factor**)**
Daily VMT Reduced		
• Ave one-way trip distance (mi)		
• Within MSA	28.2	(from GRH survey)
• Outside MSA	28.2	(discounted from actual 52.0 miles from GRH survey)
VMT reduced		
• Within MSA	297,014	(Within MSA VT reduced x trip distance)
• Outside MSA	51,270	(Outside MSA VT reduced x trip distance)
Total Daily VMT Reduced	**348,283**	

Appendix 3, continued

Trip and VMT Adjustment for SOV Access to HOV Modes (reduce VT and VMT for AQ analysis)

Inside MSA

- Non-SOV access percentage 40% (GRH survey)
- SOV access distance (mi) 5.3 (GRH survey)

Outside MSA – not applicable – all access outside MSA

VT Reduction

- No SOV access 6,031 (VT x non-SOV access %)

Total VT for AQ analysis **6,031**

VMT Reduction

- No SOV access 170,075 (VT x SOV % x trip distance)
- With SOV access 144,715 (VT x SOV % x (trip distance – access distance)

Total VMT for AQ analysis **314,790**

Daily Emissions Reduced

NOx reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	6,031	0.9905			5,974	0.0066
• Running (40 mph)			314,790	0.6995	220,196	0.2427
Total NOx reduced (tons)						**0.2493**

VOC reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	6,031	2.3454			14,145	0.0156
• Running (40 mph)			314,790	0.2717	85,528	0.0943
Total VOC reduced (tons)						**0.1099**

Correction for Overlap with MM TERM

Total GRH apps FY 03, 04, 05	27,252	
New GRH apps FY 04, 05	13,884	42%
Estimated MM share of new GRH	8%	
Estimated MM share of GRH impact	3%	

	GRH base	**MM**	**Net GRH**
Placements	13,819	563	13,255
VT reduced	12,350	503	11,847
VMT reduced	348,283	14,195	334,088
NOx reduced (T)	0.249	0.010	0.239
VOC reduced (T)	0.110	0.004	0.105

APPENDIX 4 - CALCULATION OF INTEGRATED RIDESHARE - KIOSK IMPACTS

Populations of Interest – Regional Commuters who used Kiosks to obtain commute information

• Regional kiosk users	34,894	(SOC survey)

Kiosk Placement Rates

• Continued placement rate	0.0%	(SOC survey)
• Temporary placement rate	16.7%	(SOC survey)

Placements

• Continued placements	0	(Kiosk users x continued placement rate)
• Temporary placements	5,827	(Kiosk users x temporary placement rate)
Total placements	**5,827**	

Daily Vehicle Trips Reduced

VTR Factors

• Continued VTR factor	0.0	
• Temporary VTR factor	1.60	(from SOC survey)
• Continued VT reduced	0	
• Temporary VT reduced	9,341	(Temporary placements x temporary VTR factor x .34 discount for temporary use)
Total Daily Vehicle Trips Reduced	**3,197**	

Daily VMT Reduced

• Continued one-way trip dist (mi)	0	
• Temp trip dist (mi)	19.6	(from SOC survey)
• Continued VMT reduced	0	
• Temp VMT reduced	62,655	(Temp VT reduced x Temp trip distance)
Total Daily VMT Reduced	**62,655**	

Daily Emissions Reduced

NOx reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	3,197	0.9905			3,166	0.0035
• Running (40 mph)			62,655	0.6995	43,827	0.0483
Total NOx reduced (tons)						**0.0518**

VOC reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	3,197	2.3454			7,497	0.0083
• Running (40 mph)			62,655	0.2717	17,023	0.0188
Total VOC reduced (tons)						**0.0271**

APPENDIX 5 - CALCULATION OF I-RS - SOFTWARE UPGRADE IMPACTS

Populations of Interest – Commuter Connections Rideshare Applicants

• FY 2003	40,125	(CC database)
• FY 2004	46,888	(CC database)
• FY 2005	56,313	(CC database)
Total applicants	**143,326**	

Software Upgrades Placement Rates

• Continued placement rate	3.2%	(CC placement surveys)
• Temporary placement rate	2.1%	(CC placement surveys)

Placements

• Continued placements	4,581	(CC applicants x continued placement rate)
• Temporary placements	3,018	(CC applicants x temporary placement rate)
Total placements	**7,599**	

Daily Vehicle Trips Reduced

VTR Factors

• Continued VTR factor	0.51	(CC placement surveys)
• Temporary VTR factor	0.37	(CC placement surveys)
• Continued VT reduced	2,345	(Continued placements x continued VTR factor)
• Temporary VT reduced	121	(Temporary placements x temporary VTR factor x 0.11 discount for temporary use)
Total Daily Vehicle Trips Reduced	**2,466**	

Daily VMT Reduced

• Continued one-way trip dist (mi)	35.4	(CC placement survey)
• Temp trip dist (mi)	34.8	(CC placement survey)
• Continued VMT reduced	82,906	(Continued VT reduced x continued trip distance)
• Temp VMT reduced	4,218	(Temp/one-time VT reduced x Temp/OT trip distance)
Total Daily VMT Reduced	**87,125**	

Trip and VMT Adjustment for SOV Access to HOV Modes (reduce VT and VMT for AQ analysis)

• Non-SOV access % - cont	21%	(CC placement survey)
• SOV access dist (mi) - cont	3.0	(CC placement survey)
• Non-SOV access % - temp	42%	(CC placement survey)
• SOV access dist (mi) - temp	3.0	(CC placement survey)

VT Reduction

• No SOV access (cont)	500	(continued VT x non-SOV access %)
• No SOV access (temp)	50	(temporary VT x non-SOV access %)
Total VT for AQ analysis	**550**	

Appendix 5, continued

VMT Reduction

• No SOV access(cont)	17,675	(continued VT x SOV % x trip distance)
• No SOV access (temp)	1,755	(temporary VT x SOV % x trip distance)
• With SOV access (cont)	52,268	(continued VT x SOV % x (trip dist – access dist)
• With SOV access (temp)	1,939	(temporary VT x SOV % x (trip dist – access dist)
Total VMT for AQ analysis	**73,637**	

Daily Emissions Reduced

NOx reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	550	0.9905			540	0.0006
• Running (40 mph)			73,637	0.6995	51,509	0.0568
Total NOx reduced (tons)						**0.0574**

VOC reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	550	2.3454			1,291	0.0014
• Running (40 mph)			73,637	0.2717	20,007	0.0221
Total VOC reduced (tons)						**0.0235**

Correction for Overlap with MM TERM

Total CC apps FY 03, 04, 05	143,326	
New CC apps FY 04, 05	34,733	24%
Estimated MM share of new CC	15%	
Estimated MM share of IR impact	4%	

	SU Base	**MM**	**Net SU**
Placements	7,599	276	7,323
VT reduced	2,466	90	2,377
VMT reduced	87,125	3,167	83,958
NOx reduced (T)	0.057	0.002	0.055
VOC reduced (T)	0.023	0.001	0.023

APPENDIX 6 - CALCULATION OF EMPLOYER OUTREACH – JURISDICTION SALES REPRESENTATIVES IMPACTS

Populations of Interest

• Sites 100+ with Level 3-4 prog	373	(ACT! database)
• Sites <100 with Level 3-4 prog	443	(ACT! database)
• Employees at L3-4 sites	217,913	(ACT! database)
Total TERM base employees	**217,913**	

Average Vehicle Occupancy (AVO)

• Starting (pre-program)	1.37	(employee survey data)
• Ending (with program)	1.70	(COMMUTER model runs)

Daily person trips

• Starting (pre-program)	435,826	(total employees x 2 one-way trips per day)
• Ending (with program)	435,826	(total employees x 2 one-way trips per day)

Daily vehicle trips

• Starting (pre-program)	318,156	(total employees / starting AVO)
• Ending (with program)	255,758	(total employees / ending AVO)
Total Daily Vehicle Trips Red.	**62,398**	(starting vehicle trips – ending vehicle trips)

Daily VMT Reduced

• One-way trip dist (mi)	16.5	(SOC survey, regional average)
Total Daily VMT Reduced	**1,029,567**	**(**vehicle trips reduced x average trip distance)

Trip and VMT Adjustment for SOV Access to HOV Modes (reduce VT and VMT for AQ analysis)

• Non-SOV access percentage	71%	(from SOC survey)
• SOV access distance (mi)	3.1	(from SOC survey)

VT Reduction

• No SOV access (cont)	44,303	(VT reduced x non-SOV access %)
Total VT for AQ analysis	**44,303**	

VMT Reduction

• No SOV access	730,993	(VT reduced x SOV % x trip distance)
• With SOV access	242,479	(VT reduced x SOV % x (trip dist – access dist)
Total VMT for AQ analysis	**973,471**	

Appendix 6, continued

Daily Emissions Reduced

NOx reduced	Trips	05 Emis. Factor	VMT	05 Emis. Factor	Tot gm	Tot ton
• Cold start	44,303	0.9905			43,882	0.0484
• Running (40 mph)			973,471	0.6995	680,943	0.7506
Total NOx reduced (tons)						**0.7990**

VOC reduced	Trips	05 Emis. Factor	VMT	05 Emis. Factor	Tot gm	Tot ton
• Cold start	44,303	2.3454			103,907	0.1145
• Running (40 mph)			973,471	0.2717	264,492	0.2916
Total VOC reduced (tons)						**0.4061**

Correction for Overlap with EO-Bike and TRC TERMs

	EO base	EO-bike	TRC	Net EO
Vehicle Trips Reduced	62,398	130	1,585	60,683
VMT Reduced (miles)	1,029,567	1,300	26,153	1,002,115
NOx Reduced (tons)	0.799	0.003	0.022	0.774
VOC Reduced (tons)	0.406	0.002	0.012	0.392

APPENDIX 7 - CALCULATION OF EMPLOYER OUTREACH – METRO-CHEK/SMARTBENEFITS IMPACTS

Populations of Interest		
• Worksites with Metrochek	70	(WMATA file, not including private employers 100+ employees listed in ACT! database)
• Employees at Metrochek sites	44,450	(WMATA files)
Total TERM base employees	**44,450**	
Average Vehicle Occupancy (AVO)		
• Starting (pre-program)	1.35	(employee survey data)
• Ending (with program)	1.96	(COMMUTER model runs)
Daily person trips		
• Starting (pre-program)	88,900	(TERM base employees x 2 one-way trips per day)
• Ending (with program)	88,900	(TERM base employees x 2 one-way trips per day)
Daily vehicle trips		
• Starting (pre-program)	65,852	(total employees / starting AVO)
• Ending (with program)	45,385	(total employees / ending AVO)
Total Daily Vehicle Trips Red.	**20,467**	(starting vehicle trips – ending vehicle trips)
Daily VMT Reduced		
• One-way trip dist (mi)	16.5	(SOC survey, regional average)
Total Daily VMT Reduced	**337,703**	**(**vehicle trips reduced x average trip distance)
Trip and VMT Adjustment for SOV Access to HOV Modes (reduce VT and VMT for AQ analysis)		
• Non-SOV access percentage	71%	(from SOC survey)
• SOV access distance (mi)	3.1	(from SOC survey)
VT Reduction		
• No SOV access (cont)	14,531	(VT reduced x non-SOV access %)
Total VT for AQ analysis	**14,531**	
VMT Reduction		
• No SOV access	239,769	(VT reduced x SOV % x trip distance)
• With SOV access	79,534	(VT reduced x SOV % x (trip dist – access dist)
Total VMT for AQ analysis	**319,303**	

Appendix 7, continued

Daily Emissions Reduced

NOx reduced	Trips	05 Emis. Factor	VMT	05 Emis. Factor	Tot gm	Tot ton
• Cold start	14,531	0.9905			14,393	0.0159
• Running (40 mph)			319,303	0.6995	223,353	0.2462
Total NOx reduced (tons)						**0.2621**

VOC reduced	Trips	05 Emis. Factor	VMT	05 Emis. Factor	Tot gm	Tot ton
• Cold start	14,531	2.3454			34,082	0.0376
• Running (40 mph)			319,303	0.2717	86,755	0.0956
Total VOC reduced (tons)						**0.1332**

APPENDIX 8 – CALCULATION OF EMPLOYER OUTREACH FOR BICYCLING IMPACTS

Employer Bike Program

Populations of Interest		
• Sites with bicycle program	85	(ACT! database)
• Employees at bicycle sites	33,675	(ACT! database)
Total TERM base employees	**33,675**	
Average Vehicle Occupancy (AVO)		
With bike services in program		
• Starting (pre-program)	1.32	(employee survey data)
• Ending (with program)	1.59	(COMMUTER model runs)
Without bike services in program		
• Starting (pre-program)	1.32	(employee survey data)
• Ending (with program)	1.59	(COMMUTER model runs)
Daily person trips		
With or w/o bike services		
• Starting (pre-program)	67,350	(total employees x 2 one-way trips per day)
• Ending (with program)	67,350	(total employees x 2 one-way trips per day)
Daily vehicle trips		
With bike services in program		
• Starting (pre-program)	51,172	(total employees / starting AVO)
• Ending (with program)	42,340	(total employees / ending AVO)
Without bike services in program		
• Starting (pre-program)	51,172	(total employees / starting AVO)
• Ending (with program)	42,470	(total employees / ending AVO)
Total Daily Vehicle Trips Red.	**130**	(ending trips w/o bike – ending trips w/ bike)
Daily VMT Reduced		
• One-way trip dist (mi)	10.0	(BTW Day survey)
Total Daily VMT Reduced	**1,300**	**(**vehicle trips reduced x average trip distance)

Appendix 8, continued

Bike-to-Work Day Event

Participants' riding percentage and frequency

• Number of riders	5,738	(BTWD registration data, 2002, 2003, 2004)
• % biking to work before event	78%	(BTWD survey)
• Ave days riding before event	2.4	(BTWD survey)
• % part. Start/incr biking	20%	(BTWD survey)
• Ave days riding after event	1.4	(BTWD survey)
• % new riders still Bk winter	72%	(BTWD survey)
• Weekly bike days during winter	1.1	(BTWD survey)

New Bike Days

• New wkly bike days summer	1,607	(riders x % new after event x ave days summer)
• New wkly bike days winter	909	(riders x % new riders x still ride winter x ave days)
• Total new bike days summer	44,986	(wkly summer days x 28 wks – Apr-Oct)
• Total new bike days winter	19,996	(wkly winter days x 22 wks – Nov-Mar)
• Total new bike days-year	64,982	(summer bk days + winter bk days)
• New bike trips - year	129,963	(annual bike days x 2)

New Bike Trips and VT Reduction

• Ave new daily bk trips	520	(Annual new bike trips / 250)
• % DA/RS on non-bike days	41%	(BTWD survey)
• Daily vehicle trips reduced	213	(daily new bike trips x DA %
BTWD Daily Vehicle Trips Reduced	**213**	

Daily VMT Reduced

• Ave trip distance (mi)	10.0	(BTWD survey)
BTWD Daily VMT Reduced	**2,131**	(vehicle trips reduced x average trip distance)

Total Daily Vehicle Trips Reduced	**343**	(Bike program VT reduced + BTWD VT reduced)
Total Daily VMT Reduced	**3,431**	(Bike program VMT reduced + BTWD VMT reduced)

Daily Emissions Reduced

NOx reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	343	0.9905			340	0.0004
• Running (40 mph)			3,431	0.6995	2,400	0.0026
Total NOx reduced (tons)						**0.0030**

VOC reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	343	2.3454			805	0.0009
• Running (40 mph)			3,431	0.2717	932	0.0010
Total VOC reduced (tons)						**0.0019**

APPENDIX 9 - CALCULATION OF MASS MARKETING IMPACTS

PART 1
Populations of Interest – commuters influenced by ads to contact CC
New CC apps (does not include re-apply or follow-up)

• FY 2003	0	(no MM credit for FY 2003)
• FY 2004	19,656	(CC database)
• FY 2005	15,077	(CC database)
Total applicants	**34,733**	

Commuters influenced by ads to contact CC	15%	(COC – monthly applicant analysis)
New apps 04-05 as % of total	24%	(new apps FY04, 05 / total CC apps)
% all apps influenced by ads	3.6%	

CC Impacts – FY 03-05	**Total**	**MM Share**
• CC placements	55,336	2,011
• CC Vehicle trips reduced	13,466	489
• CC VMT reduced	402,019	14,614

CC Impacts – FY 03-05 – Discounted for AQ Analysis

	Total	**MM Share**
• CC Vehicle trips reduced	6,874	250
• CC VMT reduced	362,916	12,192

Daily Emissions Reduced – Part I

NOx reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	250	0.9905			247	0.0003
• Running (40 mph)			13,192	0.6995	9,228	0.0102
Total NOx reduced (tons)						**0.0105**

VOC reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	250	2.3454			586	0.0006
• Running (40 mph)			13,192	0.2717	3,584	0.0040
Total VOC reduced (tons)						**0.0046**

Appendix 9, continued

PART 2
Populations of Interest – commuters influenced by ads to change mode – no contact CC

Total commuters in region	2,422,811	(SOC and Mini-HH surveys)
• % recall commute message	39%	(SOC and Mini-HH)
• % chg to alt mode after ads	1.0%	(SOC and Mini-HH)
• % chg influenced by ad	85%	(SOC and Mini-HH)
Placements – no contact with CC	**7,785**	(COC – monthly applicant analysis)
Placement Rates		
• Continued placement rate	56%	(SOC and Mini-HH)
• Temporary placement rate	44%	(SOC and Mini-HH)
Placements		
• Continued placements	4,360	(Placements x continued placement rate)
• Temporary placements	3,426	(Placements x temporary placement rate)
Daily Vehicle Trips Reduced		
VTR Factors		
• Continued VTR factor	1.25	(SOC and Mini-HH)
• Temporary VTR factor	1.00	(SOC and Mini-HH)
• Continued VT reduced	5,450	(Continued placements x continued VTR factor)
• Temporary VT reduced	856	(Temporary placements x temporary VTR factor x 0.25 discount for temporary use)
Total Daily Vehicle Trips Reduced	**6,306**	
Daily VMT Reduced		
• Ave one-way trip dist (mi)	16.5	(SOC and Mini-HH)
Total Daily VMT Reduced	**104,052**	

Trip and VMT Adjustment for SOV Access to HOV Modes (reduce VT and VMT for AQ analysis)

• Non-SOV access percentage	71%	(from CC placement survey)
• SOV access distance (mi)	3.1	(from CC placement survey)
VT Reduction		
• No SOV access	4,477	(VT x non-SOV access %)
Total VT for AQ analysis	**4,477**	
VMT Reduction		
• No SOV access	73,877	(VT x SOV % x trip distance)
• With SOV access	24,506	(VT x SOV % x (trip dist – access dist)
Total VMT for AQ analysis	**98,383**	

Appendix 9, continued

PART 2 (cont.)
Daily Emissions Reduced

NOx reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	4,477	0.9905			4,435	0.0049
• Running (40 mph)			98,383	0.6995	68,819	0.0759
Total NOx reduced (tons)						**0.0808**

VOC reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	4,477	2.3454			10,501	0.0116
• Running (40 mph)			98,383	0.2717	26,731	0.0295
Total VOC reduced (tons)						**0.0411**

PART 3 – GRH Credit
From GRH Analysis

Total GRH apps FY 03, 04, 05	27,252	
New GRH apps FY 04, 05	13,884	51%
Estimated MM share of new GRH	8%	
Estimated MM share of GRH impact	4%	

	GRH base	**MM**
Placements	13,819	563
VT reduced	12,350	403
VMT reduced	348,283	14,195
NOx reduced (T)	0.249	0.010
VOC reduced (T)	0.110	0.004

Total – PART 1, PART 2, AND PART 3

	CCContacts	**NoContact**	**GRH**	**Total MM**
Placements	2,011	7,785	563	**10,360**
VT reduced	489	6,306	503	**7,299**
VMT reduced	14,614	104,052	14,195	**132,861**
NOx reduced (T)	0.010	0.081	0.010	**0.101**
VOC reduced (T)	0.005	0.041	0.004	**0.050**

APPENDIX 10 - CALCULATION OF COMMUTER OPERATIONS CENTER IMPACTS

Populations of Interest – Commuter Connections Rideshare Applicants

New, Reapply, Transit/other, follow-up requests

• FY 2003	40,125	(CC database)
• FY 2004	46,888	(CC database)
• FY 2005	56,313	(CC database)
Total assisted commuters	**143,326**	

Within MSA (84%)	120,393
Outside MSA (16%	22,919

COC Placement Rates	**In MSA**	**Out MSA**	
• Continued rate	25.2%	24.3%	
• Temporary rate	13.6%	13.6%	
• Total	38.7%	37.9%	
Placements			
• Continued	30,337	5,533	(Apps x cont. rate)
• Temporary	16,366	3,101	(Apps x temporary rate)
• **Total placements 55,336**			

Daily Vehicle Trips Reduced

VTR Factors			
• Continued	0.33	0.47	
• Temporary	0.38	0.42	
• Temporary discount	10.5%	10.5%	
• Continued trips reduced	10,075	2,596	(Placements x cont. VTR factor)
• Temporary trips reduced	657	138	(Placements x temp VTR factor)
Total VT reduced 13,466			

Daily VMT Reduced

Ave one-way trip distance (mi)

• Continued	29.9	29.9	(Actual Outside dist. 54.4 miles)
• Temporary	28.6	28.6	(Actual Outside dist. 57.9 miles)
• Continued VT reduced	301,593	77,713	(Vehicle trips x ave distance)
• Temporary VT reduced	18,769	3,944	

Total VMT Reduced 402,019

Appendix 10, continued

Trip and VMT Adjustment for SOV Access to HOV Modes (reduce VT and VMT for AQ analysis)

	In MSA	Out MSA	
• Non-SOV access % - cont/temp	39%	0%	(CC placement survey)
• SOV access dist (mi) – cont/temp	5.9	0.0	(CC placement survey)

VT Reduction

• No SOV access (cont + temp)	4,139	2,734	(VT x non-SOV access %)

Total VT for AQ analysis 6,874

VMT Reduction

• No SOV access (cont + temp)	123,572	81,657	(VT x SOV % x (dist – access dist))
• SOV access (cont + temp)	157,688	0	

Total VMT for AQ analysis 362,916

Daily Emissions Reduced

NOx reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	6,874	0.9905			6,808	0.0075
• Running (40 mph)			362,916	0.6995	253,860	0.2798
Total NOx reduced (tons)						**0.2873**

VOC reduced	**Trips**	**05 Emis. Factor**	**VMT**	**05 Emis. Factor**	**Tot gm**	**Tot ton**
• Cold start	6,874	2.3454			16,122	0.0178
• Running (40 mph)			362,916	0.2717	98,604	0.1087
Total VOC reduced (tons)						**0.1265**

Correction for Overlap with Integrated Rideshare and GRH TERMs

	COC base	**MM**	**Kiosk**	**SoftUpg**	**GRH**	**Net COC**
Placements	55,336	2,011	318	7,323	3,040	42,645
Vehicle Trips Reduced	13,466	489	77	2,377	740	9,783
VMT Reduced (miles)	402,019	14,614	2,310	89,958	22,082	279,055
NOx Reduced (tons)	0.287	0.010	0.0017	0.055	0.016	0.204
VOC Reduced (tons)	0.126	0.005	0.0007	0.023	0.007	0.092

Notes:
MM influenced commuters – from MM analysis, Appendix 9
Kiosk – 0.7% of COC base applications obtained through kiosks
GRH – 13.3% of new apps/reapps ask for GRH and other info = 5.7% of COC total after MM adjustment