**United States
Environmental Protection
Agency**

COMMUTER Model v2.0
User Manual

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Transportation and Regional Programs Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

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The purpose in the release of such reports is to facilitate the exchange of
technical information and to inform the public of technical developments which
may form the basis for a final EPA decision, position, or regulatory action.

Table of Contents

List of Tables

List of Figures

1. INTRODUCTION

1.1 What is the COMMUTER model?

The COMMUTER model (subsequently referred to as simply "COMMUTER") is a spreadsheet-based computer model that estimates the travel and emissions impacts of transportation air quality programs focused on commuting. The model is particularly useful for programs such as those recognized under the EPA's Best Workplaces for Commuters℠ and other Commuter Choice Programs.

1.2 Who will use COMMUTER?

EPA designed COMMUTER for two types of users:

- Metropolitan Planning Organizations (MPOs) and state Departments of Transportation (DOTs) who are assessing emissions impacts of various Transportation Control Measure Strategies. These impacts can be incorporated into State Implementation Plan (SIP) analyses.

- Individual employers who are assessing the likely effectiveness of various commuter benefit packages and other measures to facilitate use of commute alternatives.

MPOs and DOTs can also provide guidance and assistance to employers participating in voluntary programs on the application of this tool.

1.3 Why was COMMUTER created?

COMMUTER was designed to help simplify the effort required by air quality planners to estimate travel and emission effects resulting from Transportation Control Measures. The model can also be used to estimate the benefits of site-specific Commuter Choice (employer-based transportation) programs to assist employers in designing a program appropriate for them.

The 1990 Clean Air Act Amendments mandated that the EPA and DOT provide guidance on "the formulation and emission reduction potential of transportation control measures related to criteria pollutants and their precursors" (Section 108(f)). In the early 1990s, EPA developed a number of tools and guidance documents to assist communities in developing these measures and taking credit for the resulting emission reductions. Because the effects of TCMs on travel activity and emissions can be very complex, the

guidance included many aspects of vehicle operation and other factors that affect emissions. The guidance documents were often very detailed and difficult to use.

COMMUTER consolidates existing TCM guidance, and is based on "state-of- practice" methodologies and data. COMMUTER will reduce the time required to calculate the benefits of regional and employer-based TCMs. It will also save regional government resources, since these governments will have less need to develop their own models and tools.

1.4 What Programs can I evaluate with COMMUTER?

You can use COMMUTER to evaluate these types of programs, either for a defined region within an urban area, or for individual employers:

- Transit fare decreases or other incentives that reduce the cost of using transit;

- Transit service improvements (faster or more frequent service);

- Ridesharing programs, in which employers support carpooling and/or vanpooling through on-site programs, financial incentives, or preferential parking;

- Other actions, such as increased parking charges or cash-out programs, that change the time and/or cost of traveling by any particular mode;

- Non-motorized (e.g., bicycle and pedestrian) commuting programs;

- Alternative work schedules, including flex-time, compressed work weeks, and staggered work hours; and

- Telecommuting.

1.5 What methodology does COMMUTER use?

COMMUTER is broken down into two components: travel impacts and emissions impacts.

The travel impacts component uses a logit mode-choice model referred to as the "pivot point" approach. This approach allows you to analyze the effects of several strategies simultaneously. Mode choice models have been developed for many cities and regions nationwide, so you can often use coefficients that have already been developed to reflect local characteristics. This component will calculate the impact of the mode share changes

from these programs and translate the mode share changes into changes in trips and vehicle miles traveled (VMT). In addition, COMMUTER contains an input option that allows you to enter mode share changes directly (such as might be obtained from employee survey data) as an alternative to the pivot point-based calculation performed internally by the model.

The emissions component is based on EPA's MOBILE6.2 model. MOBILE6.2 emission factors were generated and loaded into COMMUTER for several sets of local conditions. You can select the conditions most appropriate for your area, and the model will apply the corresponding emission factors in calculating and outputting emission reduction impacts. If you are an experienced MOBILE6.2 user, you can also generate your own set of MOBILE6.2 emission factors (reflecting your exact local conditions) that can be imported into COMMUTER. In fact, if you intend to use COMMUTER to produce emissions reduction estimates for SIP submittals or conformity determinations, your emission outputs from COMMUTER must be based on an imported MOBILE6.2[*] run using your own local or state information. See the BWC SIP and Conformity Guidance for more information on how to include control measures from BWC programs in SIPs and conformity determinations.

1.6 When can I use COMMUTER, and when should I not use it?

COMMUTER is particularly useful for smaller Transportation Control Measures and can be used for the purpose of calculating State Implementation Plan (SIP) credit or for conformity determinations. The model will not perform as well for larger programs, particularly those large enough to impact travel speeds throughout an area. If your program is likely to have a regionally significant effect on travel patterns[**] it must be analyzed within the modeling performed by the MPO during its regional emissions analysis You should consult with your regional EPA office if you believe your program can have these impacts. In this case, you can still use COMMUTER to calculate an initial estimate of a potential program. You may want to do this to help you select a program and determine if you want to further consider particular options.

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[*] EMFAC is required for SIP modeling in California. COMMUTER does not have the ability to import EMFAC emission factor output.

[**] 40 CFR 93.101 defines a "regionally significant" project as "a transportation project (other than an exempt project) that is on a facility which serves regional transportation needs (such as access to and from the area outside of the region, major activity centers in the region, major planned developments such as new retail malls, sports complexes, etc., or transportation terminals as well as most terminals themselves) and would normally be included in the modeling of a metropolitan area's transportation network, including at a minimum all principal arterial highways and all fixed guideway transit facilities that offer an alternative to regional highway travel."

> ***IMPORTANT****: COMMUTER is <u>not</u> designed to quantify baseline travel or emissions. Instead, its purpose is to estimate travel and emission <u>changes</u> associated with specific measures, based on inputs you provide. Thus, although COMMUTER may be used to calculated SIP credits for these measures, the baseline travel or emissions estimates it generates will <u>not</u> exactly match your baseline SIP inventory.*

The COMMUTER Model is most appropriately applied to a single worksite, employment center, or subarea for sketch-level analysis purposes. Its most robust predictive power lies with measures that can be translated into time and cost strategies. The factors used for employer support and alternative work arrangements are based on the best research and professional judgment available. In most cases, though, the empirical evidence to support these factors is very limited. Furthermore, the impacts of any one type of program can vary substantially, depending upon the characteristics of the worksites being evaluated, the employees who work there, and how effectively a given program is implemented. For some planning purposes, therefore, it may be necessary to gather additional empirical data and/or conduct more detailed modeling, in order to increase the reliability of the estimate of a program's impacts.

1.7 What do I need to do to get started?

In order to run the model, you will need to gather background information about the travel characteristics in your area. MPOs or Councils of Government (COGs) generally compile this information for an area. Regional COGs are local government organizations designed to study and recommend solutions to problems facing an individual region and to help their local government members apply effective, coordinated regional planning. MPOs are similar organizations that focus on transportation-related planning.

If you are an employer or other non-MPO user of this model, you should contact the MPO or COG in your area. The National Association of Regional Councils (NARC) maintains an Internet website at http://www.narc.org. From the NARC home page, you can access information about the Association of Metropolitan Planning Organizations (AMPO) and lists of COG and MPO links by state (http://www.narc.org/links/member.html). If you are unsure of the appropriate source, you should consult with your regional EPA office to find the appropriate source of information.

You will also need specific background information for your particular program. This user manual will assist you in determining the appropriate inputs into the model. Again, if you have any further questions, you can consult with your regional EPA office.

1.8 What other documentation is available?

This user manual presents the key instructions needed for you to effectively develop inputs and run COMMUTER. Although it attempts to provide you with enough information to understand how to develop inputs and operate the model, it is not exhaustive in detail. If you are interested in further understanding the theory behind the modeling calculations, please consult the companion document to this user manual, *"Procedures Manual for the COMMUTER Model v2.0."*[1]*

1.9 What has Changed Compared to COMMUTER Version 1.0?

COMMUTER Model version 1.0 was originally released in 2000. Version 2.0, released in 2005, incorporates a number of updates and changes to calculation procedures, to make use of the most recently available travel and emissions data and to expand the model's capabilities. Significant changes include the following:

- The default travel parameters (e.g., mode shares, trip lengths) have been updated using data from the 2000 U.S. Census, the 2001 Nationwide Household Transportation Survey, and other recent sources.
- The default and area-specific mode choice coefficients have been updated based on a review of current national practice. Default coefficients are no longer provided for different area sizes, since a review of the coefficients did not find significant differences among urban areas of different sizes.
- Some of the TCM impact values embedded in the model have been updated, based on recent research. These include the mode share impacts for "level 3" and "level 4" carpooling and vanpooling support, and default participation level for telecommuting programs.
- Emissions are now calculated using MOBILE6.2, EPA's most current version of the MOBILE emission factor model, rather than MOBILE5b.
- Emissions are reported for seven additional pollutants, including particulate matter (PM2.5, users can get PM10 output by importing their own MOBILE6.2 runs with PM10 output) and six air toxics, as well as for the four pollutants originally reported by COMMUTER - volatile organic compounds (VOC), carbon monoxide (CO), oxides of nitrogen (NOx), and carbon dioxide (CO2). Emissions for some pollutants are now reported in pounds per day as well as in tons per day.

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* Superscripts denote references provided in Section 6.

- The procedure for calculating emissions changes has been revised for consistency with MOBILE6.2 format emissions data. Additional user inputs may be specified, including the percentage of vehicle-miles of travel (VMT) by facility type, and average travel speeds for both freeways and arterials in both the peak and off-peak periods. On the other hand, user inputs for the percentage of cold starts are no longer required.

2. USING THE MODEL

This section explains how to install COMMUTER and provides a general overview of how to run each element of the program, as well as how to view and save your results. Further details on the type of data required are provided in Section 3 (for general existing condition inputs), Section 4 (TCM-specific information), and Section 5 (emissions-related information).

2.1 What type of computer equipment and software do I need?

COMMUTER runs on personal computers using Microsoft's Windows 95 or later operating systems. You must also have Microsoft Excel 95 (i.e., Excel 7.0) or a more recent version of Excel installed. If your computer allows you to run these programs, you can use COMMUTER. (However, if you have a Pentium-class CPU with less than 150 MHz, moving through the input screens may be slow at times.)

COMMUTER will work at 640 x 480, 800 x 600, and 1,024 x 768 display resolutions at both 250-color and 16-bit (Hi-Color) depths, and should run at any available video display setting.

The COMMUTER model itself requires a minimum of 2.0 MB of disk space. In addition, the default MOBILE6 emission factors that may be used with the model are provided in 192 external tab-delimited data files (.tbz) that require 12.2 MB when zipped or 47.4 MB when unzipped. If disk space is a concern, the user may choose to retain only the files that are relevant to their analysis area. If the user chooses to provide their own MOBILE6 outputs, the output file will require approximately 40 MB of disk space.

2.2 How do I install and operate COMMUTER?

Installing the Program

Installing COMMUTER is quite simple. The model, along with some sample files, is contained in the **COMM1.EXE** self-extracting archive file (which can be downloaded from EPA's web site at http://www.epa.gov/otaq/transp.htm). Step-by-step installation instructions are given as follows.

> Step 1 - Create a new folder or directory on your computer where you want to install and operate COMMUTER (e.g., C:\COMMUTER). (When you run COMMUTER, it can create and re-use "scenario" files that store your data and assumptions for a

particular analysis case or scenario. Thus, it is highly recommended that you create a separate folder for COMMUTER so these files don't get mixed up with others.)

Step 2 - Download or copy the **COMMUTER_v20.ZIP** file to your computer and unzip it, directing it to deploy all files to the folder or directory you just created.

When this is complete you should have a folder entitled "COMMUTER_v20" within the directory you've chosen with the following items: the model itself, **COMMUTER_v20.xls**; an example scenario file entitled **Example Scenario_v20.vme**; a sample MOBILE6.2 input file entitled **M6sample.in**; and a folder entitled **Data** containing 192 files with a .tbz extension. These files contain data related to the Petroleum Administration for Defense Districts (PADDs) that are needed to compute changes in emissions of air toxics. It is important that the **Data** folder be in the same folder as **COMMUTER_v20.xls**. If the **Data** folder is in a different location, COMMUTER will be unable to access the files.

Finally, you should check your macro security level in Excel to ensure that it is set on "Medium." This is done by opening the "Tools" menu, selecting "Macro," and then selecting "Security." You will have a choice of High, Medium, or Low security. Select Medium. COMMUTER's macros will not run if the security level set to High, and Low is not recommended.

Running the Program

Once you have installed the program, there are several different ways that you can run the program.

- Create and launch a shortcut to the application;

- Double-click[*] the **COMMUTER_v20.xls** file from within the Windows Explorer or Internet Explorer window (assuming Excel has been installed and associated with .XLS file types);

- Right-click the **COMMUTER_v20.xls** file and click "Open" from the pop-up menu; or

- Click the Start button at the bottom left of the Windows desktop, select "Documents" from the pop-up menu, and then click the **COMMUTER_v20.xls** file from the pop-up list of documents.   (This method will work only if you have

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[*] If the Windows Explorer has been replaced by Internet Explorer (e.g., in Windows 98), Internet Explorer can be configured to launch programs with a single mouse click instead of a double-click.

recently opened the **COMMUTER_v20.xls** file and it still appears in your "Recent Documents" list.)

You cannot run the program by launching a previously created scenario file (.vme) from the Windows desktop. Scenarios must be opened from within the program after it has been launched in one of the ways described above. As the program launches you will see a dialogue box stating that the file has macros and asking you to choose when to disable the macros or enable them. Select "Enable Macros." As the program loads, you will see a startup screen like the one shown below in Figure 1.

Figure 1
COMMUTER Startup Screen
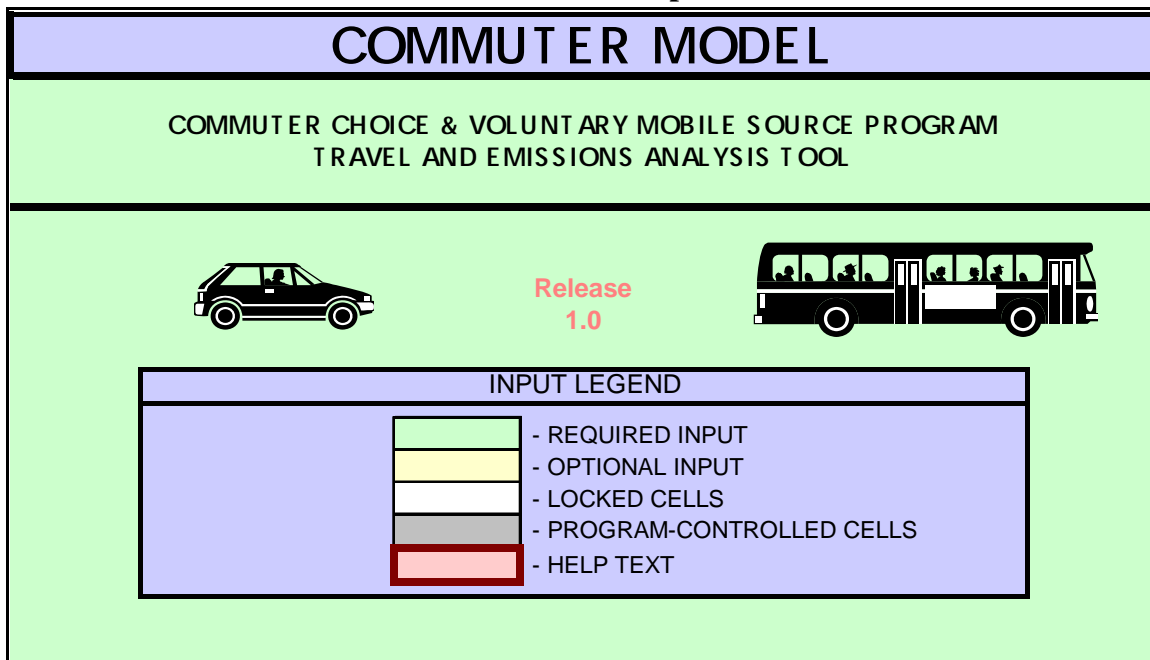
The startup screen includes an "input legend" showing the colors that are used to identify the different types of cell ranges that you will see on the data entry screens. Different colors are used to identify cells that you type inputs into and to highlight on-screen help boxes as listed below:

- light green - required input cells;
- yellow - optional input cells;
- white - locked (i.e., non-editable) cells;
- gray - program-controlled cells; and
- red - help text boxes.

9

Required inputs must be typed into all light-green cells shown in the edit screens. You can also supply inputs in the yellow shaded cells, but the program will run if they are left blank. (However, it is a good idea to use these optional input cells to supply more information about the analysis scenario you are constructing.) White and gray cells are locked from editing and are used to display information. Finally, red cells highlight help boxes containing brief instructions for the inputs being entered on each screen.

> *__NOTE__: When the program has finished loading, you will see a "Ready" indicator at the bottom left of the application window.*

The user interface for COMMUTER has been programmed to display on your entire screen (i.e., in "full" screen). If you need to temporarily minimize the COMMUTER application to the Windows taskbar (located at the bottom of the Windows desktop by default), type "*Ctrl-m*" (i.e., hold down the Ctrl key and type "m"). To restore the COMMUTER application to the full screen, just click its button in the Windows taskbar.
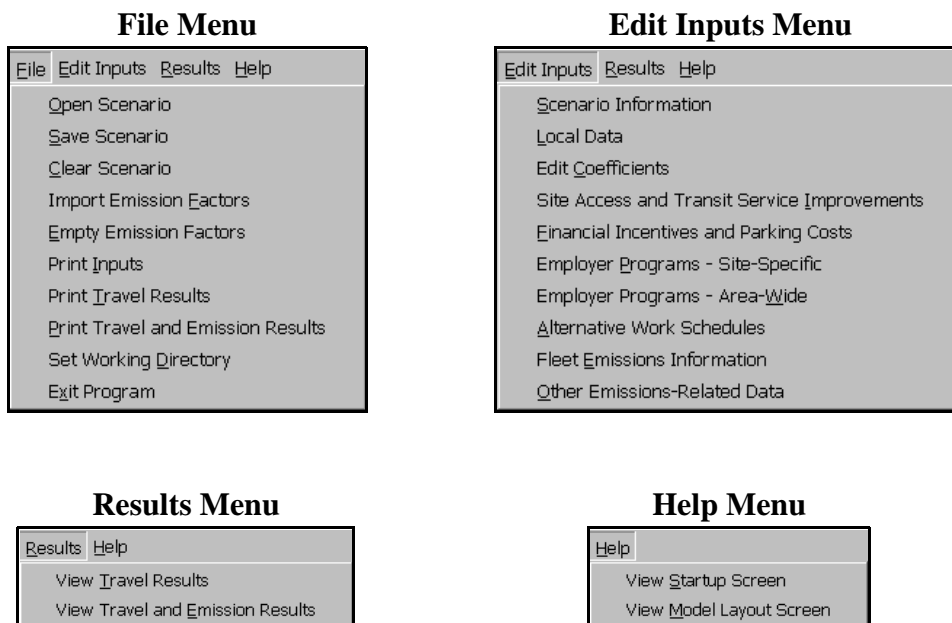
2.3 How do I begin once the program is installed?

Once the program finishes loading, you can select from four main menus listed at the top of the screen: the File menu, the Edit Inputs menu, the Results menu, and the Help menu. These menus will be available at the start of every session, and will allow you to enter data (Edit Inputs menu), view results (Results menu), print results (File menu), get help (Help menu), and retrieve or save data and results for a specific analysis (referred to as a "scenario", accessed through the File Menu).

Figure 2 shows the structure of the main menu, which includes the "File," "Edit Inputs," "Results," and "Help" menus, and each of the sub-menu elements.

You will generally begin an analysis by clicking through the data entry elements in the Edit Inputs menu in the order in which they are listed in the menu. (Once you have defined an analysis, you can later load and edit a scenario from the File menu; this will be discussed later in Section 2.6.) Each of the elements in the Edit Inputs menu corresponds to the input screens for entering specific data required by COMMUTER. (Detailed information on the data required for these screens is provided in Sections 3-5.)

10

Figure 2
Menu Structure

File Menu

File Edit Inputs Results Help

    Open Scenario
    Save Scenario
    Clear Scenario
    Import Emission Factors
    Empty Emission Factors
    Print Inputs
    Print Travel Results
    Print Travel and Emission Results
    Set Working Directory
    Exit Program

Edit Inputs Menu

Edit Inputs Results Help

    Scenario Information
    Local Data
    Edit Coefficients
    Site Access and Transit Service Improvements
    Financial Incentives and Parking Costs
    Employer Programs - Site-Specific
    Employer Programs - Area-Wide
    Alternative Work Schedules
    Fleet Emissions Information
    Other Emissions-Related Data

Results Menu

Results Help

    View Travel Results
    View Travel and Emission Results

Help Menu

Help

    View Startup Screen
    View Model Layout Screen

When the program is first loaded, some of the sub-menu elements shown in the Edit Inputs menu will be shown as gray shaded-out text, which indicates that you have not yet selected any TCM programs for analysis. (As explained below, you will make these selections by using the check boxes at the bottom of the Scenario Information screen.)

2.4 How do I input data?

The Edit Inputs menu lists each of the input screens available. Some of the screens are for inputting baseline (i.e., existing condition) information needed regardless of the type of TCM being analyzed; others will be used only when analyzing a particular measure.

> *__IMPORTANT__: The program will automatically size the width of the data entry screens to the width of your monitor. However, the length of some of the screens will exceed the monitor's vertical display dimension. Therefore, for some input screens (such as the Scenario Information and Local Data screens), you must scroll to the bottom of the screen to complete the data entry required in that screen by using the vertical scroll bar or the "Down Arrow" or "Page Down" keys.*

The information that must be entered in each input screen is listed in Table 1. The data required in the first three screens ("Scenario Information," "Local Data," and "Edit Coefficients") consist of general information, background travel data, and mode-choice coefficients.

Table 1 **Summary of COMMUTER Data Inputs**	
Input Screen	Data Required
Scenario Information	General information, including area size and scope (i.e., regional vs. site-specific) being analyzed and the TCM programs being evaluated
Local Data	Background travel data such as existing mode shares, trip lengths, occupancy levels, baseline vehicle miles traveled, baseline speeds, and option to provide final mode shares (after TCMs)
Edit Coefficients	Provides default mode choice coefficients as a function of the area size entered earlier and for selected cities, which can be edited by the user
Site Access & Transit Service Improvements	Data required for analysis of either site access or transit service improvement TCMs, including changes in site access walk times and employer participation rates, and transit headway and route travel time changes
Financial Incentives & Parking Costs	Inputs for analysis of financial and parking incentive programs consisting of changes in parking, transit fare, or other costs by travel mode
Site-Specific Employer Support Programs	Parameters that specify either the program participation level or expected mode share increase resulting from the implementation of an employer (i.e., site) specific commuter choice program
Area-Wide Employer Support Programs	Employer participation level inputs required for area-wide analysis of commuter choice programs being implemented across a metropolitan area

Table 1 Summary of COMMUTER Data Inputs	
Alternative Work Schedules	Existing and expected eligibility or participation rates for alternative work schedule programs being evaluated, such as flex time, compressed work weeks, staggered hours, and telecommuting
Fleet Emissions Information	Inputs required by the program in order to either apply a pre-generated set of MOBILE6.2 fleet emission factors or to utilize locally generated MOBILE6.2 emission factors imported into the model
Other Emissions-Related Data	Fleet travel mix (e.g., fraction of travel by vehicle class) and start fraction inputs required by the program to calculate TCM emission reductions that are specific to the local conditions being modeled

If you have not yet done any analyses or want to analyze a new scenario, you will start with the Scenario Information screen to enter general background information and to select the type(s) of TCM programs being evaluated. This selection is made by checking the appropriate boxes shown at the bottom of the Scenario Information screen. You can enter any non-blank character in the check boxes to activate analysis of the specific TCMs.

Travel data should be entered using the Local Data screen, and you can use the Edit Coefficients screen to edit the default mode choice coefficients provided with the program. (Images of these screens and details on the data required are provided in Section 3.) By default, COMMUTER calculates changes in mode share due to the types and extent of specific TCM programs being modeled. If , however, you have estimates of changes in mode share due to modeled programs, you can optionally enter the final mode shares (resulting from changes to existing shares) in the Local Data screen.

Data for the specific TCM program(s) being evaluated are entered in the next five screens. *You will have access to only those screens that were selected (checked off) for analysis in the Scenario Information screen.* Detailed information on these screens is provided in Section 4.

> *__NOTE__: If you have chosen to enter your own final mode share estimates in the Local Data screen, you do __not__ need to enter information in any of the TCM-specific program screens. In this case, the inputs in these screens are bypassed and the final mode shares you have entered are used to compute VMT and trip impacts.*

Finally, you will enter emission-related data in the last two data screens (addressed in Section 5). This will include either vehicle fleet parameters that allow the program to find and apply a specific set of previously generated MOBILE6.2 emission factors that approximate local conditions being modeled, or selection of MOBILE6.2 emission factors that you have generated to more precisely reflect local conditions.

> *__NOTE__: You may see a "Calculate" annunciator on the status bar at the bottom of the application window while you are entering data. This is normal. During data entry, the program recalculates only specific portions of the underlying spreadsheets in order to speed up performance. Later, when you view or print results or save the scenario data, all underlying sheets are recalculated.*

If you are only interested in computing travel impacts, you do not need to enter any emissions-related inputs in these last two screens.

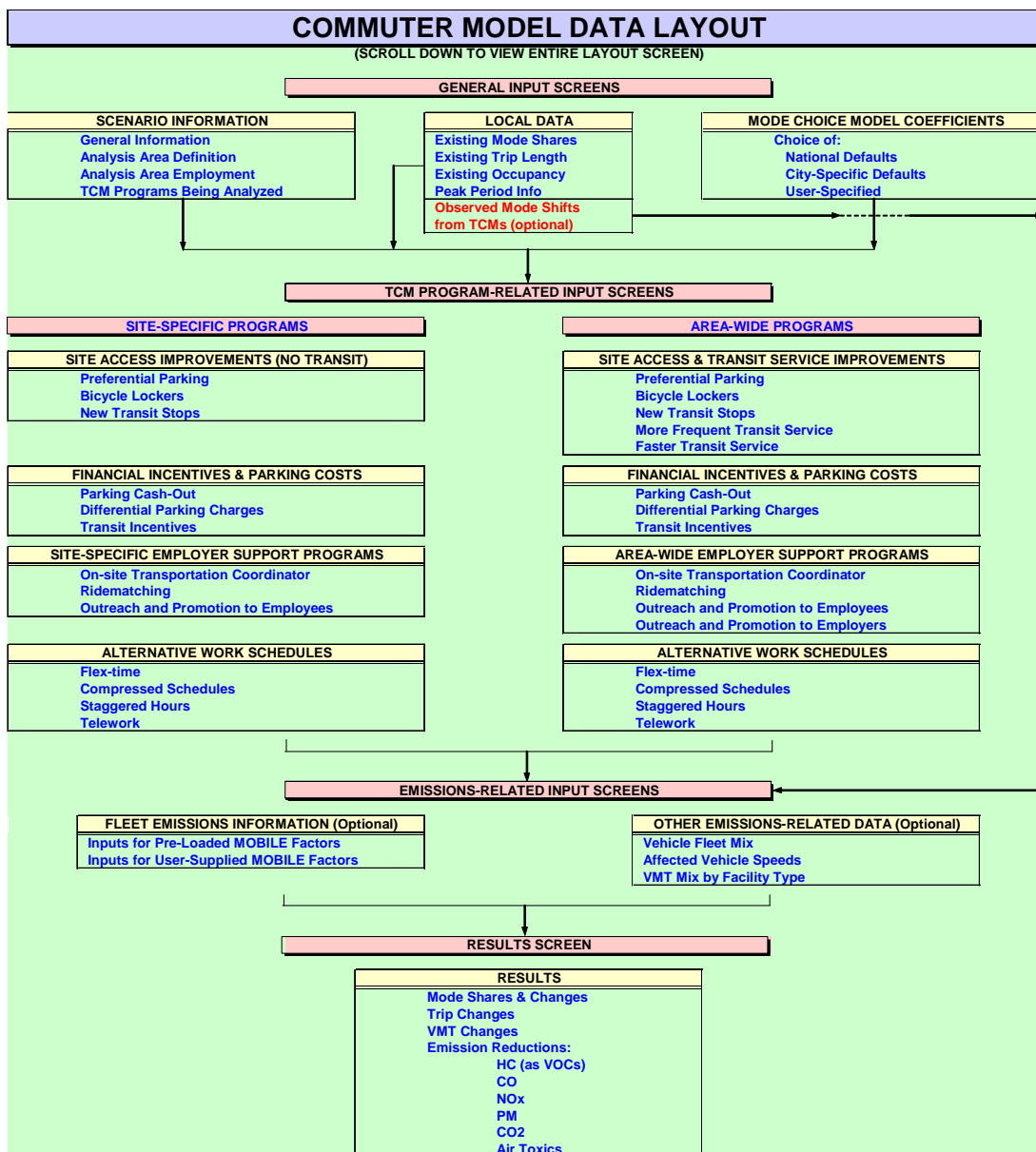## 2.5 Is there help available when inputting data?

From the Help menu, you can view a "Model Layout" screen that provides an overview of the layout and data flow of COMMUTER. The Model Layout screen also identifies the input screens that apply to specific voluntary measures and commuter choice programs. Figure 3 shows the Model Layout screen. Note that on smaller monitors, you may need to scroll down to view the entire screen.

You can also return to the Startup screen from the Help menu. (This is handy if you need to refer to the cell coloring conventions used to guide you in entering model inputs.)

In addition, many of the input screens offer additional guidance on the specific data that must be entered. In some screens, explanatory notes are shown next to the input cell. In other screens, "help boxes" displayed with light red backgrounds provide more extensive descriptions of key data inputs.

Once you've finished inputting all the required data for each screen (remember that in some cases you may need to scroll down your screen to complete data entry), that screen will appear with a checkmark (✓) beside it the next time the Edit Inputs menu is accessed. You can use the presence or absence of checkmarks as an easy visual reference of additional data that must still be entered.

Figure 3
Model Layout Screen

COMMUTER MODEL DATA LAYOUT
(SCROLL DOWN TO VIEW ENTIRE LAYOUT SCREEN)

GENERAL INPUT SCREENS

SCENARIO INFORMATION	LOCAL DATA	MODE CHOICE MODEL COEFFICIENTS
General Information	Existing Mode Shares	Choice of:
Analysis Area Definition	Existing Trip Length	National Defaults
Analysis Area Employment	Existing Occupancy	City-Specific Defaults
TCM Programs Being Analyzed	Peak Period Info	User-Specified
	Observed Mode Shifts from TCMs (optional)	

TCM PROGRAM-RELATED INPUT SCREENS

SITE-SPECIFIC PROGRAMS	AREA-WIDE PROGRAMS
SITE ACCESS IMPROVEMENTS (NO TRANSIT)	**SITE ACCESS & TRANSIT SERVICE IMPROVEMENTS**
Preferential Parking	Preferential Parking
Bicycle Lockers	Bicycle Lockers
New Transit Stops	New Transit Stops
	More Frequent Transit Service
	Faster Transit Service
FINANCIAL INCENTIVES & PARKING COSTS	**FINANCIAL INCENTIVES & PARKING COSTS**
Parking Cash-Out	Parking Cash-Out
Differential Parking Charges	Differential Parking Charges
Transit Incentives	Transit Incentives
SITE-SPECIFIC EMPLOYER SUPPORT PROGRAMS	**AREA-WIDE EMPLOYER SUPPORT PROGRAMS**
On-site Transportation Coordinator	On-site Transportation Coordinator
Ridematching	Ridematching
Outreach and Promotion to Employees	Outreach and Promotion to Employees
	Outreach and Promotion to Employers
ALTERNATIVE WORK SCHEDULES	**ALTERNATIVE WORK SCHEDULES**
Flex-time	Flex-time
Compressed Schedules	Compressed Schedules
Staggered Hours	Staggered Hours
Telework	Telework

EMISSIONS-RELATED INPUT SCREENS

FLEET EMISSIONS INFORMATION (Optional)	OTHER EMISSIONS-RELATED DATA (Optional)
Inputs for Pre-Loaded MOBILE Factors	Vehicle Fleet Mix
Inputs for User-Supplied MOBILE Factors	Affected Vehicle Speeds
	VMT Mix by Facility Type

RESULTS SCREEN

RESULTS
Mode Shares & Changes
Trip Changes
VMT Changes
Emission Reductions:
HC (as VOCs)
CO
NOx
PM
CO2
Air Toxics

15

2.6 Can I save my inputs to use in another analysis?

Saving Scenarios - To make repeated use of COMMUTER quicker and easier, you can save a complete set of analysis inputs and re-use them later as a template for evaluating other scenarios. This avoids having to type in complete data from scratch for each analysis, but still allows you to modify selected data to evaluate alternatives.

After inputting data for a specific analysis case, save the information to a "scenario file" (indicated by a ".VME" file extension). First click on the "File" menu and select "Save Scenario." This will bring up a dialog box that allows you to save the file to disk for later use. Click the arrow to the right of the "Save in" box to select the directory where you want to save the file, then type a file name for the scenario to be saved in the "File name" box, using the .VME suffix. (To make it easier to find and use your files, you may want to save the ".VME" scenario files to the same folder or directory where the application program was stored, e.g., C:\COMMUTER.)

Loading Saved Scenarios - When you want to load and re-use a saved scenario file, click the "Load Scenario" item from the File menu. Then, select the directory and the specific scenario file you saved earlier to be loaded into the application. Re-using existing scenarios and making minor changes to their inputs is a more efficient way to create a series of related scenarios than typing in all the data for each scenario.

Clearing Scenarios - If for some reason you have loaded a scenario or have typed in data for all the input cells and want to delete the data from all the input cells and start over, you can click the "Clear Scenario" item on the File menu. This initializes the program by erasing the data currently contained in the input cells if you want to start re-entering all new data without having to exit and reload COMMUTER. It does not delete saved scenario files from your hard disk.

2.7 Can I use my own emission factors?

COMMUTER has been supplied with 192 sets of MOBILE6.2 emission factors that encompass a range of input conditions throughout the country. Each of these supplied data sets contains emission factors for six calendar years: 2007, 2009, 2010, 2013, 2019, and 2021. Under general circumstances when COMMUTER is used as a screening model, selecting the set of pre-loaded emission factors that best matches your local conditions is adequate. However, if you want to use COMMUTER to produce emission reductions reflecting local conditions, such as for SIP or conformity purposes, you must use your own locally generated MOBILE6.2 emission factors to calculate emission reductions in COMMUTER. The steps for using your own emission factors are explained below.

Step 1 - Create Properly Formatted Emission Factor Output File-Although you can specify your exact local input conditions, your MOBILE6.2 output emission factors must be generated in a specific format expected by COMMUTER. The sample MOBILE6.2 template input file M6SAMPLE.IN, which is provided with the model, identifies how specific commands in the MOBILE6.2 input file must be set to produce output emission factors in the COMMUTER-required format. In addition, it contains a series of 13 "Scenario" records that produce emission factors over a range of speeds expected by COMMUTER. These scenario records can be edited to reflect the altitude, calendar year, local ambient temperature, season of interest, and local fuels data. In addition, the user may specify other locality-specific data in the "Run Data" or "Scenario" sections, such as I/M programs, vehicle registration distributions, or alternative Tier 2 phase-in schedules. Speed data files for each scenario are provided with the model and should not be edited.

In addition, the user must specify the "database output" option with the formats shown in the sample file. In addition, the user must specify calculation of particulates as well as air toxics, as shown in the sample file, and provide the fuel parameters and particulate emission factor inputs in each scenario record, as required by MOBILE6.2 to calculate particulate and air toxics emissions. If these conventions are not followed, the resulting MOBILE6.2 model output will not work properly with COMMUTER.

> *IMPORTANT*: *Once you've edited the 13 scenario records to reflect your own altitude, temperature, and season inputs, you can copy and paste this block of records to create emission factors for multiple calendar years.*

Once you have set up your MOBILE6.2 input file as described above and in accordance with the required database output options, run MOBILE6.2. You can name the MOBILE6.2 input and output files as you choose.

Step 2 - Process MOBILE6.2 Output - Once you have run MOBILE6.2, an intermediate step is required to process MOBILE6.2 database-format output into the format expected by COMMUTER. You can run this step from inside the COMMUTER model using the "Process MOBILE6.2 Output" command from the "File" menu. This command will allow you to browse for and select a standard MOBILE6.2 database output file (.TB1) extension. It will then convert the data in this file into a text file suitable for import into COMMUTER, with a .TBZ extension. Note that corresponding toxics and PM MOBILE6.2 output files are also read (.TOX

and .PM extensions, respectively), and a corresponding VMT file (.VMT) is also generated that contains VMT fractions by vehicle type and facility type. The model user must retain these files in the same directory as the .TB1 and .TBZ files and should not delete them. The routine to process MOBILE output may take a few minutes to run; this is normal.

Step 3 - Activate User-Supplied Emission Factors Option - On the "Fleet Emissions Information" input screen in COMMUTER, you have the option of selecting "User-Supplied Emission Factors." Once you have selected this option and specified a calendar year, you will be reminded to Import User Emission Factors, as described below. It is important that the calendar year you have specified match one of the calendar years included in the .TBZ file you select.

Step 4 - Import User Emission Factors - Once you have generated a .TBZ file, you can import this file into the COMMUTER model using the "Import User Emission Factors" command from the "File" menu. This command will allow you to browse for and select a .TBZ file. You may select any .TBZ file that you already have generated from MOBILE6.2 output, without re-running the "process MOBILE6.2 output" routine described above. Importing the .TBZ file will take a few seconds; you will be notified when the import routine has been successfully completed. These emission factors will be saved within the COMMUTER model until you import a different set of either user-specified or default scenario emission factors.

2.8 How do I view the results?

Once you have provided all of the required inputs (or selected default values), COMMUTER will automatically calculate TCM travel impacts and, if you've entered emission factor inputs, emission reductions. To view the results, all you need to do is simply click either of the two command items on the Results menu. "View Travel Results" displays travel impacts only. "View Travel and Emission Results" shows both travel impacts and emission reductions (assuming you've entered emission factor inputs).

You can then scroll down the tabular summary to see the calculated results. Key outputs include the following:

- Baseline and final mode shares for each mode, including percent of trips eliminated and change in mode share (final minus baseline);

- Percent of trips shifted from the peak to off-peak period;

- Baseline and final peak, off-peak and daily VMT;

- Baseline and final peak, off-peak and daily vehicle trips; and

- Change in total daily emissions for each pollutant in tons per day and/or pounds per day.

> *__NOTE:__ If you did not enter all of the necessary input data, an "Incomplete or Inconsistent Input" message box will be displayed when the View Travel Results or View Travel and Emission Results buttons are clicked. The message box indicates which data must still be entered. If you click the OK button in the message box, the program will activate the first entry screen and cell for which missing or invalid data were detected.*

To return to an input screen after viewing the results calculated by COMMUTER, simply click the appropriate item in the Edit Inputs menu at the top of the application window.

2.9 How do I print my data and results?

For each scenario you evaluate, you can print both the detailed input data and the tabulated emission reductions. To do this, click the File menu. Then select "Print Inputs" from the drop-down menu to print a detailed listing of all program inputs.   Select either "Print Travel Results" or "Print Travel and Emission Results" from the File menu to print a one-page output report showing travel impacts or travel impacts and emission reductions, respectively.

Figure 4 shows the layout of a sample output report. General scenario information and the specific TCMs evaluated are listed at the top of the report. Included in these items are boxes that indicate whether you have supplied your own final mode shares and emission factors. Below these items, summaries of the combined mode share impacts and travel and emission reductions from baseline levels for all the TCMs selected are presented. As noted in the table headers, travel and emission reductions are shown as positive numbers.

Figure 4

COMMUTER MODEL RESULTS

SCENARIO INFORMATION

Description	
Scenario Filename	
Emission Factor File	
Performing Agency	
Analyst	
Metropolitan Area	
Area Size	
Analysis Scope	
Analysis Area/Site	
Total Employment	

PROGRAMS EVALUATED

- ☐ Site Walk Access Improvements
- ☐ Transit Service Improvements
- ☐ Financial Incentives
- ☐ Employer Support Programs
- ☐ Alternative Work Schedules

- ☐ User-Supplied Final Mode Shares

MODE SHARE IMPACTS

Mode	Baseline	Final	%Change
Drive Alone			
Carpool			
Vanpool			
Transit			
Bicycle			
Pedestrian			
Other			
No Trip			
Total			

Shifted from Peak to Off-Peak	

TRAVEL IMPACTS (relative to affected employment)

Quantity	Peak	Off-Peak	Total
Baseline VMT			
Final VMT			
VMT Reduction			
% VMT Reduction			
Baseline Trips			
Final Trips			
Trip Reduction			
% Trip Reduction			

EMISSION REDUCTIONS (positive values are decreases)

lbs/day:

Pollutant	Peak	Off-Peak	Total
HC			
CO			
NOx			
PM2.5			
Toxics			
Acetaldehyde			
Acrolein			
Benzene			
1, 3-Butadiene			
Formaldehyde			
MTBE			
CO2			

tons/day:

Pollutant	Peak	Off-Peak	Total
HC			
CO			
NOx			
CO2			

20

> *__CAUTION:__ The program allows you to set up a scenario and produce results for an individual TCM (as opposed to a combination of measures). However, summing the results for measures evaluated individually will not give you an accurate representation of the true impact of a combination of measures.*

2.10 Can I tell the model to remember where my files are stored?

Depending on how you launch COMMUTER (see Section 2.2), your "default" directory (the directory pointed to when you open or save files) may not be the same as the directory that the model and scenario files are stored in. You can tell the model where to look for your scenario (and emission factor) files so you don't have to click out of the "system" default directory (e.g., C:\My Documents) each time you want to open or save a scenario.

To set your default or "working" directory when you're running COMMUTER, click "Set Working Directory" from the File menu. The first time you do this, COMMUTER will report that the working directory is blank as shown below.
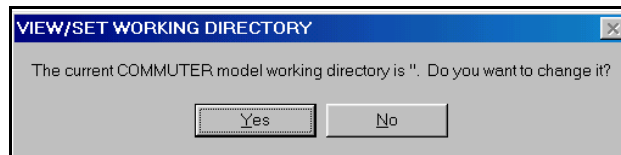
This is normal. Simply click the "Yes" button. Another window, shown below, will be displayed that then allows you to enter the disk drive and directory path where you've installed COMMUTER (e.g., C:\COMMUTER).

21
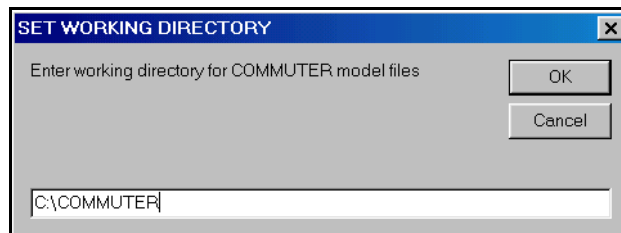
Once you have set the working directory, COMMUTER remembers that location and uses it each time you open or save scenario files or import your own emission factors, even if you exit and then re-run the model.

2.11 What do I do when I'm finished?

Before exiting COMMUTER, be sure you have saved the current inputs in a scenario file, as described above, if you plan to re-use them later. When you have completed your analysis session and want to exit COMMUTER, click "Exit Program" from the File menu. The application will then close and exit.

3. GENERAL INPUT SCREENS

This and the following two sections guide you step-by-step through the data that must be provided in each of the input screens. This section covers the first three screens, which you use to input general information; Section 4 explains the five input screens that are specific to individual TCMs being analyzed; and Section 5 discusses the two screens you will use to enter information required to calculate emission reductions. Each subsection within these sections corresponds to one of the program's ten input screens. These have been ordered in the sequence in which you would generally enter data for an analysis. To make it easier to find information on specific data inputs, fields have been noted in **bold, underlined** text.

3.1 Scenario Information

Scenario information describes the area you are analyzing and the broad types of commuter choice programs to be analyzed. Figure 5 displays the layout of the Scenario Information screen. Key data items are explained below.

Metropolitan Area Size - This is where you define the size of the metropolitan area you are analyzing, using the following categories:

- Large - more than 2,000,000 in population;
- Medium - 750,000 to 2,000,000 in population; and
- Small - less than 750,000 in population.

Based on the area size you select, the program will retrieve default travel speeds. You have the option to override the default speeds in the "Edit Emissions Data" screen with values you obtain for your city.

Analysis Scope - The actual analysis can apply to any geographic level. However, you must define the scope of your analysis as being area-wide ("1") or site-specific ("2").

Figure 5
Scenario Information Input Screen

SCENARIO INFORMATION		
Field	**Data**	**Notes**

Scenario Information

Scenario Filename		Filename of scenario stored on disk
User EFs Filename		User-supplied MOBILE emission factors (if used)
Description		Title to further identify the scenario (optional)

General Information

Performing Agency		Name of your organization (optional)
Address		Address of your organization (optional)
Analyst		Your name (optional)
Metropolitan Area		Name of city/area being modeled (optional)
Metropolitan Area Size		1 = Large (Over 2 million) 2 = Medium (750,000 to 2 million) 3 = Small (Under 750,000)

Metropolitan Area Size is a required input. The program retrieves default freeway and arterial travel speeds for the area size input by the user. However, these defaults for Large, Medium and Small metropolitan areas may not be as accurate as locally-derived travel speed data. These default travel speeds can be overridden in the "Edit Other Emissions-Related Data" screen.

Definition of Analysis Area

Analysis Scope		1 = Area-Wide (Metropolitan Area, County, etc) 2 = Site or Employer-Based
Analysis Area/Site		Name of analysis area evaluated (optional)
Analysis Area Type		1 = CBD (Central Business District) 2 = Other High-Density Commercial 3 = Other

The COMMUTER model can be used to evaluate commuter choice programs on both an urban area-wide and individual employer (or site-specific) basis. The Analysis Scope input controls whether the model calculates area-wide or site-specific impacts of commuter choice programs.

Employment in Analysis Area

Office Employment		Refers to "traditional" professional office space employment
Non-Office Employment		Manufacturing, warehousing, retail, medical, educational, entertainment and other employment-generating land uses
Total Employment	-	

The COMMUTER model may generate abnormally large mode shifts under a regional or area-wide analysis scenario if realistic limits are not applied in estimating the affected employment input above. For site-specific analysis, enter the employment of the workplace being analyzed. For area-wide analysis, the user is encouraged to consult Section 3.1 of the COMMUTER Model User Manual for more detailed guidance on estimating affected employment inputs for region being modeled.

Programs (Mark All Programs Being Analyzed with an "X")

1. Site Walk Access Improvements	Includes preferential parking, improved access to transit
2. Transit Service Improvements	Includes more frequent and/or faster transit service
3. Financial Incentives	Includes parking costs, transit fare/pass subsidies, or other financial incentives
4. Employer Support Programs	Includes support programs for carpooling, vanpooling, transit, and/or bicycling
5. Alternative Work Schedules	Includes flex time, telecommuting, staggered work hours, and/or compressed work weeks

24

An area-wide analysis evaluates TCM programs for a geographic area such as traffic corridors, subareas (for example, the central business district), activity centers (for example, a large office park complex), or the entire metropolitan region. A site-specific analysis evaluates TCM programs applied only to a single business or employer location. This option can be used when considering either a single place of business for a given employer or a mixed use or multi-purpose place of business for a given employer or employers. *If you are an individual employer using this model to evaluate a company employer support program, you should use the "site-specific" analysis.*

As discussed in Sections 4.3 and 4.4, you will later be asked for further data that are related to the scope you select. For example, if you specify "area-wide," some screens will ask you to specify the percentage of employers in the area participating in the program. If "site-specific" is specified, this percentage will be assumed to be 100 percent. (See Sections 4.3 and 4.4 for detailed instructions for inputting data for both area-wide and site-specific analysis.)

Affected Employment in Analysis Area - The impact or applicability of various programs and strategies is affected by type of employees in an area, which COMMUTER defines according to the land use category of the employer. "Office" employees are those working in land use categories that include traditional professional office space. "Non-office" employees include those working in manufacturing, warehousing, retail, medical, educational, entertainment, and other employment-generating land use activities.

You will be asked to enter both the number of office and non-office employees in the area or at the target site that can be affected by the TCM programs being modeled. "Affected" is the keyword in understanding what employment levels you should input here and depends on whether you are performing a site-specific or area-wide analysis, as explained below.

Site-Specific Affected Employment - If you are performing a site-specific or "single employer" analysis (specified by choosing "2" for Analysis Scope), the employment levels you enter should be the total of all employees that are eligible for, or exposed to, any or all of the TCM programs you are evaluating. Most of the time, site-specific affected employment will be the total employment level at the site. In rare cases where employer support, financial incentive, or alternate work schedule programs being evaluated would only be made available to a portion of all employees, enter that portion as the affected employment.

Area-Wide Affected Employment - In an area-wide analysis, affected employment should not be entered as the total employment in the area being considered. You must estimate that subset of the total area employment that will be potentially affected by any or all of the specific TCM programs you are evaluating.

> ***CAUTION:*** *For area-wide analysis, you should not enter the total employment in the analysis area. You do not want to base the analysis on the total employment in the analysis area because COMMUTER will then generate unrealistically high results for regional scenarios. For example, the number of trips being shifted from one mode of travel to another if all employees for a given region are assumed to participate in a voluntary program would be too high.*

Steps to help you calculate the number of employees that can be affected by the TCM programs you are evaluating under an area-wide analysis are listed below.

1. First, identify the portion of regional employers (and number of employees) that <u>are currently participating</u> in existing programs, and therefore should be excluded from the analysis. You can obtain the percentages of employers (by size and type) from the MPO responsible for transportation and emissions planning in the region. Using the total number of employees for a region is not realistic.

2. Finally, determine that portion of employers of a specific size (based on their number of employees) that will be subjected to, or encouraged to implement, the voluntary programs being evaluated. This percentage will vary by MPO region and could include either office or non-office employers with 1,000, 500, 250, or 100 employees.

3. Next, estimate the portion of employers of each type (office and non-office) who <u>will agree to participate</u> in <u>any</u> of the TCM programs you are evaluating, which will largely be voluntary in nature. This percentage will vary by MPO region and could include office employers only or a combination of office and non-office employers.

The following example is provided to demonstrate how you should use this process to determine the employment levels you need to enter under an area-wide analysis.

    Assume total employees for Region X: 1,000,000 employees

1. Estimate portion of total employees currently
    participating in existing TCM programs: 20%   -<u>200,000 employees</u>
                                                              800,000 employees

2. Estimate portion of remaining employees by size of
    employer targeted by your voluntary programs, using

<div align="center">26</div>

employers of 500+ employees in this example:

Office (500+ employers):	250,000 employees
Non-office (500+ employers):	50,000 employees

3. Determine portion of remaining employees based on
    estimated percentage of employers willing to
    participate in any of the modeled programs:

    (In this example we'll assume 30% office and
    10% non-office employer participation)

Office - 30% participation:	75,000 employees
Non-Office - 10% participation:	5,000 employees

Using this example, you would enter inputs of 75,000 and 5,000 employees for affected office and non-office employment, respectively.

You should be careful in making assumptions about the number of affected employees in each region. Each region is likely to be significantly different based on the current participation in voluntary programs, employer and employee participation rates, and regional employment characteristics.

As these steps and the example indicate, when inputting the "affected" employment under an area-wide analysis, you should supply estimates of the number of office and non-office employees that are eligible for participation in any of the specific TCM programs you are evaluating.

> **_NOTE:_** _If you are evaluating a scenario that packages multiple programs (e.g., site access improvements, transit improvements, and financial incentives), individual "program" participation rates can also be specified in subsequent input screens for each program. You should not confuse these program-specific participation rates with the employer participation percentage in any program used to estimate affected employment inputs. The program-specific participation rates in subsequently discussed input screens provide you with a means to "weight" the participation of all affected employees within individual programs when analyzing scenarios that combine multiple programs._

Programs - In this section, you simply check off which types of TCM strategies or programs are to be considered in the scenario being analyzed. There are five possible choices, described below. You simply mark (with an "X") all of the programs being analyzed; you do not have to select only one.

1. Site Walk Access Improvements - Includes preferential parking for employees using carpool and/or vanpool programs and improved access to transit systems.

2. Transit Service Improvements - Includes more frequent and/or faster transit service.

3. Financial Incentives - Includes any project or program that changes the out-of-pocket cost of alternative travel modes relative to automobile travel. Examples include transit fare/pass subsidies, parking costs, or other financial incentives.

4. Employer Support Programs - Includes support programs for carpooling, vanpooling, transit, and/or bicycling that do not result in any changes in direct travel time or cost changes. For example, employers might provide information about ridesharing and transit opportunities, match employees with carpools or vanpools, and offer guaranteed ride home programs.

5. Alternative Work Schedules - Includes flex time, telecommuting, staggered work hours, and/or compressed work weeks.

> ***NOTE:*** *If you are planning to enter your own estimate of* **final** *mode shares as described in the Local Data inputs in Section 3.2, COMMUTER will ignore any TCM programs you check here. By inputting your own final mode shares, you are bypassing COMMUTER's final mode share calculations that are based on TCM screen inputs.*

3.2 Local Data

Once you have provided the general information on the scenario you are analyzing, you need to provide data on the existing travel behavior and characteristics of the area or site. Because travel characteristics such as mode shares (for example, transit users) and average travel distances can vary a great deal within a region, you should define separate geographic areas that have distinct and more or less homogenous characteristics for

analysis. For example, you may wish to conduct separate analyses for the central business district (CBD) and for the non-CBD portions of a city.

Baseline (i.e., existing) travel data for the region of interest are entered in the Local Data input screen, shown in Figure 6. Each of the data elements in this screen is discussed following Figure 6.

Figure 6
Local Data Input Screen

LOCAL DATA

	Use Default	Baseline (Existing) Data			Supply Final Mode Shares?
		Local	**Default**		
Work-Trip Mode Shares	☐			*Supply Final Mode Shares?* ☐	
Auto - Drive Alone			78.2%		
Auto - Carpool			12.1%		
Vanpool			0.5%		
Transit			4.9%		
Bicycle			0.4%		
Walk			3.0%		
Other			0.8%		
Total		0.0%	100.0%		
Work Trip Length (mi)	☐				
Average person-trip length			12.2		
Average trip length -- vanpool			20.4		
Average trip length -- bicycle			2.9		
Average trip length -- walk			0.9		
Vehicle Occupancy	☐				
Average Carpool Occupancy			2.3		
Average Vanpool Occupancy			7.2		
Length of Peak Period (hours)	☐		3.0		
Percent of Work Trips in Peak Periods			61.4%		

Baseline mode share, trip length, average occupancy and peak period data representing local conditions are entered in this input screen. From these inputs and data entered in the "Mode Choice Model Coefficients" screen, the COMMUTER model internally calculates final mode shares and travel changes resulting from TCM programs selected. If you want to supply your own estimates of final mode shares (such as might be obtained from employee survey data), mark the box labeled "Supply Final Mode Shares" (with an "X"). When this option is selected, the COMMUTER model displays an additional series of input cells below the box where final mode share inputs can be entered. Remember, these final mode shares should reflect work-trip mode choice after implementation of the TCM programs you're currently analyzing and override the mode share calculations made by the model.

The peak period includes the morning and evening time periods when highways are most congested. These periods may be defined differently in different areas. For the default "percent of work trips in peak period" provided, the AM peak is defined as 6:00 to 9:00 AM and the PM peak as 4:00 to 7:00 PM. The same peak period should be used for reporting percent of work trips in peak period and affected vehicle speeds (which are entered later in the "Other Emissions-Related Data" screen).

"Length of peak period" refers to the length (in hours) of the AM or PM peak period. If the AM and PM peak periods are different lengths, this can be an average of the two lengths.

"Percent of work trips in peak period" should also be reported as an average for the AM and PM peak periods combined. For example, assume there are 200,000 and 300,000 total vehicle trips in the AM and PM peak periods, respectively. If the number of work trips are 150,000 in the AM peak and 250,000 in the PM peak, then the percentage of work trips in peak period is (150,000 + 250,000) / (200,000 + 300,000) = 80%.

Existing Mode Shares, Trip Length, and Occupancy - If you are conducting a site-specific analysis, you may be able to obtain data on existing employee mode shares from employee surveys, if such surveys have been conducted. You can also enter local data on trip lengths and average vehicle occupancy for carpools and vanpools if such data are available.

If you do not have specific data available, you should be able to obtain transportation data for the city, metropolitan area as a whole, or other area of analysis from the regional transportation planning agency. You should work with local or regional transportation planners to identify the most appropriate data for the analysis.

If local data are not available, you may use the default parameters provided in the model. These are shown in Figure 6 under the "Defaults" column. You should indicate which default values to use by checking the appropriate box(es) on this screen.

User-Supplied Final Mode Shares - If you are performing an analysis where you have estimates of "final" mode shares (after implementation of the TCMs being modeled), you can enter these final mode share estimates in the Local Data screen. Under most circumstances, you'll want to let COMMUTER calculate final mode shares based on the inputs you supply in the TCM screens using the pivot-point methodology discussed in Section 1.5. There may be certain situations where you want to enter your own estimate of final mode shares, rather than using COMMUTER's calculations. For example, when you are performing a site-specific analysis for a company, you may have employee survey data available that estimate how mode choice would change in response to a particular program or programs.

For these situations, mark the "Supply Final Mode Shares?" box at the upper right of the Local Data input screen. When you do, a series of cells appears below this box, allowing you to enter final mode shares, reflecting changes from existing shares due to the TCM programs you're modeling.

For example, suppose under existing conditions that "Company A" work-trip mode shares were split at 80% Auto-Drive Alone and 20% Transit. Company A is considering a program in which employees are offered a cash incentive to ride the bus and, from an employee survey, determines that an additional 5% would accept the incentive and ride the bus. The final mode shares are thus split as 75% Auto-Drive Alone and 25% Transit. These values would be entered in the final mode share cells after you marked the "Supply Final Mode Shares?" box.

> *NOTE: When you enter your own final mode shares in the Local Data input screen as explained above, any TCM programs that you've checked at the bottom of the Scenario Information screen and inputs you've entered in those TCM-specific screens are ignored. By entering your own final mode shares, you're telling COMMUTER not to use the TCM inputs to calculate final mode shares.*

Under most circumstances, you won't know what the final mode shares will be as a result of the TCM programs that you are analyzing. In these cases, leave the "Supply Final Mode Shares?" box blank and allow COMMUTER to calculate final mode share from the TCM program inputs you'll enter in subsequent input screens.

Length of Peak Period - The "peak period" includes the morning and evening time periods when highways are most congested. These periods may be defined differently in different areas. *You should use the same peak period definition when reporting the percent of work trips in a peak period that you use when reporting baseline travel speeds* (see below). You can obtain information on the peak period definition from transportation planning staff at your regional transportation planning agency.

"Length of peak period" refers to the length (in hours) of the AM or PM peak period. If the AM and PM peak periods are different lengths, you should use the average of the two.

Percent of Work Trips in Peak Periods - You need to enter the percent of trips during the peak periods that are work-related, averaging the totals for the AM and PM peak periods combined. For example, assume there are 200,000 and 300,000 total vehicle trips in the AM and PM peak periods, respectively. If the number of work trips are 150,000 in the AM peak and 250,000 in the PM peak, then the percentage of work trips in the peak period is calculated as follows:

$$\frac{150,000 + 250,000}{200,000 + 300,000} \quad = \quad 80\%$$

You should enter local or site-specific data if it is available, instead of relying on the default value. The default value provided is based on the national percentage of all work trips that occur in both the AM and PM peak periods. In this program, the default AM peak is defined as 6:00 to 9:00 AM and the default PM peak as 4:00 to 7:00 PM.

3.3 Edit Coefficients

This screen allows you to enter locally available values for mode-choice travel time and cost coefficients, rather than use the default values provided by the model. Figure 7 illustrates the layout of the Edit Coefficients screen.

Mode-choice coefficients are used within COMMUTER to compute changes in travel of each commute mode (e.g., drive-alone, carpool, transit, walk, etc.) under Site Access or Transit Improvement programs and Financial Incentive programs. These coefficients are used in transportation models referred to as "logit mode-choice" models to represent the willingness of commuters to use alternate modes of travel to driving alone when faced

with changes in travel time or cost. (Please refer to the accompanying COMMUTER Model Procedures Manual for detailed information on how mode-choice coefficients are developed, tested and applied in transportation modeling.)

The travel and emission impacts calculated by COMMUTER are highly sensitive to the values of these coefficients, especially the cost coefficients. It is <u>strongly recommended</u> that you use local coefficients for mode choice, if available. Coefficients have been estimated in many urban areas by the regional transportation planning agency (usually MPOs, Councils of Government, or Associations of Governments). Values of travel time and cost coefficients for many individual cities are incorporated into COMMUTER at the bottom of this input screen. The values of these mode-choice coefficients are based on the travel models currently used by regional transportation planning agencies. You are encouraged to contact your local transportation planning agency to ensure the values cited are up-to-date or to obtain coefficients for cities not listed in the table at the bottom of the input screen.

If local mode choice model coefficients are not available for your city, you can use the default values provided by the model (which are based on the "Metropolitan Area Size" you specified in the Scenario Information screen; see Section 3.1). However, these defaults will not represent mode choice behavior as accurately as actual local data.

Figure 7
Edit Coefficients Input Screen

MODE CHOICE MODEL COEFFICIENTS

DEFAULTS BY AREA SIZE	IVTT (min)	OVTT (min)		Cost (cents)	
Check		All Modes	Walk Time	Transit -- Wait	Auto - Parking	Transit - Fare
All Areas		-0.0253	-0.0473	-0.0466	-0.0056	-0.0040

User-Specified						

Coefficients Used: Boston		-0.0314	-0.0330	-0.0550	-0.0173	-0.0083

Mode choice model coefficients are entered in this screen. The program retrieves default coefficients based on national average from numerous cities' models. However, these defaults are typically not as accurate as city-specific coefficients developed for many communities across the country. City-specific coefficients for a number of cities based on a review of current literature and existing travel demand models are provided for use within the model and can be viewed by scrolling down below this help box. The user is encouraged to utilize these local coefficients for the specific city being modeled (if available) in lieu of the defaults by simply checking the box next to the appropriate city. The user is also encouraged to contact their local transportation planning agency to ensure the values cited are up-to-date or to obtain coefficients for cities not listed in these tables.

When applying user-specified values, be aware that most models generally use input travel/wait time coefficients in MINUTES and cost-related coefficients in CENTS. Mode choice models such as the TDM model then internally convert the values of these coefficients to match the units of the travel/wait time or cost inputs. The COMMUTER model has also been programmed to apply a conversion factor to the Auto Parking and Transit Fare cost coefficients (in cents) when used with financial incentive inputs in units of DOLLARS per vehicle per day. When inputting your own coefficients, make sure the travel/wait time coefficients are in MINUTES and the cost-related coefficients are in CENTS.

Note to previous COMMUTER users: In COMMUTER Version 2.0, metropolitan area size is no longer used to select the default mode choice coefficients. A review of recently developed coefficients found that these coefficients do not show a significant variation by area size.

CITY-SPECIFIC DEFAULTS		IVTT	OVTT		Cost	
Check City	Year	All Modes	Walk Time	Transit -- Wait	Auto - Parking	Transit - Fare
Albuquerque	1992	-0.0209	-0.0219	-0.0978	-0.0031	-0.0031
Atlanta	2002	-0.0256	-0.0639	-0.0256	-0.0031	-0.0013
Baltimore	1993	-0.0300	-0.0750	-0.0750	-0.0043	-0.0043
Boston	1991	-0.0314	-0.0330	-0.0550	-0.0173	-0.0083
Chicago	1990	-0.0282	-0.0440	-0.0960	-0.0021	-0.0008
Cleveland	1994	-0.0178	-0.0444	-0.0378	-0.0034	-0.0024
Columbus	1999	-0.0213	-0.0640	-0.0465	-0.0016	-0.0016
Dallas	1996	-0.0544	-0.0640	-0.0640	-0.0056	-0.0055
Denver	1997	-0.0180	-0.0540	-0.0180	-0.0014	-0.0012
Detroit	1996	-0.0512	-0.0186	-0.0186	-0.0041	-0.0041
Houston	1985	-0.0220	-0.0568	-0.0568	-0.0154	-0.0061
Los Angeles	1996	-0.0450	-0.1073	-0.0423	-0.0025	-0.0025
Milwaukee	1991	-0.0157	-0.0412	-0.0412	-0.0045	-0.0045
New York	1996	-0.0113	-0.0380	-0.0554	-0.0004	-0.0004
Philadelphia	1986	-0.0391	-0.0316	-0.0511	-0.0026	-0.0012
Phoenix	1991	-0.0167	-0.0206	-0.0304	-0.0053	-0.0053
Portland	1994	-0.0394	-0.0646	-0.0397	-0.0135	-0.0135
Reno	1991	-0.0275	-0.0550	-0.0550	-0.0167	-0.0067
Sacramento	2001	-0.0250	-0.0380	-0.0380	-0.0026	-0.0026
San Diego	1995	-0.0250	-0.0500	-0.0250	-0.0069	-0.0026
San Francisco	1990	-0.0333	-0.0931	-0.0523	-0.0021	-0.0021
San Juan	1990	-0.0366	-0.0717	-0.0752	-0.0066	-0.0066
Santa Cruz	1990	-0.0163	-0.0325	-0.0325	-0.0045	-0.0036
Seattle	1990	-0.0176	-0.0206	-0.0155	-0.0024	-0.0024
Tucson	2000	-0.0178	-0.0400	-0.0200	-0.0018	-0.0018
Washington D.C.	1994	-0.0300	-0.0750	-0.0750	-0.0043	-0.0043

4. TCM-SPECIFIC DATA

This section discusses the input screens that are used to enter TCM-specific data for each of five different types of programs, with each program having its own input screen. As explained in Section 2, programs can be analyzed individually or in combination.[*] At this stage, you can edit any of the programs checked under "Programs Analyzed" on the "Scenario Information" screen. (Remember, however, that if you did not select a program from the Scenario Information screen, you will not have access to the data entry screen for that program.)

4.1 Site Access and Transit Service Improvement Programs

This section describes the Site Access and Transit Service Improvement program inputs. Figure 8 shows the single input screen used for these programs.

Site Access Improvements

Site access improvements include such things as preferential parking policies for carpools and vanpools or improvements to the work site or area that make access to transit easier. For example, parking spaces in close proximity to both office building locations and transit station/transit center locations could be provided for ease of access and reduced travel times for carpool and vanpool vehicles. These programs also include improved pedestrian and bicycle infrastructure at transit locations to encourage transit usage. Along with preferential parking spaces, infrastructure improvements could include secure lockers and showers for pedestrians and bicyclists and improved access to transit facilities from the adjacent roadway system.

Walk-Access Time - You will need to specify the change in "walk access time," which is the time required to walk from the parking space or transit stop to the work site. A decrease in walk access time for any particular travel mode is represented as a negative value.

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[*] As noted in Section 2, however, you will not obtain accurate results by analyzing individual measures and then summing the results. Measures that may be implemented together should be analyzed together.

Figure 8
Site Access & Transit Improvements Input Screen

SITE ACCESS & TRANSIT SERVICE IMPROVEMENTS

I. Site Access Improvements

Mode:	Change in Walk Access Time (min)
Drive Alone	
Carpool	
Vanpool	
Transit	
Bicycle	
Pedestrian	

Employer Participation Rate:	

"Change in Walk Access Time" represents the <u>difference</u> in walking time associated with travel to or from the workplace as a result of worksite access changes. Walking time includes the time taken to walk from a parking lot or a bus stop to the actual worksite. Walk access time can be affected through policies such as preferential parking for carpools and vanpools or through improvements to the worksite or area which make access to transit easier. A decrease in walk access time for any particular mode should be entered as a negative value.

"Employer participation rate" refers to the percent of employers in the analysis area implementing the walk access improvements. (This option is not necessary for site-specific analysis because the "participation rate" is 100%.)

II. Transit Service Improvements

IIa. More Frequent Service

Change in avg. headway (min)	
Employment Served (% of area)	

IIb. Faster Service

Change in route travel time (min)	
Employment Served (% of area)	

Transit Operating Data

Increase in daily VMT by Transit Vehicles	
Average speed of affected transit vehicles (mph)	
Default average speed	14.8
Check here to use default transit speed	

"Change in average headway" refers to the average change in frequency of service for transit service to the employment center or analysis area. An increase in service frequency is entered as a negative number. For example, if peak period transit service frequency increases from 20-minute to 15-minute intervals, the change in average headway would be entered as "-5.0".

"Change in route travel time" refers to the average change in total route travel time for all transit service to the area. A decrease in travel time is entered as a negative number. For example, if new express bus service decreases the overall route travel time by 5 minutes, this would be entered as "-5.0".

"Employment served" refers to the <u>percent of employment in the analysis area</u> which is served by the improved transit service. (This option is not available for site-specific analysis).

"Increase in daily VMT by transit vehicles" refers to the additional transit vehicle-miles of travel as a result of the improved transit service. Refer to Section 4.1 of the COMMUTER Model User Manual for guidance on how to calculate this parameter.

Employer Participation Rate - If you specified an area-wide analysis scope, you will also need to specify the percent of employers in the analysis area implementing the walk-access improvements.

Remember, as discussed in Section 3.1, that there are two types of participation rates you need to consider in setting up the inputs to COMMUTER. The first type is used in estimating the affected employment inputs and refers to participation in <u>any</u> of the TCM programs being modeled. The second type, the individual program participation rates, are actual model inputs, and are used to further restrict the "eligibility" of all affected employment to individual programs, such as Site Access Improvement programs. Thus, in an area-wide analysis assuming 100,000 affected employees, a 15% Employer Participation Rate for Site Access Improvement programs instructs COMMUTER that 15,000 employees ($100,000 \times 15\%$) are eligible or affected by site access improvement strategies. (Note that the model assumes a proportional ratio of employers to employees in determining affected employment for individual programs.)

The employer participation rate is not used in site-specific analysis because it is assumed to be 100%.

Transit Service Improvements

Transit service improvements may include providing <u>more frequent</u> bus or shuttle service to work sites, as well as providing <u>faster</u> transit service through express routes or operational improvements. These improvements may also include implementing <u>new</u> route services resulting from the transit planning process.

If you are analyzing improvements that lead to more frequent service, you will need to enter the "**Change in Average Headway**." This refers to the average change in the frequency of transit service to the employment center or analysis area. An increase in service frequency is entered as a negative number. For example, if peak period transit service frequency increases from every 20 minutes to every 15 minutes, the change in average headway would be represented as -5.0 minutes.

"**Employment Served**" refers to the percent of employment in the analysis area that is served by the improved transit service. As with the Employment Participation Rate input for Site Access Improvement programs, Employment Served should reflect the fraction of all affected employment that are exposed to the transit improvements. As an example, expanding transit service along a single network corridor would affect only the fraction of employment served by this transit corridor. Again, you do not need to enter this input if you are conducting a site-specific analysis.

If you are evaluating faster service improvements, you will need to enter the "**Change in Route Travel Time**." This refers to the average change in the time required to travel the total route for all transit service to the area. A decrease in travel time is represented as a negative number. For example, if new express bus service decreases the overall route travel time by 5 minutes, this would be represented as -5.0 minutes.

If transit service improvements are implemented, the change in **daily transit vehicle-miles** as a result of increased service must also be considered. For this, you will need to estimate the following items:

- The number of additional daily bus-trips on each route, for routes on which service is increased; and

- The total round-trip route length for each route on which service is increased.

You should be able to obtain information on route-mileage increases from the local transit agency or you can develop estimates from operating plans for the proposed transit service. Estimates of daily mileage increases should take into consideration the distance traveled to and from the storage/maintenance facility to the beginning/end of the route.

In addition, an **average travel speed** for the affected transit service should be estimated. This can be done by dividing the total length of each affected route by the time taken to complete the route.

If transit service improvements are implemented, the change in daily transit vehicle-miles as a result of increased service must also be considered. This requires estimating the following items:

- The number of additional daily bus-trips on each route, for routes on which service is increased; and

- The total round-trip route length for each route on which service is increased.

Information on route-mileage increases can be obtained from the local transit agency or can be estimated from operating plans for the proposed transit service. Estimates of daily mileage increases should take into consideration the distance traveled to and from the storage/maintenance facility to the beginning/end of the route.

In addition, an average travel speed for the affected transit service should be estimated. This can be done by dividing the total length of each affected route by the time taken to complete the route.

4.2 Financial Incentive and Parking Cost Programs

Financial incentives include any policies that affect how much it costs to travel via a particular mode. Some examples of financial incentives are listed below.

- Increased parking charges, especially for single-occupant vehicles.

- Reduced parking fees for carpools and vanpools.
- Transit subsidies such as free monthly passes.

- Parking cash-out programs.

The Financial Incentive and Parking Cost program input screen is shown in Figure 9. A decrease in cost (i.e., an incentive) is entered as a <u>negative number</u>. Changes in **parking cost** are entered on a per-vehicle basis. Changes in other **fare costs** and **other financial costs** are entered based on the change in cost per person per day (i.e., round trip transit fare).

Figure 9
Financial Incentives Input Screen

FINANCIAL INCENTIVES AND PARKING COSTS				
	Change In Daily Cost:			
Mode:	Parking Cost ($/vehicle)	Fare Cost ($/person/RT)	Other Financial Cost ($/person/RT)	Total Change ($/person/RT)
Drive Alone				$ -
Carpool				$ -
Vanpool				$ -
Transit				$ -
Bicycle				$ -
Pedestrian				$ -

Employer Participation Rate:	

"Financial incentives and parking costs" may include higher parking charges for single-occupant vehicles, reduced parking fees for carpools or vanpools, transit subsidies such as free monthly passes, or other financial incentives for specific modes. A decrease in cost is entered as a negative number. For example, provision of a transit pass valued at $30 a month would be entered as a change in fare cost of -$1.50 ($30 / 20 days). The cost change inputs are entered on a daily basis.

"Employer participation rate" refers to the percent of employers in the analysis area offering these incentives to their employees. (This option is not required for site-specific analysis because the "participation rate" is 100%.)

As in other screens, "**Employer Participation Rate**" refers to the fraction of all affected employees being offered financial incentives on a percent-of-employers basis. Like the other program-specific "employer participation rate" inputs, COMMUTER applies the proportion of participating employers to determine the fraction of all affected employees being offered financial incentives. It is not used for site-specific analysis.

Two examples are provided below to illustrate how the financial costs should be calculated and entered.

Sample Calculations for Financial Incentives and Parking Cost Programs:

- If parking costs are increased by $2.00 per day for all types of vehicles, you would enter +$2.00 for Auto-Drive Alone, Carpool, and Vanpool. (The model will convert the costs per vehicle to the costs per person by dividing by the assumed average vehicle occupancy as identified in "Local Data.")

- If a transit pass worth $30 per month is provided, you would enter a change in fare cost of -$1.50 ($30 divided by 20 days per month).

Note that you enter these cost inputs in dollars per vehicle per day. COMMUTER internally converts the Parking Cost and Transit Fare mode-choice coefficients that you entered in units of cents in the "Edit Coefficients" screen into dollar units before combining them with the cost inputs entered in this screen in the mode share calculations.

Parking Cash-Out Programs - Parking cash-out programs are modeled in this input screen by treating the cash-out payment as a "subsidy" for use of eligible alternative modes. For example, if the cash value of the parking subsidy were $60 per month or $2 per day, a current Single Occupant Vehicle (SOV) user would see no difference in his/her cost to drive (park), but the transit user would suddenly find it $2 per day cheaper to use transit. The same logic applies to all modes that are eligible alternatives, i.e., bike, walk, or ridesharing (if there is no problem with the cash-out recipient still parking at the site as a carpooler/vanpooler). In this example, you would enter -$2 in the "Transit" row and "Parking Cost" column.

So to handle cash-out programs in COMMUTER, you enter nothing for the SOV mode parking cost, and enter a subsidy for each of the eligible alternative modes. Note that in the rideshare case, each passenger receives the full value of the subsidy, unlike where you give a parking discount to carpools and the savings is split among the number of occupants.

4.3 Site-Specific Employer Support Programs

There are a number of strategies that <u>employers</u> can use that reduce the number of people commuting to work in single-occupancy vehicles (SOVs), but do not result in measurable changes in the time or cost of traveling to work. Research suggests that such "soft" incentives or support programs can change travel behavior by providing encouragement to use other modes of travel, informing travelers of alternatives, or removing impediments. Examples of this type of strategy include selling transit passes at the work site, providing rideshare matches, marketing and promoting alternative modes, providing a guaranteed ride home program, forming and supporting a vanpool, and providing preferential parking for carpools. (Note that these types of programs also apply for an area-wide analysis, discussed in Section 4.4.)

Figure 10 shows the input screen for site-specific analysis of employer support programs. As shown in the figure, the first thing you need to do is specify the **entry format**, which refers to the type of data you will be entering.

For a site-based analysis, it is recommended that you specify existing and proposed *program levels*. These refer to the general level of effort spent on the program (which affects its effectiveness) and are explained below, along with the codes used for data entry. They are defined separately for carpooling, vanpooling, transit, and bicycle commuting.

As an alternative, you can specify the expected *mode share increase*. This expected increase in each mode of travel is added to the baseline mode share that was specified in the input data.

> *<u>CAUTION</u>: You should <u>not</u> use this alternative entry option unless you have good data indicating that a proposed program will lead to a likely mode share increase. If you do specify a mode share increase, you should document existing support programs and the programs to be implemented, along with survey or other data that were used to estimate the mode share increase.*

Figure 10
Site-Specific Employer Support Programs Input Screen

EMPLOYER SUPPORT PROGRAMS FOR ALTERNATIVE MODES
SITE-SPECIFIC ANALYSIS

Entry Format (check one only):
☐ Specify Program Level
☐ Specify Mode Share Increase

"Program Level" and "Mode Share Increase" input options are mutually exclusive. You enter input data for either one or the other based on which Entry Format box you check to the left. See the help box below for an explanation of each input.

Specify Program Level:

Program	Existing	New
Carpool		
Vanpool		
Transit		
Bicycle		

Specify Mode Share Increase:

Program	Existing	Increase	New
Carpool	0.0%		0.0%
Vanpool	0.0%		0.0%
Transit	0.0%		0.0%
Bicycle	0.0%		0.0%

"Employer Support Programs" include programs such as provision for an on-site transportation coordinator, ridematching, transit information, and other actions aside from time and cost incentives which encourage employees to utilize alternative modes. Two entry options are available for site-specific analysis:

(1) Specify existing and new program levels for Carpool, Vanpool, Transit, and Bicycle program support. A program level of "0" represents no program. Program levels of "1" through "4" indicate varying levels of effort for the programs. These program levels are described in Section 4.3 of the COMMUTER Model User Manual.

(2) Specify an expected mode share increase for each mode. This increase is added to the baseline mode share as specified in the input data.

IMPORTANT: Entry option (2) should only be utilized if the user has evidence, such as survey data, suggesting a likely mode share increase as a result of proposed programs. If a mode share increase is specified, the user should document existing support programs and programs to be implemented, along with survey or other data indicating the basis for the mode share increase estimates.

Definition of Program Levels

The impact of employer support programs and strategies varies depending on the level of effort expended on the program. The level of program effort is a particularly important data input because it defines what is actually meant by, for example, a "carpool support" program. The program level can vary from 0 to 4, with 0 representing no program and 4 representing a program of maximum effort. (These program level definitions will also apply for area-wide analyses, as discussed in Section 4.4.) The following program level descriptions are not requirements for each level, but are intended as suggested guidelines to help you assign a level designation to the support activities you are trying to model.

42

Note that preferential parking or direct financial incentives to employees offered as part of a support program should be captured on the Site Access and Transit Service Improvement input screen, and the Financial Incentives and Parking Costs input screen, respectively. They should not be considered in the determination of program support level.

Carpool Support Programs

Level 0 - no program

Level 1 - includes carpool information activities (tied in with area-wide matching) and a quarter-time transportation coordinator.

Level 2 - includes an in-house carpool matching service and/or personalized carpool candidate get-togethers (including information activities) and a quarter-time transportation coordinator.

Level 3 - includes in-house carpool matching and information services plus preferential (reserved, inside, and/or especially convenient) parking for carpools, a policy of flexible work schedules[*] to accommodate carpools, and a half-time transportation coordinator.

Level 4 - includes in-house carpool matching and information services plus preferential parking for carpools, flexible work schedules, and a full-time transportation coordinator.

Vanpool Support Programs

Level 0 - no program

Level 1 - includes vanpool information activities (tied in with area-wide vanpool matching and/or third-part vanpool programs), plus a quarter-time transportation coordinator.

Level 2 - includes in-house vanpool matching services and/or personalized vanpool candidate get-togethers, and non-monetary vanpool development, plus a quarter-time transportation coordinator and a policy of flexible work schedules.

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[*] Flexible work schedules as defined under these support programs refers to providing latitude to employees to accommodate slight variations in arrival/departure to participate in these programs. This differs from a formal Flex-Time policy, which is defined and discussed later in Section 4.5.

Level 3 - includes in-house vanpool matching services; vanpool development and operating assistance, including financial assistance, such as vanpool purchase loan guarantees, consolidated purchase of insurance, and a startup subsidy (generally, at least two forms of such financial assistance should be included); and additional services such as van washing and preferential (reserved, inside, and/or especially convenient) parking for vanpools, plus a half-time transportation coordinator.

Level 4 - includes in-house vanpool matching services; vanpool development and operating assistance, including major financial assistance, such as employer purchase of vans with favorable leaseback (or alternative continuing subsidy, such as free maintenance, free insurance, and/or direct subsidy to keep vanpool fares low) in addition to startup subsidy; several additional incentives such as van washing, preferential parking for vanpools, guaranteed ride home, and a full-time transportation coordinator and/or personalized vanpool candidate get-togethers.

Transit Support Programs

Level 0 - no program

Level 1 - includes a transit information center plus a quarter-time transportation coordinator.

Level 2 - includes a transit information center and a policy of work hours flexibility to accommodate transit schedules/delays, plus a quarter-time transportation coordinator.

Level 3 - includes a transit information center and a policy of work hours flexibility, on-site transit pass sales, plus a half-time transportation coordinator.

Level 4 - includes a transit information center and a policy of work hours flexibility, on-site transit pass sales, guaranteed ride home, and a full-time transportation coordinator.

Bicycle Support Programs

Level 0 - no program

Level 1 - providing on-site bicycle parking (racks or lockers).

Level 2 - providing bicycle parking (racks or lockers) and shower facilities.

Level 3 - providing secure bicycle parking (storage lockers or indoor storage) and shower facilities, in conjunction with local infrastructure conducive to bicycling. This includes the presence of (a) off-street bike paths, (b) on-street bike lanes, and/or (c) local streets with light traffic by which cyclists can access the workplace.

Level 4 - providing parking, shower, and infrastructure conditions as for Level 3, and also sponsoring workplace promotional activities. These activities should include promoting bicycle commuting, identifying the availability and location of parking and shower facilities, and providing local bicycle route maps, along with other activities to encourage bicycle commuting.

Some employer support programs may have combinations of characteristics different than those shown here. In this case, you should choose the program level that most closely represents the actual program being implemented.

If there is no program level that you feel most closely represents the combination program being offered, you can specify "combinations" of program levels by running the program for an area-wide rather than site-specific analysis. For example, if a carpool program includes all the elements of a Level 3 program except for flexible work schedules, you may want to model this program as halfway between Level 2 and Level 3 in terms of effectiveness. You can do this by setting the analysis scope to "Area-Wide" and specifying that 50 percent of employers have a Level 2 program and 50 percent have a Level 3 program. Note that if you set the employer participation rate at 100 percent for every program being tested, the area-wide and site-specific analyses will give identical results.

4.4 Area-Wide Employer Support Programs

The discussion in Section 4.3 of the types of employer support programs that may be offered also applies here. Although different input formats are used for site-specific and area-wide employer support programs, the data elements themselves are similar. Figure 11 shows the input screen for area-wide analysis of employer support programs.

Figure 11
Area-Wide Employer Support Programs Input Screen

EMPLOYER SUPPORT PROGRAMS FOR ALTERNATIVE MODES
AREA-WIDE ANALYSIS

Percent of Employers Participating -- Existing

Program			Program Level			
	None	1	2	3	4	Total
Carpool	100%					100%
Vanpool	100%					100%
Transit	100%					100%
Bicycle	100%					100%

Percent of Employers Participating -- New

Program			Program Level			
	None	1	2	3	4	Total
Carpool	100%					100%
Vanpool	100%					100%
Transit	100%					100%
Bicycle	100%					100%

"Employer Support Programs" include programs such as provision of an on-site transportation coordinator, rridematching, transit information, and other actions aside from time and cost incentives which encourage employees to utilize alternative modes.

For an area-wide analysis, the analyst should specify both existing and new (expected) participation rates (percent of employers participating) by program level for each mode. Program levels of "1" through "4" indicate varying levels of effort for the programs which are described in Section 4.4 of the COMMUTER Model User Manual.

You should use the definitions of support **program levels** given in Section 4.3 for area-wide analyses also. *Be sure to read these definitions before proceeding.*

For area-wide analysis of employer support programs, you must specify the **percent of employers participating** in each of the program levels and modes. For each mode (carpool, vanpool, transit, and bicycle), you need to enter the percent of employers in the area participating at each program level. The sum of Levels 0 through 4 for each mode should equal 100%. Employers who are not participating in any program would be included in the "Level 0" program level. Participation rates should be specified for both the base case (existing conditions) and the proposed program levels being evaluated.

4.5 Alternative Work Schedule Programs

This class of commuter-related TCM strategies is aimed at reducing how often commute trips are made or shifting the timing of the trip out of the peak hour. For example, flex-time and staggered work hour strategies have the effect of merely shifting commute travel to a less-congested time period. These strategies will not affect the number of overall

trips or the amount of VMT, but they will change the distribution of trips, VMT, and emissions between the peak and off-peak time periods. They may also affect overall emissions slightly by affecting the average speed in the peak and off-peak periods. Definitions of the various work schedule programs and their likely impacts are discussed later in this section.

Figure 12 shows the input screen for entering information on alternative work schedules and telecommuting programs. As shown, you will first need to choose an **entry format** option, as explained below:

- *Eligibility Rate* - This indicates the percent of all employees in the analysis system[*] who are offered the program. The model then applies an assumed participation rate to the total number of employees that are eligible. *Note that the employees eligible for each alternative work schedule and those not eligible for any strategy must sum to 100 percent.* In other words, only one alternative work schedule strategy may be offered to an employee at a time. This simplifying assumption is used in the manual and spreadsheet model because employees are unlikely to combine more than one alternative work strategy at a time (for example, those employees working a compressed work week are unlikely to be allowed to telecommute on regularly scheduled work days). This parameter relates mainly to the logic of applying this strategy to different employment segments. For example, manufacturing or retail employees are not reasonable candidates for participation in telecommuting programs. *You should consider the characteristics of the employment base you are analyzing when determining the value to use for this parameter.*

- *Participation Rate* - As an alternative, you can specify existing and expected actual participation rates for each program. If you do specify the participation rates, you should document the existing support programs and the programs to be implemented, along with the survey or other data that formed the basis for the participation rate estimates.

Alternative Work Schedules are more commonly implemented by employers as an employee benefit or workplace efficiency measure, rather than as a mode shift strategy. As such, the proportion of employees that might adopt these schedules is highly dependent on how and why the employer is implementing the program. The default proportions using the "eligibility rate" option are currently set to 22 percent for Flexible Work Hours, Staggered Work Hours, and 4/40 Compressed Work Weeks, and to 11 percent for 9/80 Compressed Work Weeks. These figures reflect voluntary adoption of alternative work schedules if made available and optional. The user can change the

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[*] For an area-wide analysis, this will be the percent in the area-wide employment base; for a site-specific (single employer) analysis, it will be the percent of employees within the firm.

47

proportion of employees who would shift to each schedule to reflect local knowledge of such programs. For example, if a given employer or set of employers decides to require staggered hours to addressed localized congestion or compressed work weeks to reduce overall operating costs, the proportion of employees shifting schedules could be considerably higher.

Figure 12
Alternative Work Schedules Input Screen

ALTERNATIVE WORK SCHEDULES

	Use Default	Data	
		Local	Default
Alternative Work Schedule Parameters			
Telecommute: Avg. Days/Week			1.5
Flex Time/Staggered Hours: Percent of trips shifted from peak period			

Participation Entry Format (check one only):
☐ Specify Eligibility for Participation
☐ Specify Before/After Participation Rates

A. Eligibility for Participation

	% Eligible	
Program	Existing	New
Flex Time		
Compressed 4/40		
Compressed 9/80		
Staggered Hours		
Telecommute		
Not Eligible	100%	100%
Total	100%	100%

B. Participation Rates

	% Participating	
Program	Existing	New
Flex Time		
Compressed 4/40		
Compressed 9/80		
Staggered Hours		
Telecommute		
Not Participating	100%	100%
Total	100%	100%

"Alternative Work Schedules" include the option to allow employees to utilize flex time, compressed work weeks, staggered work hours, or telecommuting. Flex time and staggered hours will have the effect of shifting some trips outside of the peak period, while compressed work weeks and telecommuting will have the effect of eliminating some work trips. Two program entry options are available:

(1) The user can specify the percentage of employees eligible for each program. Both existing and new levels of eligibility should be specified.

(2) The user can specify existing and expected participation rates for each program.

To accomodate instances where employees are eligible for, or participate in multiple programs, the model allows the user to enter rates that exceed 100% when summed across all alternative programs. The model then internally normalizes the rates before using them in the travel calculations. Section 4.5 of the COMMUTER Model User Manual presents an example for this situtation.

IMPORTANT: Entry option (2) is preferred if the user can obtain data indicating a likely participation rate as a result of proposed programs. If participation rates are specified, the employer/analyst should document existing support programs and programs to be implemented, along with survey or other data indicating the basis for the participation rate estimates. If the user does not have survey data indicating likely participation rates or another strong basis for estimating expected local participation rates, entry option (1) should be used.

Definition of Alternative Work Schedule Strategies

Flex-Time - In this policy, employees can adjust their work schedule (based on when they arrive at and depart from the work site) in order to travel during the off-peak hours, when there should be less traffic congestion. COMMUTER assumes a formal Flex-Time policy rather than flexible work schedules. Flexible work schedules are seen as simply allowing employees who would carpool or take transit to arrive or leave with slight variations in order to be compatible with the pool/bus schedule. In contrast, a Flex-Time policy involves formally moving the time of arrival or departure to a set of consistent work hours that are different from the employer's official hours. This type of policy may actually detract from employees' incentive to carpool or take transit as a means of avoiding traffic congestion. The only assumed effect of this strategy is to shift the time of the trips, no vehicle trips are eliminated.

Staggered Work Hours - Under this strategy, employers establish different starting times for groups of employees in order to avoid having the entire workforce arrive or leave at the same time. Some work sites have a large number of employees arriving within a very narrow time period, so staggering starting hours can help reduce localized traffic problems. This strategy is also assumed to affect only the timing of the trips, not the number of vehicle trips.

Compressed Work Week - Under this strategy, employees are allowed to reduce the number of work trips made by working longer hours on fewer days per week. Options include the 4/40 schedule where 40 hours are worked in 4 days with the fifth day off and the 9/80 schedule where 80 hours are worked in 9 days with the tenth day off. COMMUTER assumes that the 4/40 schedule eliminates one round-trip a week (1/5 of a daily trip) and that the 9/80 schedule eliminates one round-trip every two weeks (1/10 of a daily trip) for each participating employee.

Telecommuting - This strategy involves allowing employees to work off-site, usually at home via telecommunications linkups, one or more days per week. Telecommuting thus reduces the demand for travel to the workplace. This is accounted for in COMMUTER by simply removing person trips, along with the equivalent number of vehicle trips, from the total amount of travel. (A more sophisticated analysis would consider how some of the commute trips might be replaced by non-work travel.)

5. EMISSIONS-RELATED INPUT SCREENS

In the final two input screens, you will supply the information that COMMUTER needs to calculate emission reductions. (If you are only interested in using COMMUTER to compute <u>travel impacts</u>, you don't need to enter any input information these two screens.)

To make this easier, a large matrix of MOBILE6.2 emission factors was generated for a series of local conditions and provided with the program. (A total of 192 different sets of emission factors are provided with COMMUTER.) To use these factors, all that you need to do is supply a simple set of vehicle fleet characteristics, and COMMUTER will then look up the appropriate set of MOBILE6.2 factors and use them to calculate emission reductions from the TCM programs being evaluated. Thus, you do not have to supply detailed, locally generated MOBILE6.2 emission factors.

If you are an experienced MOBILE6.2 user, however, and want to use emission factors that <u>exactly</u> match your local conditions, you can optionally direct COMMUTER to import and apply your locally generated factors.   (Refer to Section 2.7 for step-by-step details on generating and properly importing your own MOBILE6.2 emission factors into COMMUTER.)

5.1 Fleet Emissions Information

In the first emissions-related input screen, you will provide the data needed for the program to select the appropriate set of pre-loaded MOBILE6.2 emission factors or activate the User-Supplied Emission Factors" option if you want to use your own locally generated MOBILE6.2 factors.

Figure 13 shows the layout of this screen.   If you want to use the pre-loaded emission factors contained in COMMUTER, follow the input requirements under "Using Pre-Loaded Factors." To use your own factors, see "Using Locally Generated Factors."

<u>Using Pre-Loaded Factors</u> - To use pre-loaded factors, you must select from the available fleet characteristic options in the **MOBILE Scenario** section at the top of the screen that best match your local conditions. Once you've specified all of the fleet characteristics or changed any of these characteristics, you will be reminded to import the scenario-specific emission factors using the "Import Default Emission Factors" command on the "File" menu. You do not need to re-import the default emission factors if you only change the calendar year of analysis, as each default emission factor file contains factors for all six calendar years available. (Leave the "User-Supplied Emission Factors" and "Calendar Year of User EFs" cells toward the bottom of the screen blank.)

FLEET EMISSIONS INFORMATION

Field	Data	Notes

MOBILE Scenario Inputs

Field	Data	Notes
Calendar Year of Analysis		Enter either 2007, 2009, 2010, 2013, 2019, or 2021
Season		S = Summer, W = Winter
Climate Type		1 = Mild, 2 = Moderate, 3 = Severe
I/M Program Type		0 (zero) = none, 1 = Basic I/M, 2 = Enhanced I/M, 3 = OBD Only
Fuel Type		C = Conventional, R = RFG
PADD		1, 2, 3, 4, or 5 (based on state - see below)

The "MOBILE Scenario" inputs are used by the program to select a specific set of MOBILE6.2 emission factors from a series of stored tables that best represent local conditions and emission control programs being modeled. These inputs are familiar to MOBILE6.2 users. Further clarification of these inputs for users less familiar with the MOBILE6.2 emission factor model is provided below. **Once the user has entered all scenario inputs, or changed an input, he or she must import the scenario emission factors using the "Import Default Emission Factors" command from the File menu.**

Calendar Year - Because new vehicle emission levels continue to decrease with the introduction of each model year, current and future vehicle fleet emissions will depend on the calendar year being analyzed.

Season - This input affects the temperature range for which emissions are modeled (emissions characteristics of vehicles vary depending upon the temperature range in which the vehicle is being operated.) The choice of season may depend upon which pollutants are of greatest interest. Since ozone is typically a summer problem and carbon monoxide (CO) is typically a winter problem, summer should generally be used if ozone is of primary interest, while winter should be used if reducing CO is of primary interest. The seasonal importance of other pollutants may vary regionally.

Climate Type - This input is used on conjunction with the "season" input to determine default temperature ranges for the model. Choose the climate type (1 = mild, 2 = moderate, 3 = severe) that most closely matches the average daily minimum and maximum temperatures in your area (in deg F) as specified below:

    Summer - Mild: min 55/max 75
    Summer - Moderate: min 65/max 85
    Summer - Severe: min 75/max 95
    Winter - Mild: min 52/max 72
    Winter - Moderate: min 32/max 52
    Winter - Severe: min 12/max 32

If the user is interested, monthly normal temperatures for 250 cities can be looked up through the National Climatic Data Center, http://www.ncdc.noaa.gov/oa/ncdc.html.

I/M Program Type - The type of Inspection and Maintenance (I/M) program, if any, being operated. Basic I/M refers to a program where a simple "no-load" idle or 2500 RPM test is performed. Enhanced I/M represents programs in which a loaded IM240 or ASM test are run on a dynamometer. OBD Only represents programs in which vehicles are not subject to an annual or biennial inspection. but instead emissions malfunctions are identified by a vehicle's on-board diagnostics (OBD) system.

Fuel Type - Under the 1990 amendments to the Clean Air Act, certain areas of the country must use reformulated gasoline (RFG) beginning in 1995. This input allows the user to specify whether RFG is being used. A map and list of counties in which RFG is required is provided on the EPA's web site, http://www.epa.gov/OMSWWW/rfg/whereyoulive.htm.

PADD - (Petroleum Administration for Defense District) - PADD's were delineated during World War II to facilitate oil allocation. The characteristics of refined fuels, and therefore the emissions characteristics of vehicles, vary generally by PADD. The most significant effect is on emissions of air toxics. Select the appropriate PADD (1 – 5) based on your analysis state:

  1 - East Coast: Connecticut, Delaware, District of Columbia, Florida, Georgia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, Vermont, Virginia, West Virginia.

  2 - Midwest: Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Ohio, Oklahoma, Tennessee, Wisconsin.

  3 - Gulf Coast: Alabama, Arkansas, Louisiana, Mississippi, New Mexico, Texas.

  4 - Rocky Mountain: Colorado, Idaho, Montana, Utah, Wyoming.

  5 - West Coast: Alaska, Arizona, California, Hawaii, Nevada, Oregon, Washington.

For a map of PADDs, see: http://www.eia.doe.gov/pub/oil_gas/petroleum/analysis_publications/oil_market_basics/paddmap.htm.

Figure 13b
Fleet Emissions Information Input Screen (p. 2)

User-Supplied MOBILE Emission Factors

User-Supplied Emission Factors ☐   Mark the box to the left (with an "X") to compute emission reductions using alternate MOBILE6.2 emissions factors instead of the pre-loaded factors already contained in the COMMUTER model

Calendar Year of User EFs [＿＿＿＿]   Select the calendar year of the user-supplied emission factors

The COMMUTER model has been designed to use pre-loaded MOBILE6.2 emission factors for a defined range of input conditions or a set of user-supplied emission factors for specific local conditions. Before user-supplied emission factors can be used, the user must load these factors into the model using a two-step process:
1) MOBILE6.2 database format output must be processed, using the "**Process MOBILE Output**" command from the File menu. This routine requests the user to select a MOBILE6.2 output file (.TB1), and then produces a text file with the extension ".TBZ," that is formatted for import into the COMMUTER Model.
2) The .TBZ data file must be imported, using the "**Import User Emission Factors**" command from the File menu. The user can choose a different .TBZ file without having to process MOBILE output every time.

The "Process MOBILE Output" command requires the availability of a MOBILE6.2 output file in database format (.TB1 file extension), along with corresponding toxics (.TOX) and particulate (.PM) output files that have the same base file name as the .TB1 file. The resulting .TBZ file can be stored with the COMMUTER Model for future use, and the .TB1, .TOX, and .PM files deleted or moved if desired. The database output options must be specified as shown in the sample MOBILE6.2 input file provided and described in Section 5 of the User Manual. The "Calendar Year of User EFs" input identifies the specific calendar year factors from the set of user-supplied factors. The calendar year can be any year between 1960 and 2050, but must match one of the available calendar years in the user-provided MOBILE6.2 output files. (These output files may include a maximum of **six** calendar year scenarios.)

Each of these "pre-loaded" fleet characteristics inputs is explained below.

- **Calendar Year** - Since vehicle fleet emission levels change as new technology improvements are introduced on newer cars, the calendar year that represents the analysis scenario must be entered.

  You can choose either 2007, 2009, 2010, 2013, 2019, or 2021. If you are interested in an analysis year between two of those years, the model should be run for both of the surrounding years (for example, if you are interested in 2008, you should run analyses for both 2007 and 2009). You will then need to interpolate the resulting travel and emission impacts to represent impacts in the year of interest.

  When you choose the year, you should keep in mind the time period when the TCM programs being modeled will actually be implemented. For example, in evaluating improved levels of transit service, it may take a couple of years to implement the service improvements.

- **Season** - Vehicle emissions vary depending upon the ambient temperature and, in some areas, fuel controls are imposed only in certain seasons. You therefore need to enter the season for the analysis of interest, selecting either "S" (summer) or "W" (winter). If you are an air quality planner, you will generally select

52

summer when evaluating ozone-related emission reductions (including VOC and NOx), and winter for carbon monoxide evaluations. The seasonal importance of other pollutants may vary regionally.

- **Climate Type** - This input is used in conjunction with the "season" input to determine temperature ranges for the model. You should choose the climate type (1 = mild, 2 = moderate, 3 = severe) that most closely matches the average daily minimum and maximum temperatures in your area (in degrees Fahrenheit), in either summer or winter depending upon your analysis season:

  - Summer - Mild (S, 1): min 55/max 75
  - Summer - Moderate (S, 2): min 65/max 85
  - Summer - Severe (S, 3): min 75/max 95
  - Winter - Mild (W, 1): min 52/max 72
  - Winter - Moderate (W, 2): min 32/max 52
  - Winter - Severe (W, 3): min 12/max 32

You may, if you choose, look up monthly normal temperatures for your city through the National Climatic Data Center, http://www.ncdc.noaa.gov/oa/ncdc.html. Data for 250 cities are provided at no cost on this web site. In most areas, summer temperatures for July and winter temperatures for January (when temperatures are at their highest and lowest) should be used.

- **I/M Program Type** - The type of Inspection and Maintenance (I/M) program, if any, being operated in your area will affect fleet emissions. If you do not know what type of I/M program is in place in your area, your state department of environmental protection or department of motor vehicles should be able to tell you. The following I/M program options are available:

  - None (0) - No I/M program exists in your area.
  - Basic I/M (1) - A program where a simple "no-load" idle or 2500 RPM test is performed along with a visual inspection;
  - Enhanced I/M (2) - A program in which a loaded IM240 or ASM test are run on a chassis dynamometer in conjunction with a visual and functional emission control system inspection;
  - OBD Only (3) - A program in which vehicles are not subject to an annual or biennial inspection, but instead emissions malfunctions are identified by a vehicle's on-board diagnostics (OBD) system.

- **Fuel Type** - Under the 1990 amendments to the Clean Air Act, certain areas of the country must use reformulated gasoline (RFG) beginning in 1995. This input allows the user to specify whether RFG is being used. A map and list of counties

in which RFG is required is provided on the EPA's web site,
http://www.epa.gov/OMSWWW/rfg/whereyoulive.htm.

- **PADD** - (Petroleum Administration for Defense District) - PADDs were
  delineated during World War II to facilitate oil allocation. The characteristics of
  refined fuels, and therefore the emissions characteristics of vehicles, vary
  generally by PADD. The most significant effect is on emissions of air toxics.
  Select the appropriate PADD (1 - 5) based on your analysis state:

  1 - East Coast: Connecticut, Delaware, District of Columbia, Florida, Georgia,
      Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York,
      North Carolina, Pennsylvania, Rhode Island, South Carolina, Vermont,
      Virginia, West Virginia.
  2 - Midwest: Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota,
      Missouri, Nebraska, North Dakota, South Dakota, Ohio, Oklahoma,
      Tennessee, Wisconsin.
  3 - Gulf Coast: Alabama, Arkansas, Louisiana, Mississippi, New Mexico,
      Texas.
  4 - Rocky Mountain: Colorado, Idaho, Montana, Utah, Wyoming.
  5 - West Coast: Alaska, Arizona, California, Hawaii, Nevada, Oregon,
      Washington.

  For a map of PADDs, see:
  http://www.eia.doe.gov/pub/oil_gas/petroleum/analysis_publications/oil_market_ba
  sics/paddmap.htm.

Using Locally Generated Factors - Once you have successfully imported your own
locally generated MOBILE6.2 emission factors into COMMUTER as described in
Section 2.7, you can direct COMMUTER to apply them in the emission reduction
calculations by marking the "User-Supplied Emission Factors" box (with an "X") toward
the bottom of the screen. Once you activate this option, you must then enter the specific
calendar year of the emission factors you've imported in the "Calendar Year of User EFs"
input cell. (This input is used to select a specific calendar year from a set of factors
you've imported that may encompass multiple calendar years. Even if you've only
imported emission factors for a single year, you must enter it into this input cell.)

> *__NOTE:__ When you activate the "User-Supplied Emission Factors" option, any entries you may have made in the "MOBILE Scenario Inputs" cells at the top of the screen are ignored. In addition, the vehicle fleet mix and VMT mix by facility type that you've specified in your locally generated emissions factors file is automatically loaded into the appropriate cells in the "Other Emissions-Related Data" screen that follows.*

5.2 Other Emissions-Related Data

In this final input screen, you will provide additional emission-related inputs that COMMUTER will then use in conjunction with the MOBILE6.2 emission factors discussed in Section 5.1 to calculate "before TCM" (i.e., existing) and "after TCM" daily emissions for the vehicle fleet. It will then determine the resulting emission reductions from the TCMs being evaluated.

Figure 14 shows the Other Emissions-Related Data input screen. Each of the inputs you will be required to enter is described below.

Vehicle Fleet VMT Mix - The light-duty vehicle fleet is composed of nine different classes of vehicles, which are listed on the screen. The VMT mix for the vehicle fleet refers to the percent of the total travel (VMT) that is driven by each of the nine vehicle classes. The emission factors in MOBILE6.2 are based on vehicle class. COMMUTER will calculate emissions for the entire vehicle fleet (referred to as the fleet composite emissions) based on the percentage of VMT in each vehicle class, by weighing the emission factors together according to the fleet mix input.

If known, you should supply local data on fleet mix for the analysis area in the "Local" column. Only the light-duty vehicle mix (vehicles <8,500 lb.) is required, since the strategies analyzed by COMMUTER are not intended to affect travel by heavy-duty vehicles (trucks). You may enter the vehicle mix either as a percentage of all light-duty vehicles (in which case the total should sum to 100%), or as a percentage of all vehicles including heavy-duty vehicles. If the total you enter is less than 100%, COMMUTER will assume that you have selected the second alternative and will normalize the percentages to 100%, to represent the fractions of light-duty vehicles.

Figure 14
Other Emissions-Related Data Input Screen

OTHER EMISSIONS-RELATED DATA

	Use Default	Data Local	Default	Explanatory Notes
Vehicle Fleet VMT Mix	☐			Percentages of total VMT by vehicle type
LDGV - Light-Duty Gas Vehicles			#N/A	Passenger Cars
LDGT1 - Light-Duty Gas Trucks 1			#N/A	0-6,000 lbs. GVWR, 0-3,750 lbs. LVW
LDGT2 - Light-Duty Gas Trucks 2			#N/A	0-6,000 lbs. GVWR, 3,750-3,750 lbs. LVW
LDGT3 - Light-Duty Gas Trucks 3			#N/A	6,000-8,500 lbs. GVWR, 0-5,750 lbs. ALVW
LDGT4 - Light-Duty Gas Trucks 4			#N/A	6,000-8,500 lbs. GVWR, over 5,750 lbs. ALVW
LDDV - Light-Duty Diesel Vehicles			#N/A	Passenger Cars
LDDT12 - Light-Duty Diesel Trucks 1 & 2			#N/A	0-6,000 lbs. GVWR
LDDT34 - Light-Duty Diesel Trucks 3 & 4			#N/A	6,000-8,500 lbs. GVWR
MC - Motorcycles			#N/A	Gasoline
TOTAL		0.0%	#N/A	If not 100%, model will normalize
Affected Vehicle Speed (mph)	☐			Average speed (mph) of TCM-affected trips
Peak Period Average Speed - Freeways			50.5	
Off-Peak Period Average Speed - Freeways			56.4	
Peak Period Average Speed - Arterials			24.2	
Off-Peak Period Average Speed - Arterials			26.0	
Percent of VMT by Facility Type	☐			
Freeway			34.2%	
Arterial			49.8%	
Local Road			13.1%	
Ramp			3.0%	
TOTAL (must add to 100%)		0.0%	100.0%	

Vehicle Fleet VMT Mix
MOBILE6 generates emission factors for each of the nine different vehicle classes listed. Fleet "composite" emission factors are then calculated by weighting these emission factors by the percentage of travel (i.e., VMT) in each vehicle class. The default VMT mixes provided by this program are MOBILE6 national default values. These defaults are calendar year specific; **you must enter a calendar year under the Fleet Emissions Information screen before the defaults will appear**. If you are using user-supplied emission factors, the emissions factor import routine will automatically generate and look up a VMT mix from your MOBILE6 output file. If you are using default emission factors and do not enter local data for a VMT mix, the model will use the default MOBILE6 VMT mix.

Only the light-duty vehicle mix (vehicles <8,500 lb.) is required, since the strategies analyzed by COMMUTER are not intended to affect travel by heavy-duty vehicles (trucks). The user may specify the VMT mix either as a percentage of <u>all</u> vehicles, or as a percentage of <u>light-duty</u> vehicles. If the total of the light-duty vehicle categories entered is less than 100%, the model will assume that the user is entering the percentage of all vehicles (including heavy-duty) and will normalize these percentages to total 100% (representing the fraction of light-duty vehicles).

Note: GVWR = Gross Vehicle Weight Rating; LVW = Loaded Vehicle Weight; ALVW = Adjusted Loaded Vehicle Weight.

Affected Vehicle Speed
Vehicle emissions vary with speed. The values entered here should represent regional network average speeds during the peak and off-peak periods. Default values supplied are based upon HPMS (Highway Performance Monitoring System) averages compiled by urban area size.

Percent of VMT by Facility Type
Vehicle emissions vary by roadway facility type because of the different traffic operating characteristics on different facilities (e.g., freeway travel typically involves less starting and stopping than travel on other roads). MOBILE6 defines four facility types: freeways, arterials, local roads, and freeway ramps. If user-supplied emission factors are provided, the facility mix will be read from the user-supplied MOBILE output files and the user does not need to specify the mix. If default emissions factors provided with the COMMUTER model are used, you may either specify a local facility mix or use the default mix that is provided with the model.

If local data are not available, you can check the boxes in the "Use Default" column to use the national default fleet mixes obtained from MOBILE6.2. Note that the default fleet mixes vary by calendar year.

As indicated in Section 5.1, if you are using your own locally generated emission factors, the VMT mix from your MOBILE6.2 emission factor file is automatically loaded into these input cells.

Affected Vehicle Speeds - The values you enter here should represent existing average vehicle speeds in your region. You should be able to obtain data on average travel speeds from transportation planning staff at the regional transportation planning agency. Even if you are running a site-specific analysis, enter speeds that represent averages for your urban region.

You will need these values for both peak and off-peak periods, and for freeways as well as arterials.[*] Peak period travel speed should be the average of travel speeds in the AM and PM peak periods, if these values differ.

> *CAUTION:* *Do not specify travel speeds at a geographic area smaller than the county level. Even if you are performing a site-specific analysis, the speed inputs should reflect average regional network travel speeds that employees at the site experience driving to and from work.*

You may also choose to use default travel speeds, shown in Table 2, if local data from the regional MPO are not available. These default values have been estimated from national highway data. Travel speeds will vary depending on metropolitan area size, since larger areas tend to be more congested.

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[*] In most cases, the MPO for a given region is responsible for both transportation planning and emissions analysis. The MPO maintains local data related to travel demand, speed, and emissions inventories for regional planning purposes. These data are typically available to member agencies (counties, cities, transit operators) and businesses. Metropolitan-level emissions inventory data sets generally provide local data on travel speeds by peak and off-peak periods that are generated from the travel demand modeling process and used in regional air quality conformity analysis.

Table 2
Default Speeds (mph) by Area Size

Period	Highway Type	Urban Area Size		
		Large	**Medium**	**Small**
Peak	Freeway	40.2	46.8	50.5
	Arterial	22.6	23.2	24.2
Off-Peak	Freeway	49.0	54.7	56.4
	Arterial	25.1	25.5	26.0

VMT by Facility Type

Vehicle emissions vary by roadway facility type because of the different traffic operating characteristics on different facilities (e.g., freeway travel typically involves less starting and stopping than travel on other roads). MOBILE6 defines four facility types: freeways, arterials, local roads, and freeway ramps. If user-supplied emission factors are provided, the facility mix will be read from the user-supplied MOBILE output files and you do not need to specify the mix. If the default emissions factors provided with the COMMUTER model are used, you may either specify a local facility mix or use the default mix that is provided with the model.

6. REFERENCES

1. J. R. Kuzmyak, et. al., "Procedures Manual for Estimating Emission Reductions from Voluntary Measure and Commuter Choice Incentive Programs", prepared for the U.S. Environmental Protection Agency," Draft Final Report, September 19, 1999.