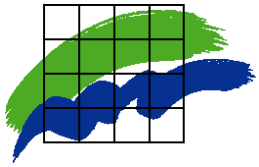

User's Guide to WinOSPM

Operational Street Pollution Model

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1 Introduction

The present User's Guide serves as an introduction to the use of the Windows version of the Operational Street Pollution Model – OSPM.

The Windows version of OSPM is distributed under the name WinOSPM.

The OSPM model has been developed by the Department of Atmospheric Environment, National Environmental Research Institute, Denmark.

The present User's Guide is a first version and it is intended to be further elaborated in the future.

Various ways to access Help

From most windows in the OSPM program, the user has access to help under the menu **Help**. It gives access to the entire help text (choose Contents or Index) and to the User's Guide (in PDF format).

There is a number of ways to access Help besides the menu **Help**

- In some windows, a Help button is available, providing help relevant for that particular window.
- In some windows, a question mark  is displayed in the upper right-corner of the window. Clicking it will put the window in Help Mode with context-sensitive help to the items in the window.
- In one specific window - the "Calculation" window, which is the central window of the entire program - a right-click will trigger a similar feature: Right-clicking activates the *What's This* banner, and a (left) click on *What's This* leads to an explanation of an item.

Note that within Help, for some windows, there is a Help topic called *Items in the "XXX" window* with a clickable map of the window

A *Glossary* is available from the page with Help Contents (available by selecting menu **Help | Contents**).

The User's Guide

It is possible to open and read the present User's Guide in an electronic format (PDF-format) under the menu **Help/User's Guide in PDF format**.

This Guide deals only with matters that concern application of the computer software and the required data. The physical principles of OSPM and the criteria of using the model for traffic pollution calculations, are not handled here.

2 Installation

2.1 System requirements

The following equipment is required in order to run OSPM:

- A PC with a Pentium processor (or compatible)
- Windows 9x, Windows 2000 or Windows XP.
- 20 MB free disk space
- 32 MB RAM
- CD-drive (for installation)
- A screen with a minimum resolution of 1024 x 768 is recommended. A resolution of only 800 x 600 can be used, but in that case scrolling is required for some windows.

When installing under Windows 2000 administrator privileges are required.

2.2 Installing WinOSPM

On a separate sheet you will find instructions for installing WinOSPM.

After the installation you will find three new icons on your desktop: The WinOSPM icon starts the OSPM program. Furthermore, you will find icons for the EmiFact program and TrafEdit. These two programs are additional tools for OSPM: EmiFact is a program for editing Vehicle Emission Factors, while TrafEdit is Traffic Data Editor. Both these tools can be applied as stand-alone programs, but they may also be accessed through the WinOSPM user interface.

2.3 First Time

When you start WinOSPM first time after installation of the software, a dialog window will appear in which you will be asked to define the Default Country (*Fig. 2.1*). The user can select one of the pre-defined Country settings or define a new Country setting. Currently, WinOSPM is distributed with Country settings for Denmark only. However, if WinOSPM has previously been installed on the computer, and new Country settings have been added to the previous installation, these countries will also be listed in the opening window as available Country settings. Information on added Country settings is written to the computers Registry Database, and remains there even after uninstalling of the WinOSPM software. The pre-requisition for using the previously added Country settings is that no data folders with the country specific data have been manually deleted from the WinOSPM installation folder and that the same installation folder is specified for the new installation.

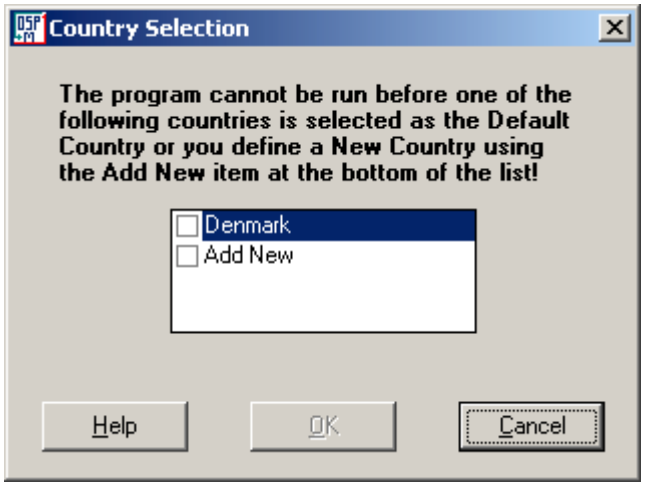


Fig. 2.1 To start using WinOSPM the first time, a Default Country must be defined.

Note: When WinOSPM is uninstalled using the "Add/Remove Programs" item from the Control Panel, non of the user created folders or files are removed from the computer. In the case that some of the previously created folders or files were manually deleted or the user wants to overwrite the country specific data with new data, the information on the particular Country setting must be removed from the Registry Database. A special tool, the Country Registry Editor, is provided with the program. How to use this tool is described later in this Chapter.

In the case, that the "Add New" item is selected, a new dialog windows appears with 3 available options (*Fig. 2.2*).

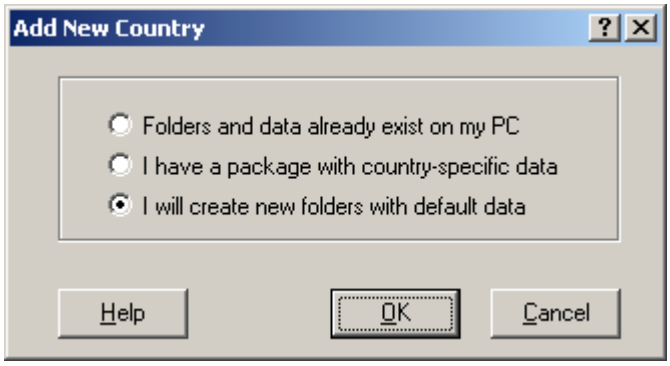


Fig. 2.2 The new Country settings can be created using three optional methods.

The three available options refer to the three different methods that can be used to add a new Country setting.

1. **Folders and data already exist on my PC**

   This condition applies to a situation when all the country specific folders and data are already created and only the reference to the new Country setting need to be added.

2. **I have a package with country-specific data**

This condition applies to a situation when all the country specific data are provided in a separate folder (or a removable media, such as a CD or a diskette) and they have to be copied to the country specific folders under the WinOSPM installation folder. New folders will be created if they don't exist. If some of the folders exist in advance, the user will be prompted with a warning message that some of the files in this/these folders can be overwritten. Normally, the user can safely accept this condition.

The User will be prompted to specify the path to the folder with the data that will be copied to the country specific folders. It's important that all these data are in same folder. Beside the data files, this folder must also contain a file with the name "Files.lst", which provides a list of the files that have to be copied as well as their destination folders. The general structure of the "Files.lst" file is illustrated in *Listing 2.1*.

Listing 2.1

```
AppPath\DataFolder\National\Code\FileName
AppPath\DataFolder\DataSubFolder\National\Code\FileName
```

The phrase "AppPath" refers to WinOSPM installation folder's path. This phrase is automatically replaced by the actual installation path when the file copy process is executed. The phrases "DataFolder" and "DataSubFolder" refer to the data folders or subfolders under the WinOSPM installation folder. These phrases should be replaced by their actual names. The directory structure of WinOSPM is explained in details in the Appendix C. The phrase "National" refers to the set of country specific folders, while "Code" is automatically replaced by the actual Country Code when the file copy process is executed. The "FileName" must be replaced by the actual name (including extension) of the file that has to be copied to the destination folder.

One line of text must be specified for each file to be copied.

3. I will create new folders with default data

This condition applies to a situation when no Country specific data are available in advance. In this case all the necessary country specific folders will be created and files with default data will be copied to these folders. These files will however mainly contain some dummy values, which must be replaced by the user with the actual data. Which data are country specific, and how they can be created, is discussed in more details later in this User's Guide.

In all three cases the User will be prompted to define the Country Name and the Country Code. The Country Name is the text that will be used to display the name of the country in the program. The Country Code is used internally in the program and all the country specific folders are named with the Country Code. Both the Country Name and the Country Code must be unique. An attempt to create two different Country settings with the same Name or Code will result in an Error Message.

The Country settings need not to refer to geographical or political country definitions. A Country setting can just refer to a set of data files with specific traffic data, traffic emissions or even a set with different pollutant included in the program calculations.

The Country setting can be changed any time when using WinOSPM. Also New Country entries can be created and added to the list of available Country settings, later on.

Note: A similar dialog window to the one shown in *Fig. 2.1* will appear if the program, that is started first time after installation of the software is the EmiFact program or the TrafEdit program. However, in this case it will not be possible to create a new Country setting. It will only be possible to select one of the pre-defined Country settings.

2.4 Using the Country Registry Editor

Country Registry Editor is a special tool that can be used to "clean up" in the registry information on the country specific settings in WinOSPM.

When a new Country setting is added to the program, the Country Name and the Country Code are added to the computers Registry Database and also are written to the Countries.ini file, which is located in the WinOSPM main directory. If for some reasons an error occurred during the installation process of a new Country settings, or the user just wants to repeat the installation, the information on the particular Country setting must be removed both from the registry database and from the Countries.ini file. It's not possible to repeat the installation as long as the Country Name and the Country Code is still registered. For this purpose, and only for this purpose, the User can use the Country Registry Editor. After installation of WinOSPM, a shortcut to this program is established in the Program Files folder OSPM. The program can also be executed by activating the CleanCtr.exe file that resides in the WinOSPM/Tools folder.

On starting the program, a list of registered countries is listed in the program window (*Fig. 2.3*). To delete an item from the list, this item must first to be marked. Only these Country settings that have been added to the list of countries after installation of WinOSPM, are listed in the main window.

It's not sufficient to delete the Country setting from the Registry Database. You need also to delete the corresponding item from the Countries.ini file (Countries List file). The Country List Editor lists all the Country settings that are currently registered in the Countries.ini file (*Fig. 2.4*).

Removing a Country setting from the Registry Database or from the Countries List doesn't result in deleting of the country specific folders or files. If required, this must be done manually. However, this is not required. Contrary, if no files are deleted from the computer, the Country setting can always be re-established by using the "Add New" menu with the option 1, as described in the previous section.

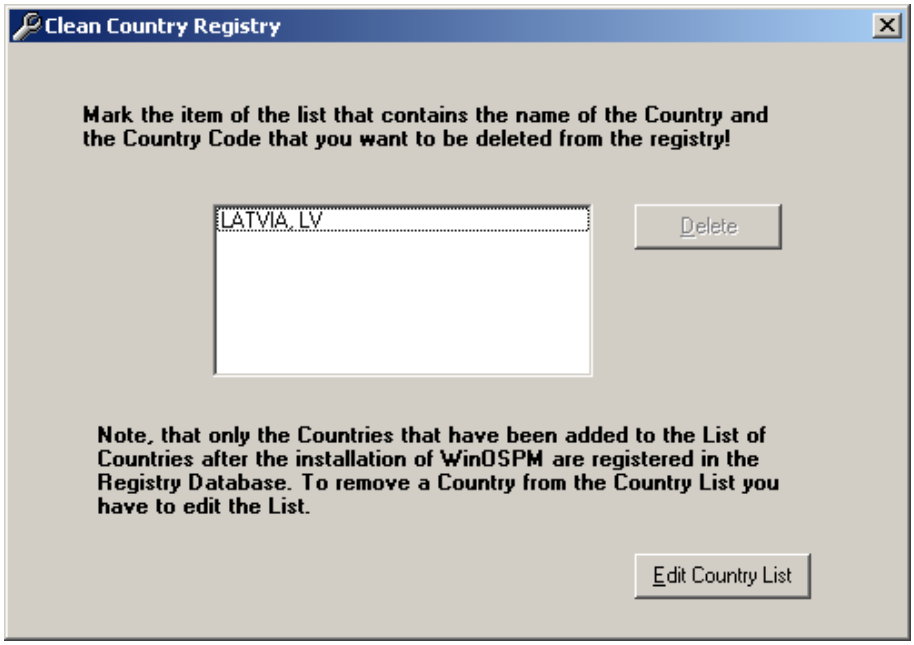


Fig. 2.3 The main window of the Country Registry Editor program. The Edit Country List button opens the Country List Editor window.

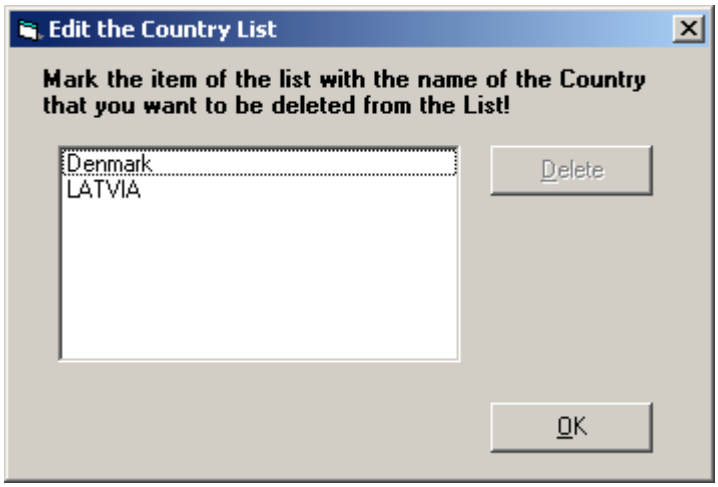


Fig. 2.4 The Country List Editor window. All Country settings that currently are registered in the Countries.ini file are listed here.

3 Defining and editing the country specific settings

This Chapter describes the procedure that can be used to define and edit the different country specific settings. If you don't need or don't want to modify any of these settings, you can skip this Chapter and go directly to the next Chapter – "Getting started – an example".

One of the menu options available in the start window of the program is the **Settings** menu option (*Fig. 3.1*). A number of submenus provide editing facilities for the basic country specific data.

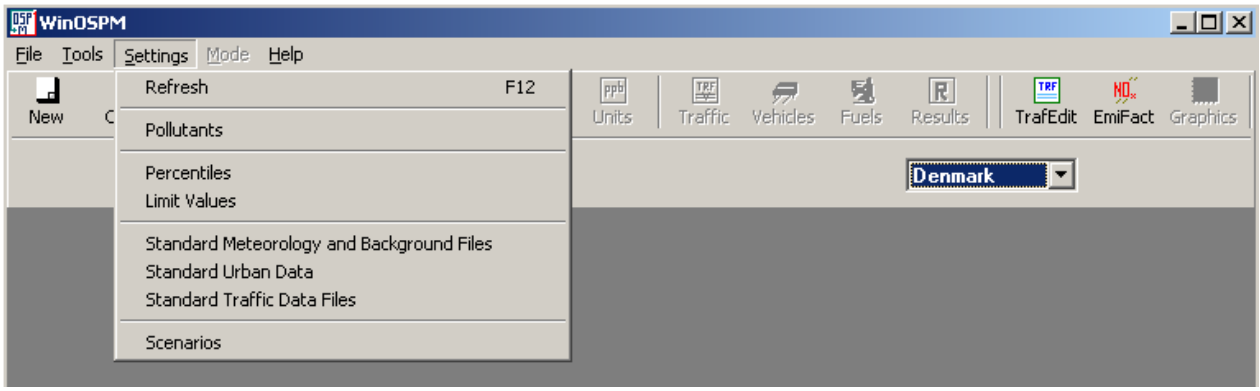


Fig. 3.1 The Settings menu option has a number of submenus, which provide editing facilities for the most of the country specific data.

All of these data can also be edited using just a text editor (e.g. Notepad) but this procedure can only recommended for experienced users. Using the editing tools provided by WinOSPM insures data integrity and consistency.

A brief description of the editing facilities is provided in the following. The online Help associated with the respective items provides more guidance.

Refresh

Pressing this menu item has the effect that all the country specific data are re-initialised. This is useful when/if some of these data have been modified outside the WinOSPM program and the user wants to apply these data without restarting the program. Restarting the program has the same effect.

Pollutants

The list of pollutants that can potentially be included in program calculations can be edited using this menu item (*Fig. 3.2*). However, if calculations for a certain pollutant have to be carried out, it is not sufficient that the pollutant is defined in the Pollutants List. Whether calculations for the pollutant can be performed also depends on the contents of the Vehicle List File and the Fuel List File for the current

project (see Chapter 8 for details on these List Files). Pollutants must be defined in the Pollutants List before they can be included in a Vehicle List File or a Fuel List File.

The Pollutants List must at least contain NOX, NO, NO2 and O3. Pollutant Names for these compounds cannot be modified by the user.

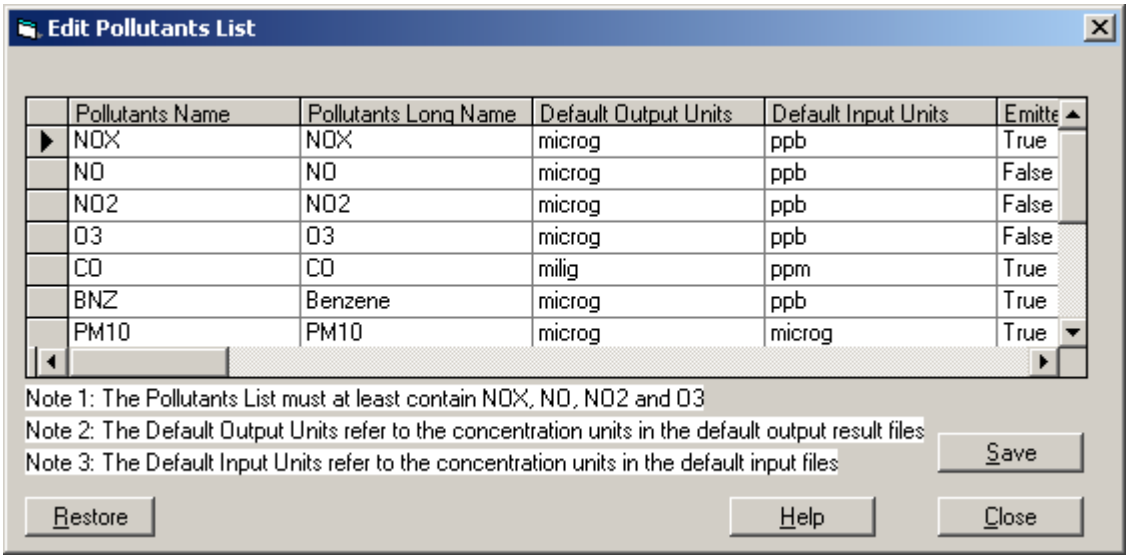


Fig. 3.2 The Edit Pollutants List window is used to add, delete or edit the list of pollutants that can potentially be used in program calculations.

Pollutants Name is the name by which the compound is identified in the OSPM calculations.

Pollutants Long Name is the name, which is used to display the name of the compound in different OSPM Windows. All Pollutants Long Names can be changed by the user.

The Default Output Units refer to the concentration units used in default output result files (automatically generated by the program). These concentration units should be the same as the units in which the respective Limit Values are expressed (if applicable).

The Default Input Units refer to the concentration units used in default input files (Standard Meteorology and Background Files). These concentration units should be the same for all default input files.

Emitter indicates whether the compound is treated as a directly emitted pollutant or is calculated as a secondary chemical reaction product. The values can be either True (directly emitted) or False (reaction product). The value of Emitter cannot be changed for NOX, NO, NO2 and O3.

microg_To_ppb provides the value, which is used to convert the concentration units given in mass per volume ($\mu g/m^3$) to volume per volume units (ppb). These values cannot be changed for NOX, NO, NO2 and O3.

How to add, delete or edit the pollutants in the Pollutants List is explained in the on-line Help.

Percentiles

The list of percentiles that can potentially be included in program calculations can be edited using this menu item (*Fig. 3.3*).

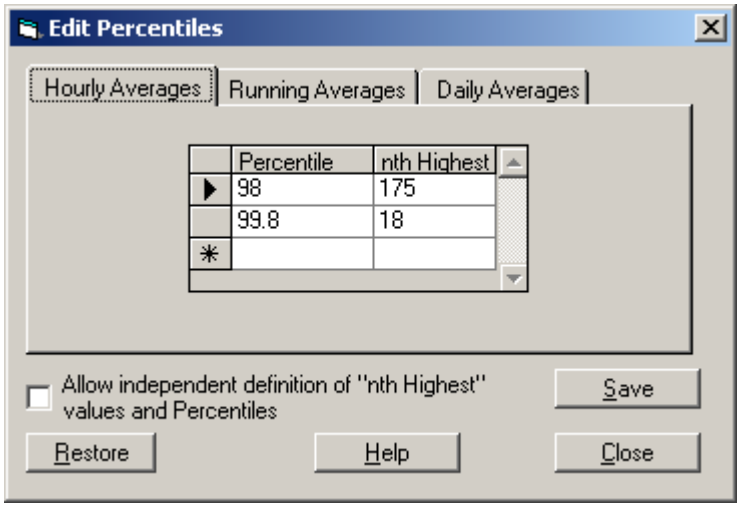


Fig. 3.3 The Edit Percentiles window is used to add, delete or edit the list of percentiles that can potentially be used in program calculations.

Here, the term Percentiles refers as well to percentiles calculated as a fraction of all available data as to the n'th-highest value of the available data.

Three types of percentiles can be calculated by the program:

- Hourly Averages refer to percentile values calculated from the hourly averages.
- Running Averages refer to the percentiles calculated from the 8 hours running averages.
- Daily Averages refer to the percentiles calculated from daily averages (24 hours).

Percentile values must be defined in the Percentile List in order to be used in the Limit Values settings.

How to add, delete or edit the Percentiles in the Percentiles List is explained in the on-line Help.

Limit Values

The list of Limit Values can be edited using this menu item (*Fig. 3.4*).

The Limit Values List provides the values of the Limit Values defined for selected pollutants. These values are displayed in the automatically generated default output files.

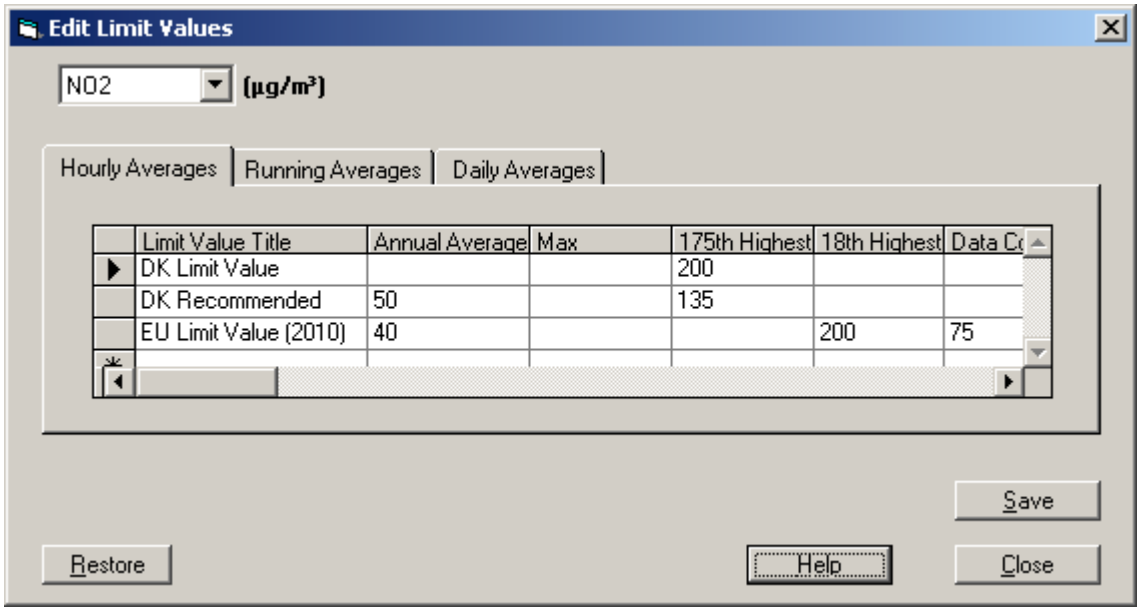


Fig. 3.4 The Edit Limit Values window is used to add, delete or edit the list of Limit Values defined for selected pollutants.

Limit Values can be defined for three different averaging times:

- Hourly Averages cover Limit Values referring to the hourly averages. Limit Values referring to Annual Averages belong also to this category.

- Running Averages cover Limit Values referring to the 8 hours running averages.

- Daily Averages cover Limit Values referring to the daily averages (24 hours).

The Limit Values List must cover all the pollutants listed in the Pollutants List, even though no limit value is specified for some of the pollutants. Only these percentile values that are listed in the Percentiles List can be referred to in the Limit Values List (except the Max value).

How to add, delete or edit the Limit Values List is explained in the on-line Help.

Standard Meteorology and Background Files

The List of Standard Meteorology and Background Files contains a list of files with pre-defined input data on meteorological and background concentration values that can be used for OSPM calculations if no own data are available. These data can refer to different regions of the country and/or different scenario years (see Chapter 9 for details on the Meteorology and background concentration files).

Beside the file list, the List provides also the short name of the file (Name To Show) by which the file will be presented to the User and a

short descriptive text (Help Text), which describes the contents of the data. In the shown example (*Fig. 3.5*) this text is provided in Danish.

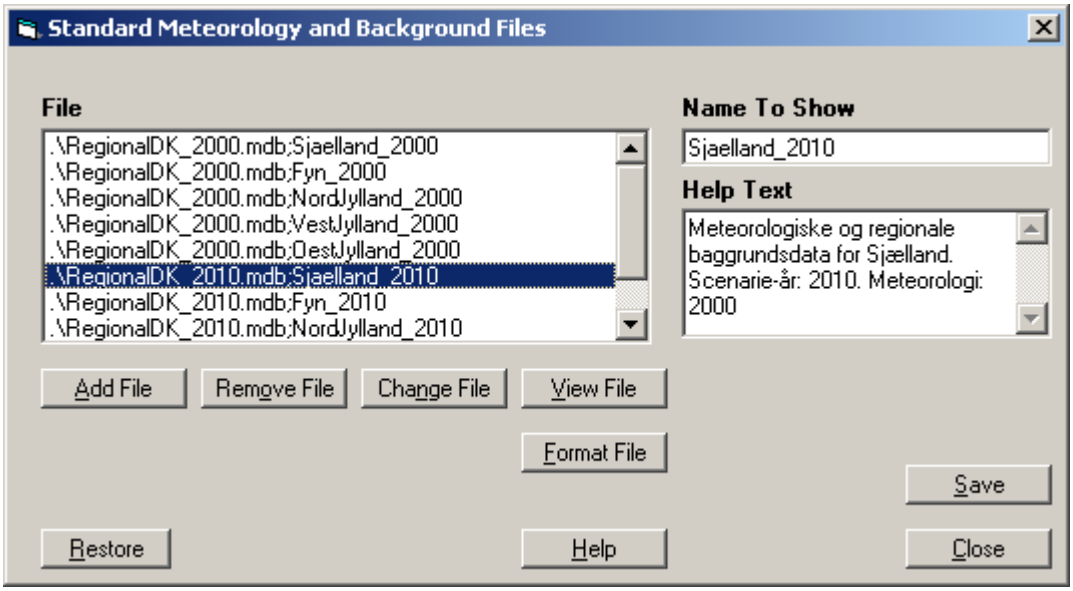


Fig. 3.5 The List of Standard Meteorology and Background Files contains a list of files with pre-defined input data on meteorological and background concentration values that can be used for OSPM calculations.

As a rule, the Standard Meteorology Background Files will contain data on the meteorological parameters and regional (rural) background concentrations. The regional background concentrations are used, together with the data provided in the Standard Urban Data Files to calculate the urban background concentrations.

The Standard Meteorology and Background Files are optional. If not available, the WinOSPM can still be used, but with user provided data.

How to add, delete or edit the items in the Standard Meteorology and Background Files List is explained in the on-line Help.

Standard Urban Data

The List of Standard Urban Data (*Fig. 3.6*) provides information on the Standard City Types, which can be used for calculation of urban background concentrations together with the Standard Meteorology and Background Files.

The Standard Urban Data are optional. If not available, the data on urban background concentrations must be provided in user defined files. The urban background concentration data can also be included in the Standard Meteorology and Background Files.

How to add, delete or edit the items in the Standard Urban Data Files List is explained in the on-line Help.

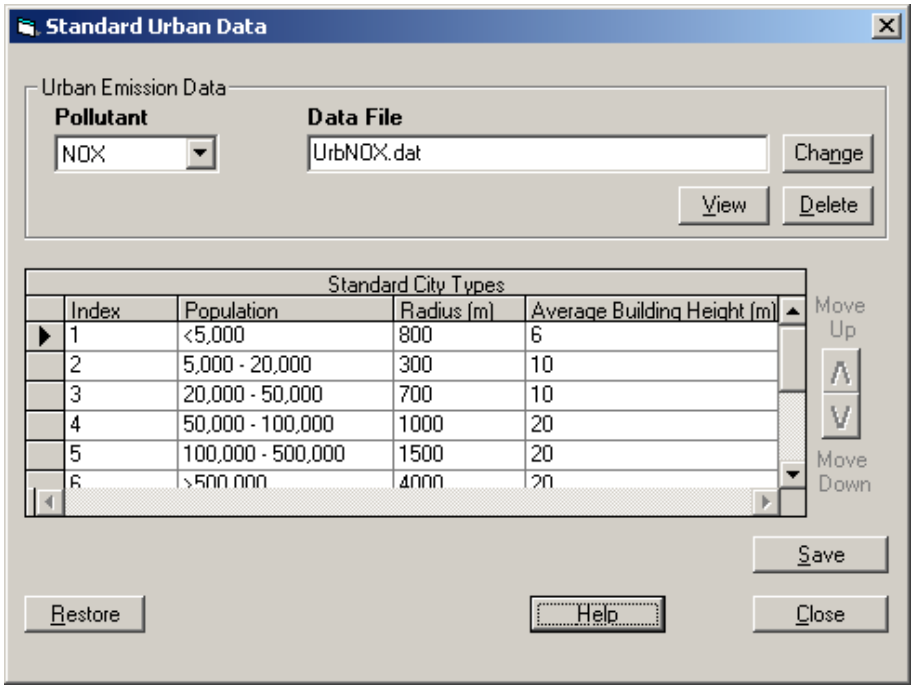


Fig. 3.6 The List of Standard Urban Data provides information on the Standard City Types, which can be used for calculation of urban background concentrations

Standard Traffic Data Files

The List of Standard Traffic Data contains a list of files with pre-defined traffic data for selected street types (composition and diurnal variation). See Chapter 7 on description of Traffic Data used with WinOSPM calculations.

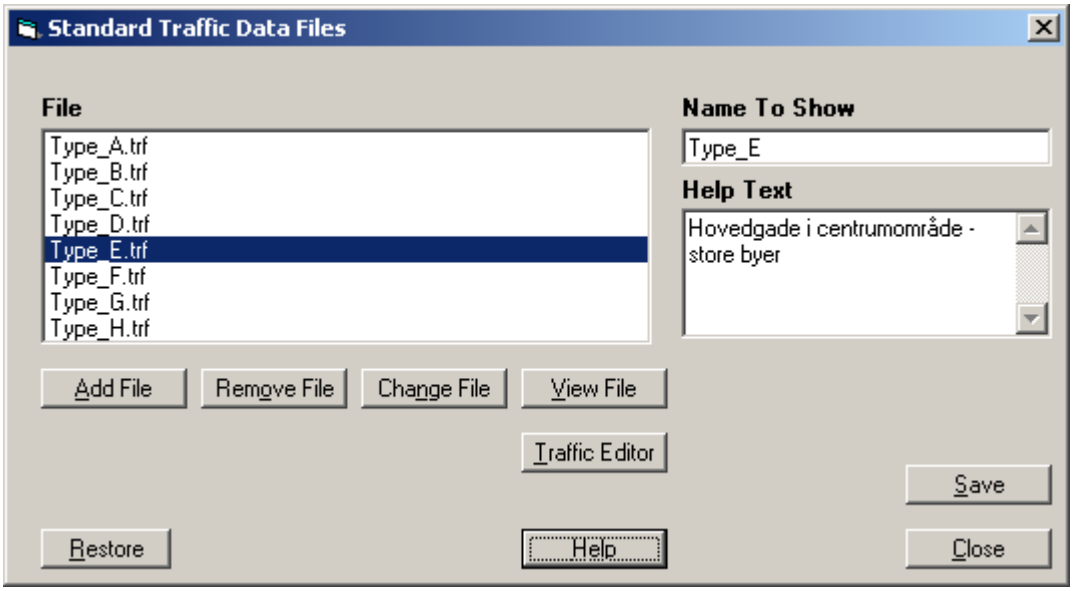


Fig. 3.7 The List of Standard Traffic Data contains a list of files with pre-defined traffic data for selected street types.

Beside the file list, the List provides also the short name of the file (Name To Show) by which the file will be presented to the User and a short descriptive text (Help Text), which describes the contents of the data. In the shown example (*Fig. 3.7*) this text is provided in Danish.

The Standard Traffic Data Files are optional. If not available, the WinOSPM can still be used, but with user provided data (see Chapter 7).

How to add, delete or edit the items in the Standard Traffic Data Files List is explained in the on-line Help.

Scenarios

The Scenarios List contains a list of files with data referring to vehicle emission factor conditions for a particular year. Files in the Vehicles List File column provide references to vehicle fleet composition data files, while files in the Fuels List File column contain data on fuel composition for the particular year (*Fig. 3.8*). See Chapter 8 for more details on Emission Scenarios and Vehicle or Fuel files.

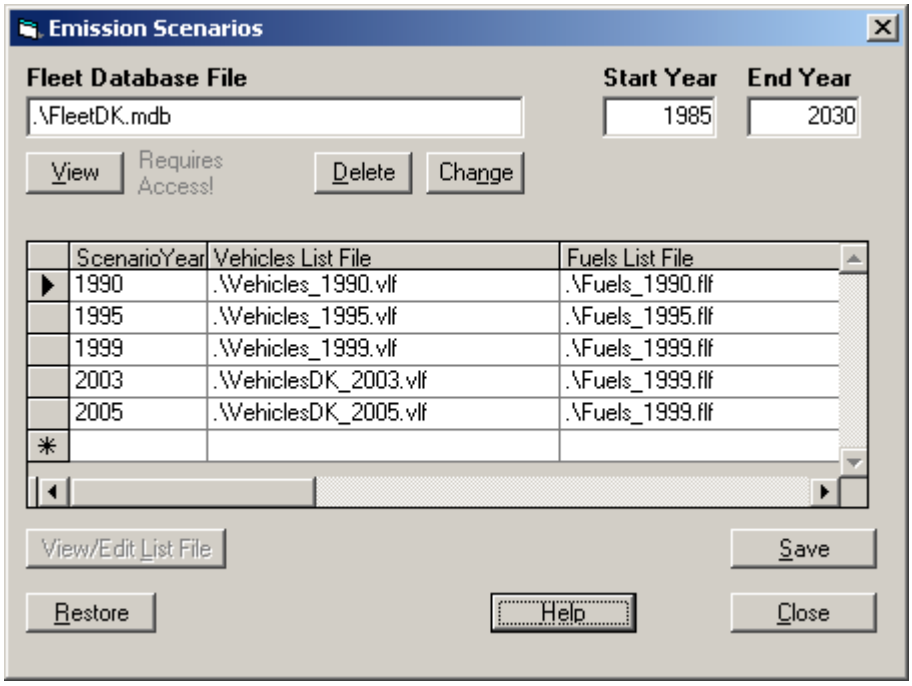


Fig. 3.8 The Scenarios List contains a list of files with data referring to vehicle emission factor conditions for a particular year.

The Scenarios List may also contain a reference to a National Fleet Database File. This is a Microsoft Access database file and the Access program is required to view/edit this file. The National Fleet Database File is used by WinOSPM and the associated EmiFact program to automatically generate data required to create new Scenarios.

The Scenarios List must contain at least one valid record. When a new Country setting is defined using option 3, as described in Section 2.3, a new Scenario List is automatically created containing one record but with Vehicles and Fuels files referring to dummy data only. These data must be edited by the user.

How to add, delete or edit the items in the Scenarios List is explained in the on-line Help.

4 Getting started - an example

This chapter takes you through an example that shows how WinOSPM can be used. WinOSPM is very flexible with respect to input and output, and the example illustrates only a few of the possible options. For more details you are referred to the subsequent chapters.

You may start the program through **Start / Programs / OSPM / WinOSPM** (or use the desktop icon).

Country setting

A drop-down list allows you to choose country. The country setting defines the choice of data for national car fleet composition and for fuel quality. Furthermore, this setting determines which standard (predefined) data will be available.

The program is currently distributed with a set of predefined data for Denmark. A new country entry can be created by selecting the "Add New" item.

For this example, choose Denmark.

A new project

Select **File / Create New Project** or click on the **New** button in order to start a new project. You will be asked to choose a "Working Directory" - i.e. a folder where project-related files are kept.

The next window is the "Project Type" window (*Fig. 4.1*).

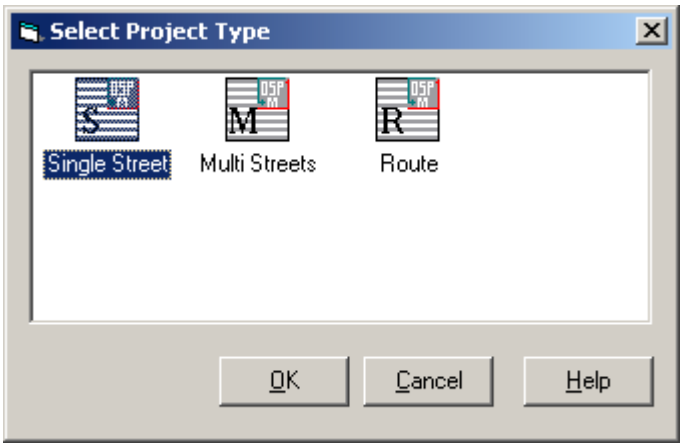


Fig. 4.1 Three different project types can be created for the WinOSPM calculations.

Three different project types can be created for the WinOSPM calculations:

- **Single Street**
- **Multi Streets**
- **Route**

For this example select the “Single Street” project type. How to create and the specifics of the “Multi Streets” project is discussed in Chapter 14. The “Route” project type is a special option for calculation of exposure doses along a pre-defined route, and will not be documented in this User’s Guide.

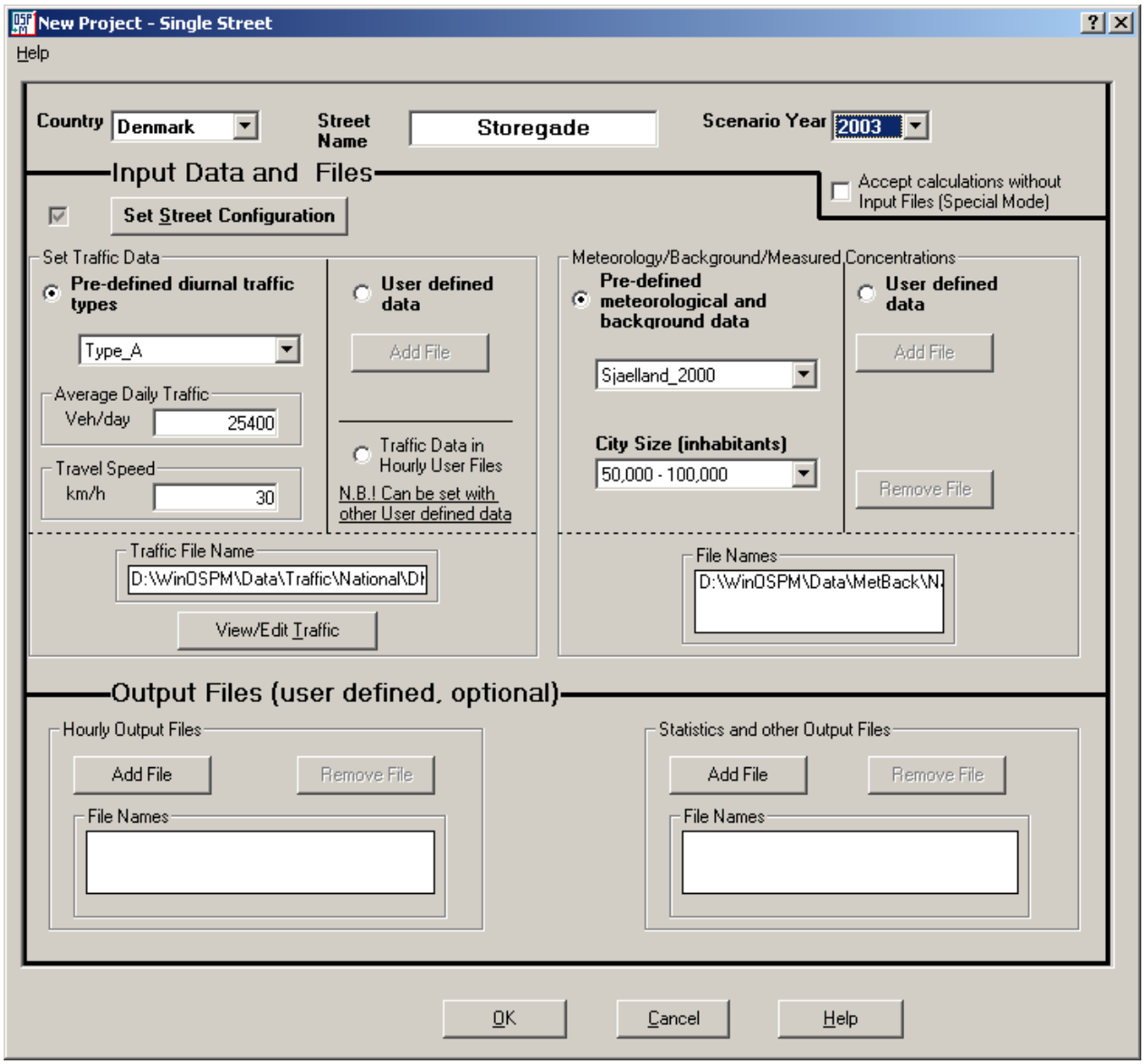


Fig. 4.2 The “New Project” window filled with values according to the example.

Accepting the “Single Street” project type (click OK or double click on the icon) leads you to the "New Project" window (*Fig. 4.2*). Please note that you will only meet the "New Project" window when you create a new project. The central working window for existing projects is a different one: the "Calculation" window (*Fig. 4.8*).

Now - as an example - go through the steps outlined below.

Example

- As "Street name" choose "Storegade".
- Choose 2003 as Scenario Year. This year might be already pre-selected, depending on the Scenarios List file for Denmark which is distributed with the installation package (however, can change

from distribution to distribution). The choice of the Scenario Year affects the choice of files with emission data (data on national car fleet composition and fuel quality).

- Leave the check box concerning *Special Mode* unchecked. Special Mode is a tool for studying how air quality depends on wind speed and direction for a given street geometry. Special Mode requires less input data than normal calculations – it requires only information about street configuration. Chapter 13 describes the use of Special Mode.

Street configuration

- Press the button "Set Street Configuration" in order to define the street configuration, i.e. the width of the street, building heights and the orientation of the street. You are brought to the "Street Configuration" window (*Fig. 4.4*).

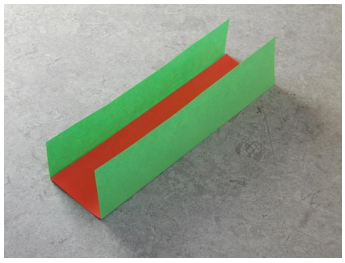


Fig. 4.3

- You may think of the street with buildings as a folded piece of cardboard (*Fig. 4.3*) The drawing in the "Street Configuration" window shows the street with the buildings "unfolded" (*Fig. 4.4*).

As an example, enter the following data:

- Enter 25 m for "Height", indicating that buildings on both sides of the street are 25 m. Later, it is possible to define exceptions from this general value. When you move the cursor from the field with numbers – e.g. by pressing [Enter] or [Tab] – the drawing is updated.
- Leave "Width" – the width of the street – at 20 m.
- Leave "Length 1" and "Length 2" at 50 meter. These values are the distance from the receptors Rec. 1 and Rec. 2 (where concentrations are calculated) to the "beginning" and "end" of the street. The beginning and the end of the street should be interpreted as beginning and end of a street section between two intersections. Note, however, that you should not indicate values larger than 75 m, even if the distances may be greater.
- Set "Orientation" at 45, thus indicating that the street's orientation is 45 degrees in relation to north.
- Define the "Receptor Height" at 2.5 m.
- Leave the "Receptor 1" and the "Receptor 2" check boxes checked. This indicates that calculations will be performed for receptor points on both sides of the street.
- Next, specify that the buildings along the street are lower than 25 m within a certain section. This is done by specifying the relevant wind sector. Within the group "Wind Sectors with Building Height Exceptions" check the box below column 1. As an example, enter 30 (degrees) for "Lower Bound" and 45 for "Upper Bound". The corresponding "Height" is set at 10 m. The convention for indications of direction is that 0 (or 360) is north, 90 east etc. The exception indicates that the building height is 10 m in the sector from 30 to 45 degrees.

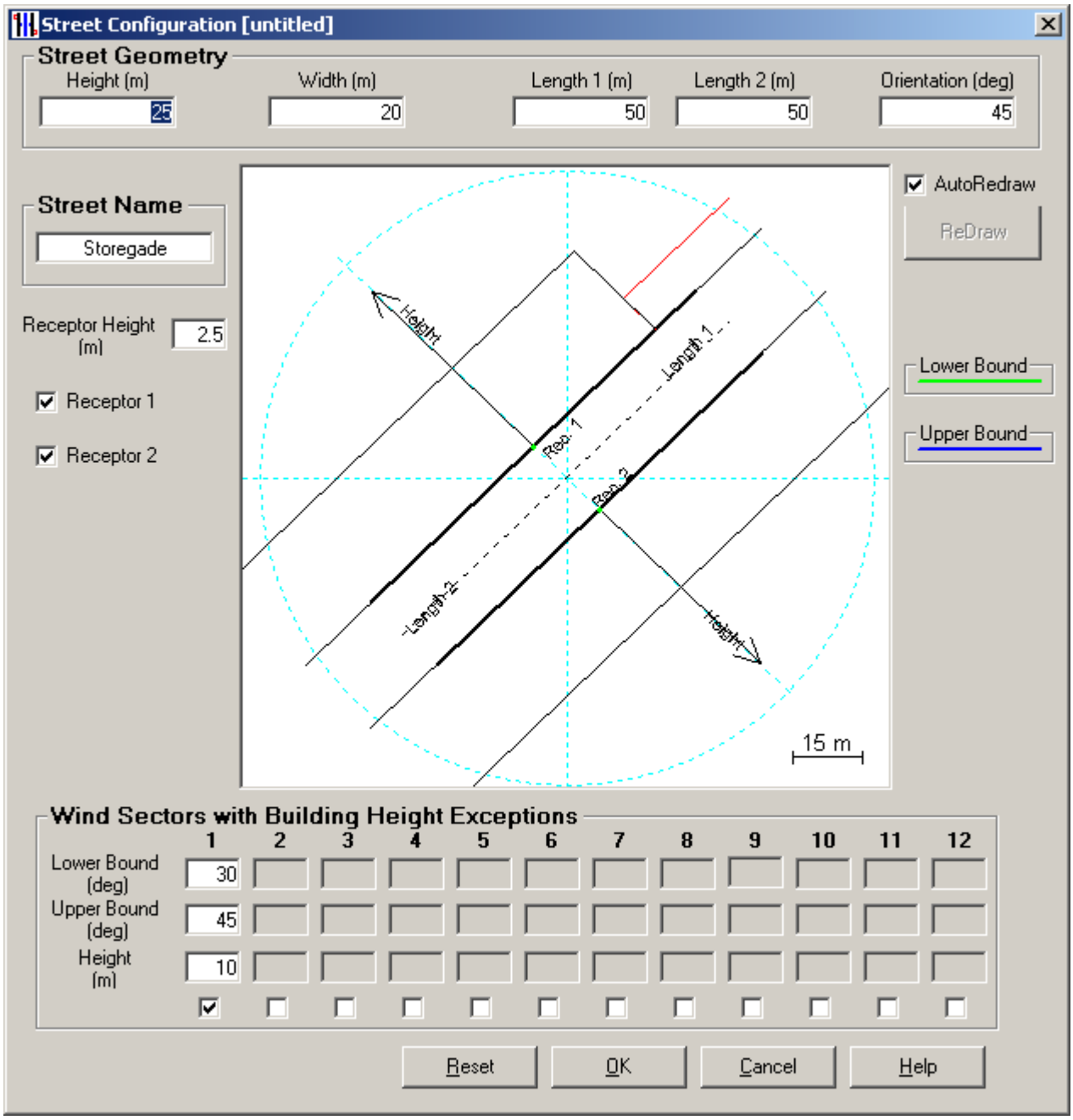


Fig. 4.4 The "Street Configuration" window.

Finally, press "OK" which brings you back to the "New Project" window.

Traffic variation

Your next task is to specify Traffic Data, i.e. the distribution of traffic flow over time for all types of vehicles. An easy way to do this is by applying standard values. Do so by choosing "Pre-defined diurnal traffic types". Alternatively, it is possible to apply files with user-defined data.

The relevant part of the "New Project" window is shown in *Fig. 4.5*.

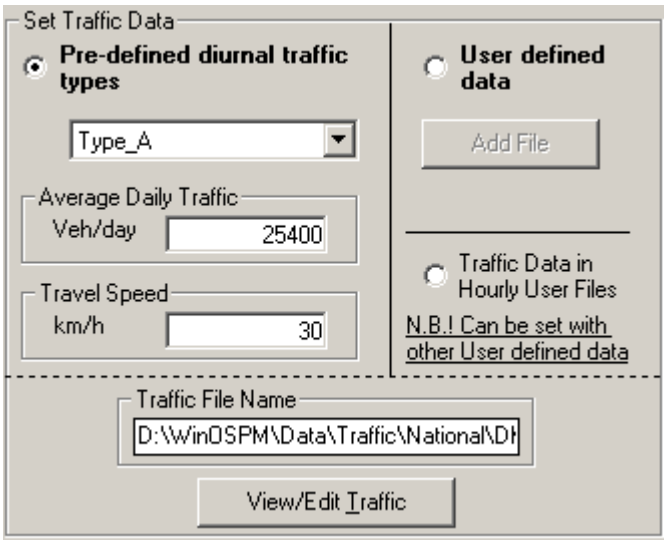


Fig. 4.5 Traffic data are defined in this section of the "New Project" window.

- As an example, choose Type_A. When the cursor moves over the field, a brief explanatory note is shown. In this case, where Danish data are used, the explanation is in Danish: "Gennemfartsvej i middelstore eller mindre byer", meaning "Through road in medium-sized or small towns".
  A pre-defined traffic data set, like the one used, is a file with information on the relative distribution of vehicle types (such as e.g. passenger cars, vans, trucks and buses) over time, indicated as the fraction of the daily total. The Country setting determines the availability of pre-defined traffic data.
- In order to use the pre-defined traffic data for a particular street, you must specify an Average Daily Traffic (vehicles per day as an average over the year) and an average travel speed for the street. The travel speed is an average speed for a street section of length 100-200 meter, close to the receptors. For the sake of the example, choose 25400 vehicles per day and 30 km/h.

This completes the specification of traffic data. You can now press the button **View/Edit Traffic** in order to study or edit the distribution of the number of vehicles and their speed, hour by hour. Data for the various vehicle types are shown for each vehicle type. Further, there are several "Day cases", representing different days of the week and months of the year.

The window with these traffic patterns is shown in *Fig. 4.6*. The window displays information on the amount of traffic and on emission, including a graphical representation.

In the window it is possible to change values, but we will not use this feature now. A click on **OK** leads back to the "New Project" window.

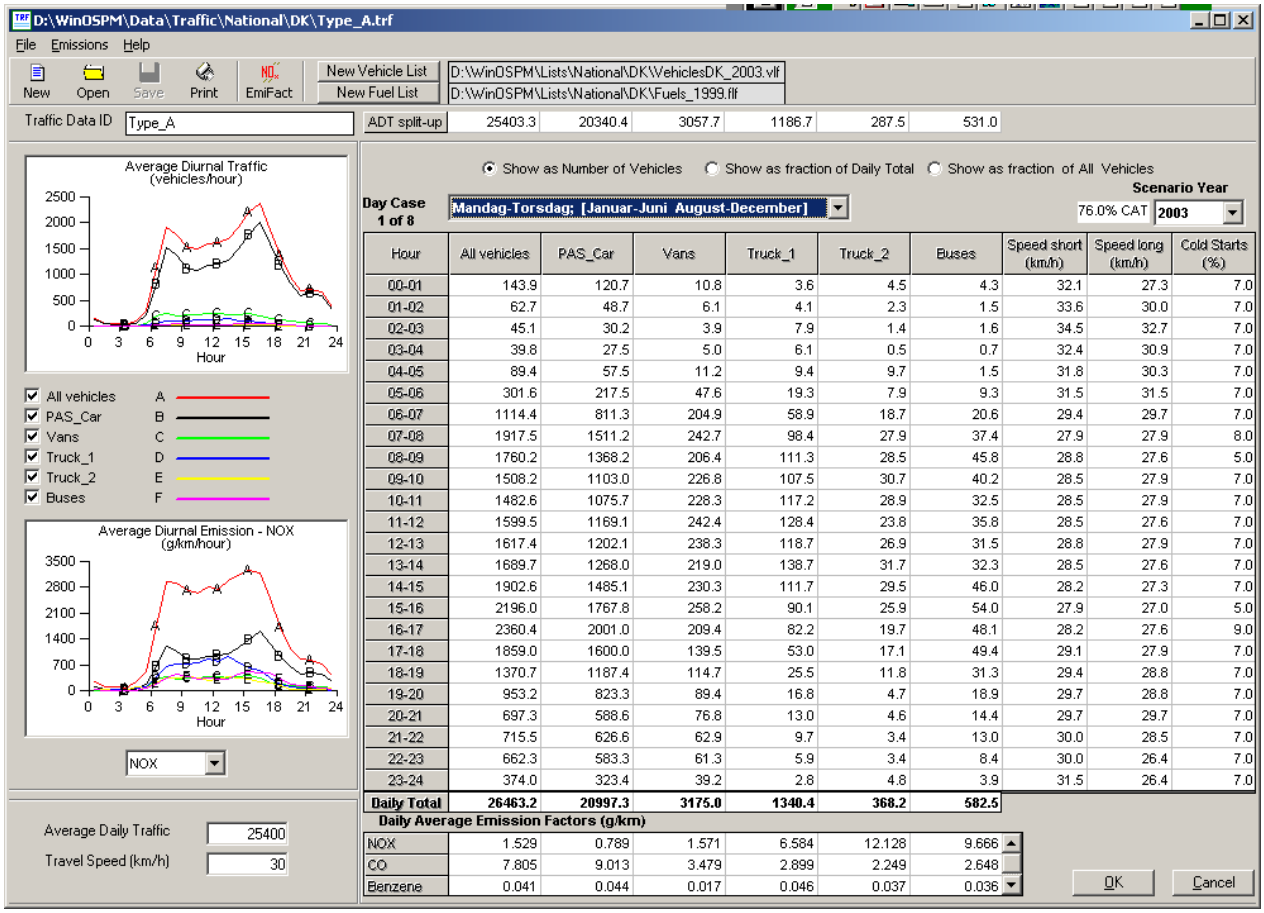


Fig. 4.6 The traffic window

Meteorology and background data

Next, specify Meteorological and Background data.

The OSPM model requires hourly meteorological data as input. The required data are wind speed, wind direction, temperature and global radiation. Wind speed and wind directions are assumed to represent the conditions above roof level in the city. Temperature and global radiation are used to calculate the chemical transformation between NO, NO_2 and O_3.

Background concentrations: Urban and regional

Further, the OSPM model requires hourly concentration data for the urban background. The urban background represents the general background pollution level in the city, e.g. as measured above roof level. However, data for the urban background need not be provided explicitly. Instead, if data for the *regional* background concentrations are available, the OSPM model uses a sub-model to compute urban background concentration, based on information about city size.

Available data for Danish conditions

There are various ways in which data on Meteorology and Background can be provided, and available options depend on the country settings. In the case of Denmark, the model is distributed with files containing meteorological data for different regions of the country, where the meteorological parameters have been calculated by the Operational Air Pollution Forecast System THOR (thor.dmu.dk). These files also include information on regional background concentrations in the air. Therefore, in the present example, we can proceed in the following way:

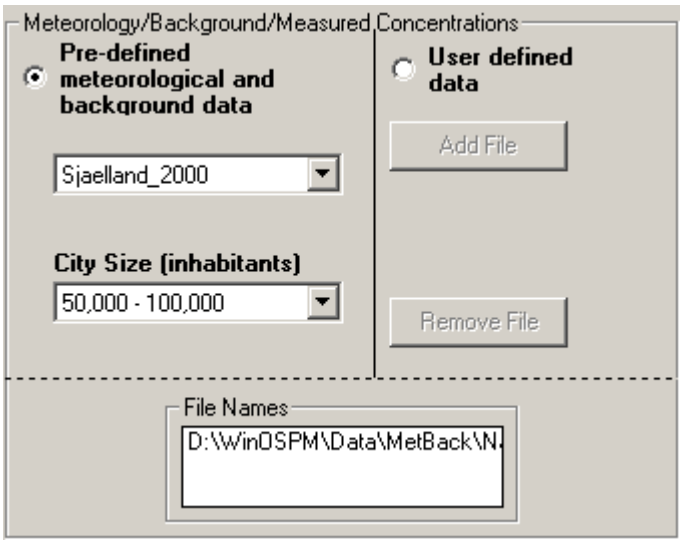


Fig. 4.7. Section of the "New Project" window concerning Meteorology and background data.

The relevant part of the "New Project" window is shown in *Fig. 4.7*

Select "Pre-defined meteorological and background data". As a result, a standard data set with meteorology and regional (rural) concentrations is used.

Next, select a region: Sjaelland_2000. Indicate a city size of 50-100.000 inhabitants. Under "File names" the name of the used file is displayed.

Output files

OSPM is extremely flexible in its ability to create user-defined output files of various contents and formats. However, in the current example we will not use this potential, but just rely on standard output, which summarises the results of the calculations.

Leave the "New Project" window

Press **OK** to leave the "New Project" window.

Note: It is not possible to return to the "New Project" window later. It is not necessary to return here because all options can be changed from other windows.

The central working window: The "Calculation" window

You are brought to the "Calculation" window (*Fig. 4.8*). This is the central working window where all further modifications of the project can be defined.

It is recommended that you save all data specified so far by pressing the **Save** button and supplying a name (e.g. "Storegade"). The default file extension for WinOSPM Single Street projects – ".osp", is automatically added to the file name. Next time you want to open this project it's enough to double click on the project name in the Windows Explorer, and this will start the project in WinOSPM.

Press **Run** to perform calculations for a year. A counter in the lower left corner shows the progress. The calculations take approximately half a minute on a 600 MHz PC.

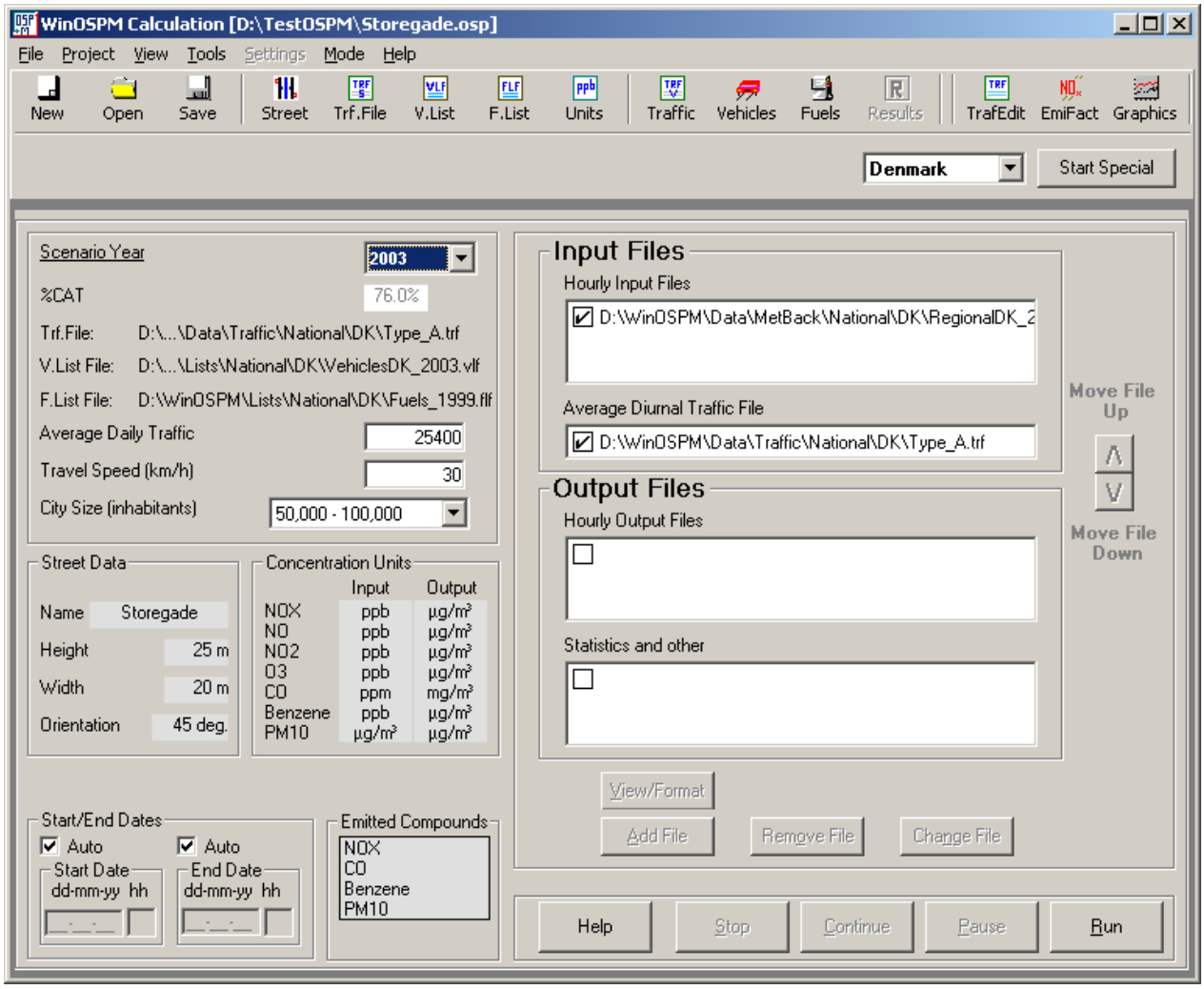


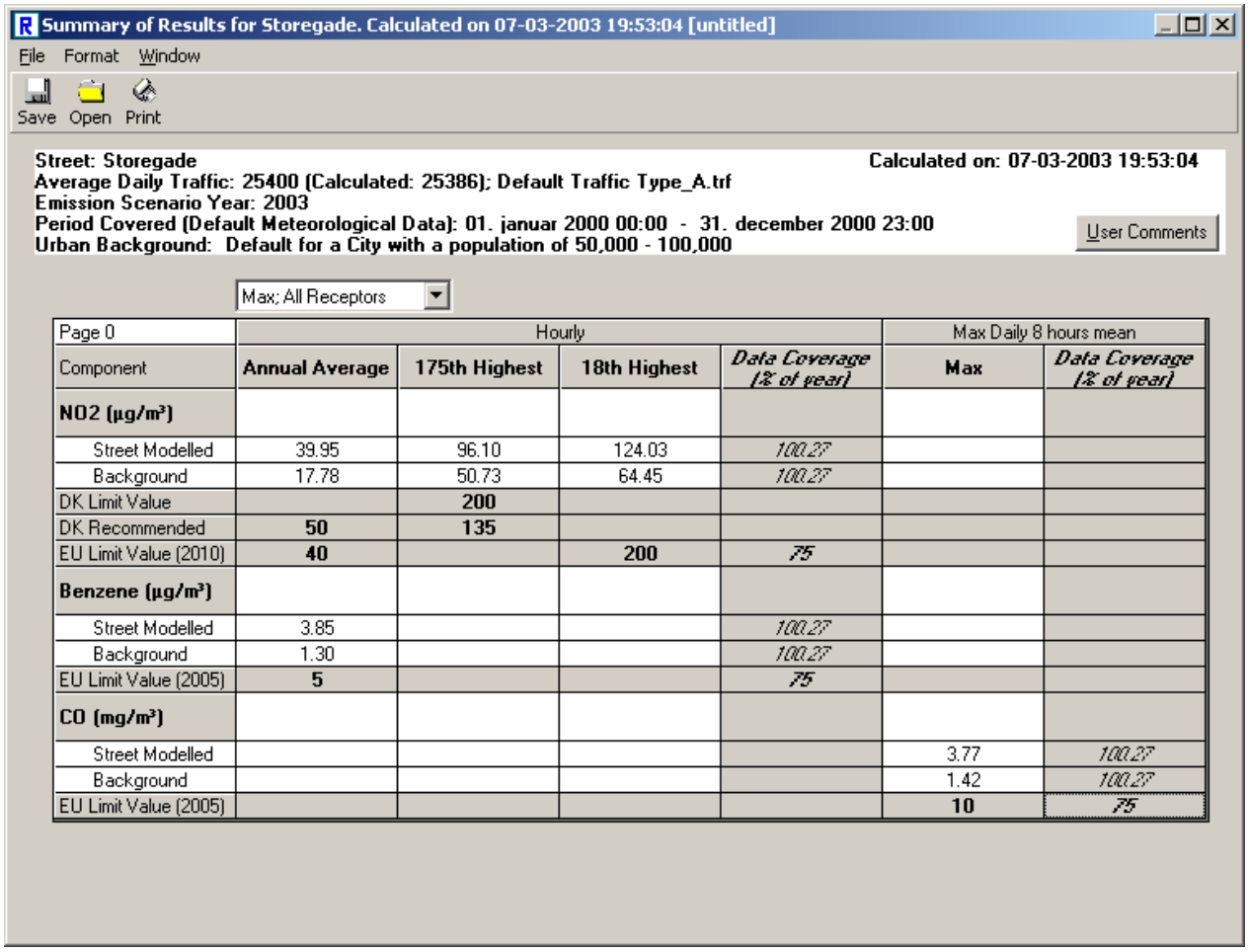
Fig. 4.8 The "Calculation" window. This window is the central working window.

Result window

At the end of calculations you are brought to the "Result" window (*Fig. 4.9*). This window shows statistical summary data compared to various air quality limit values. These limit values are country-specific. The parameters are computed for Receptor number 1 and 2 (at each side of the street). There is a sheet with results for each receptor. As default, a sheet is presented which contains maximum values for the two receptors.

If you are interested in the concentrations in the street, look at the lines labelled "Street Modelled". These values represent the total concentration in the street, including the background contribution. The numbers labelled "Background" indicate concentrations in the urban background (away from the street).

Please note that a certain set of options determines which set of parameters is displayed. These options are set through the menu **Project / Options**, and they are discussed in more detail in Chapter 12.



Page 0	Hourly				Max Daily 8 hours mean	
Component	Annual Average	175th Highest	18th Highest	Data Coverage (% of year)	Max	Data Coverage (% of year)
NO2 (µg/m³)						
Street Modelled	39.95	96.10	124.03	100.27		
Background	17.78	50.73	64.45	100.27		
DK Limit Value		200				
DK Recommended	50	135				
EU Limit Value (2010)	40		200	75		
Benzene (µg/m³)						
Street Modelled	3.85			100.27		
Background	1.30			100.27		
EU Limit Value (2005)	5			75		
CO (mg/m³)						
Street Modelled					3.77	100.27
Background					1.42	100.27
EU Limit Value (2005)					10	75

Fig. 4.9 The "Result" window summarises the results compared to limit values. Note that the reason why the "Data Coverage" is 100.27% is that the calculations are done for the meteorological year 2000, which is a leapfrog year. The percentage of the Data Coverage is calculated with respect to "standard" year with 365 days.

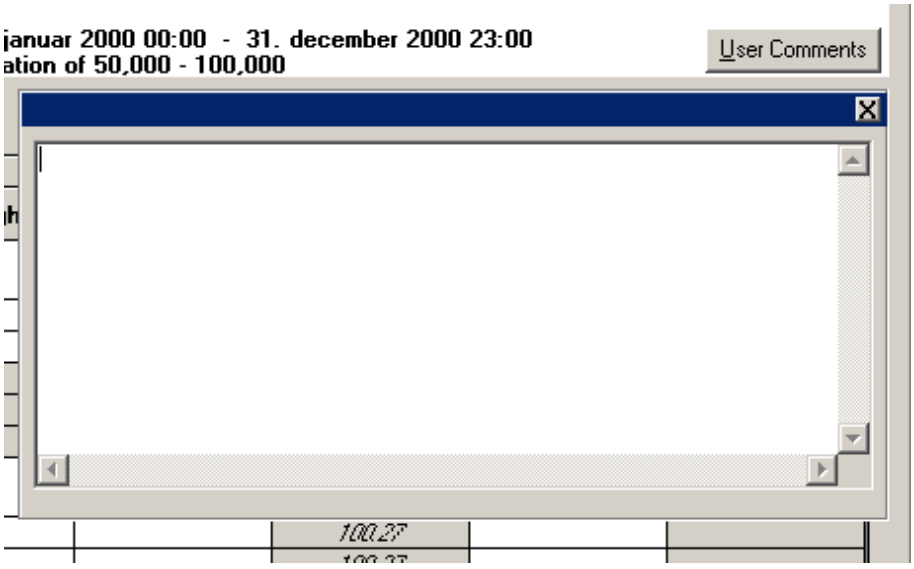


Fig. 4.10 User Comments can be entered in the text window, which is activated by pressing the "User Comments" button.

A special text window is provided for entering User Comments. This window is activated by pressing the “User Comments” button (*Fig. 4.10*)

The results can be saved in a file for later retrieval (use **File / Save** or the button **Save**). or printed (use **File / Print** or the button **Print**).

The default file extension for WinOSPM Single Street result files – “.res”, is automatically added to the file name on saving the file. The Single Street result files are simple text files (ASCII). They can be viewed using any text editor (e.g. Notepad) or opened in Excel (define semicolon (“;”) as separator). However, this not the recommended procedure. To retrieve the results later, use the menu **File / Open Saved Results File / Single Street** from the WinOSPM main window. Previously saved result files can also be opened from the “Result” Window. For this use **File / Open** or the button **Open**. You can quickly switch between several opened result files using the menu item **Window**.

5 Input, output and tools

The "Calculation" window is central

The "Calculation" window shown in *Fig. 4.8* is the central point of departure for modifications of the first set of calculations.

Basically, the following items can be changed:

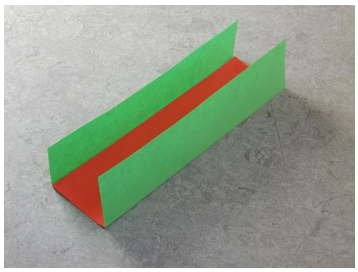
- Street configuration (street geometry).
- Traffic data (variation of traffic flow over time, distributed among various types of vehicles).
- The assumptions governing emission (car fleet and fuel).
- Meteorology and background data (the meteorology should represent urban conditions, and the background concentrations either the urban background or the regional background).
- Output data (contents and format).
- You may switch to "Special mode". Special Mode is a tool for studying how air quality depends on wind speed and direction for a given street geometry.

These possibilities are discussed in the following chapters. Further, there is a chapter concerning program options. Be aware that some options affect the current project only (options concerning Concentration Units), whereas others apply to all projects in a given working folder (this applies to options set through **Project / Options**).

6 Street configuration

The "Street Configuration" window can be accessed through the menu **Project / Set Street Configuration,** or by pressing the **Street** button. In this window you can define street geometry.

The various input parameters will be briefly explained.



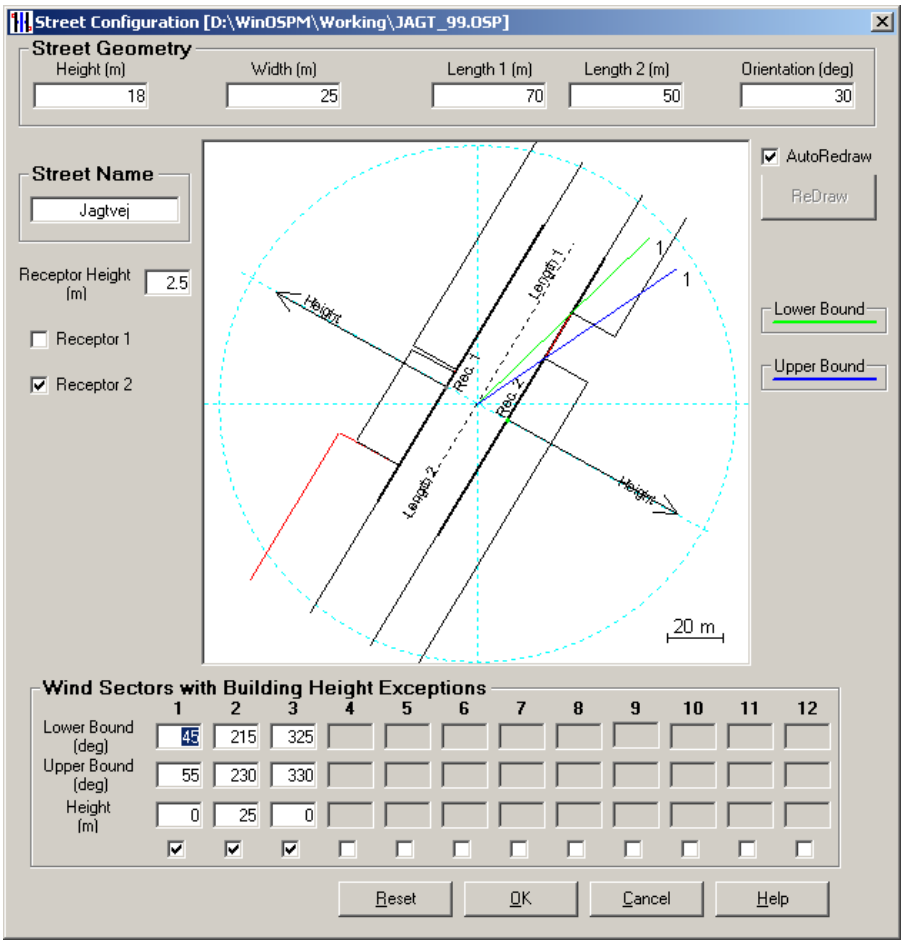


Fig. 6.1 The "Street Configuration" window, where buildings have been "wrapped down" as if they were a piece of cardboard. The bounds for one sector with building exceptions are displayed. These bounds correspond to Sector 1 because one of the fields in the Sector-1-column has been highlighted by double clicking in this field.

"*Height*" is the average height of buildings along the street.

"*Width*" is the width of the street (between building fronts).

When you move the cursor from the field with numbers – e.g. by pressing [Enter] or [Tab] – the drawing is updated.

Length: Don't specify values larger than 75 m

"*Length 1*" and "*Length 2*" indicate the distance from the receptors (where concentrations are calculated) to the "beginning" and "end" of the street. The beginning and the end of the street should be interpreted as beginning and end of a street section between two intersections. Note, however, that you should not indicate "Length"

values larger than 75 m, even if the distances may be greater. The significance of "Length" is that it determines a distance of integration: when the wind blows along the street, the model performs an integration over emissions which take place in the street over a distance corresponding to the "Length" values.

The numbers 1 and 2 are assigned based on "Orientation":

"*Orientation*": Orientation of the street in relation to north (0-180 grader); see *Fig. 6.2*. Length 1 is between 0 and 180 degrees, while Length 2 is between 180 and 360 degrees.

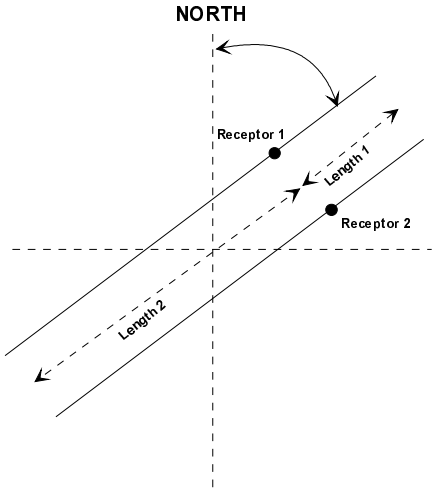


Fig. 6.2 Definition of Orientation as well as Length 1 and 2.

"*Receptor*": Point close to the building facade where calculations are performed. Receptor 1 is the first receptor encountered when going from north in a clockwise direction. Receptor 2 is on the opposite side of the street. The state of the checkbox determines whether calculations are performed for the receptor point.

"*Receptor Height*". Height above the street level for which the calculations are performed. Applies to both receptor points.

Building heights: Exceptions from the general height

"*Wind sectors with building height exceptions*":

It is possible to specify up to 12 wind sectors where the building height is different from the general height. *Fig. 6.1* shows an example where the general building height is 10 meter, while there are 3 exceptions: The building height is 25 m for directions between 215 and 230 degrees, while it is 0 m for two other wind sectors.

It is mentioned above that for "Length" you should not indicate values greater than 75 m. However, please note that the limit of 75 m does not indicate when *building height* loses its significance. If the row of houses along the street ends - e.g. because there is an open area 200 m from the receptor - you should take care to specify this through the building exceptions. Otherwise, the OSPM model will assume that the row of buildings continues over a very large distance, and these two situations differ with respect to concentration values.

The graphical representation of the street configuration can be Saved as a bitmap file (*.bmp), printed or copied to the Clipboard. Click with the right mouse button opens a menu list from which the desired operation can be selected (*Fig. 6.3*).

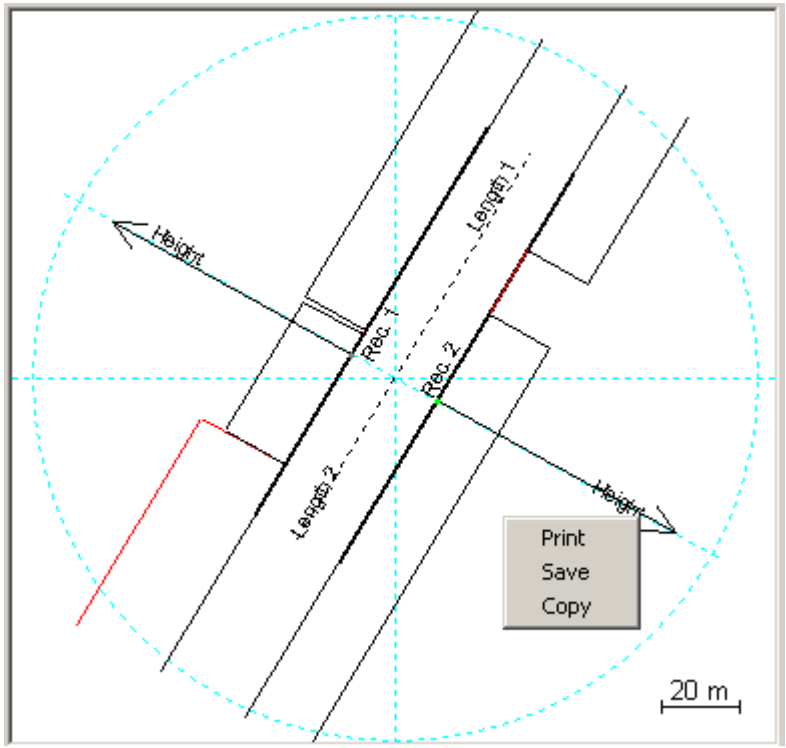


Fig. 6.3 The graphical representation of the street configuration can be Saved as a bitmap file, printed or copied to the Clipboard.

7 Traffic Data

The present chapter explains how to specify Traffic Data, i.e. the distribution of traffic flow over time.

Basically, traffic data can be specified in 3 different ways:

- as pre-defined daily traffic types
- as user provided daily traffic data
- as hourly traffic data

Pre-defined daily traffic data: Relative distribution of vehicles

Pre-defined traffic data are files with information on the relative distribution of vehicle types (such as e.g. passenger cars, vans, trucks and buses) and the fraction of the daily total for each of the vehicle types. If required, several "Day cases" can be defined, representing different days of the week and months of the year - e.g. a case for Fridays in July. In order to use such pre-defined data for a particular street, the user must specify the Average Daily Traffic (ADT) and the travel speed for the street. The pre-defined traffic data will normally be provided for some typical street types with specific traffic conditions, such as e.g. main streets in the city centre, streets in residential areas, etc.

The Country setting determines which pre-defined traffic data are available. Appendix A explains structure and format of the "Traffic List File" which governs availability of pre-defined traffic data files. Appendix B explains structure and format of the actual traffic data files. Pre-defined traffic data files are always of the so-called "Default" type (explained in the Appendix B) where traffic data are specified in terms of relative distributions, not as absolute numbers.

Chapter 4 (“Getting started - an example”) illustrates how pre-defined traffic data are applied in a new project.

User provided daily traffic data

As an alternative to pre-defined traffic data, a user can choose to specify user provided traffic data. Typically, such data contain traffic data specified as number of vehicles per hour – not as a fraction of the daily total. Furthermore, traffic speed is given in terms of speed in km/hour and not as a weight related to the travel speed. In this case the user does not need to specify the Average Daily Traffic, neither to specify the travel speed. However, it is possible to have user provided data, which are similar in structure to pre-defined data in that they do not contain absolute numbers, but relative distributions and weights. The precise structure of files with traffic data is explained in Appendix B.

Hourly traffic data

A third way to specify traffic data is to supply hourly traffic data. In this case, the number of vehicles (as vehicles per hour) must be provided hour by hour in user specified files. Data must be given for all vehicle types specified in the current Vehicle List File (this file is explained in Chapter 8). The concept of "Composed Vehicle type" (explained in Appendix B) cannot be used. When using hourly traffic data, the traffic emissions will have to be calculated for each of the

calculation hours. This can result in a substantial increase of the calculation time compared with other methods of supplying traffic data.

Sections 7.1 and 7.2 explain, respectively, how to assign traffic data to a *new project* and how to change traffic data in an *existing project*.

7.1 Assigning Traffic Data to a New Project

When data for a new project are specified in the "New Project" window, there are three alternative ways to specify traffic data, as indicated above. For each alternative, the practical approach is explained below. The relevant part of the "New Project" window is shown in *Fig. 7.1* (left).

1. Pre-defined diurnal traffic types

Select the option button “Pre-defined diurnal traffic types” to activate the drop-down list box with the available pre-defined traffic data files. Click the mouse on the drop-down button “▼” or press “Enter” to open a list of available files. A short descriptive text appears when the mouse is held over one of the list items, *Fig. 7.1* (right). You can navigate the list by using the mouse or the “up-down” arrows on the keyboard. To select an item, click the mouse on the item or press “Enter”. The name of the selected street type appears in the text box of the drop-down list box, while the full path and name of the file with the selected traffic data is displayed in the Traffic File Name text box *Fig. 7.1* (left). The user must type the value of the Average Daily Traffic (vehicles per day as an average over the year) and the Travel Speed in the street for which the traffic data are applied. The travel speed is an average speed for a street section of length 100-200 meter, close to the receptors.

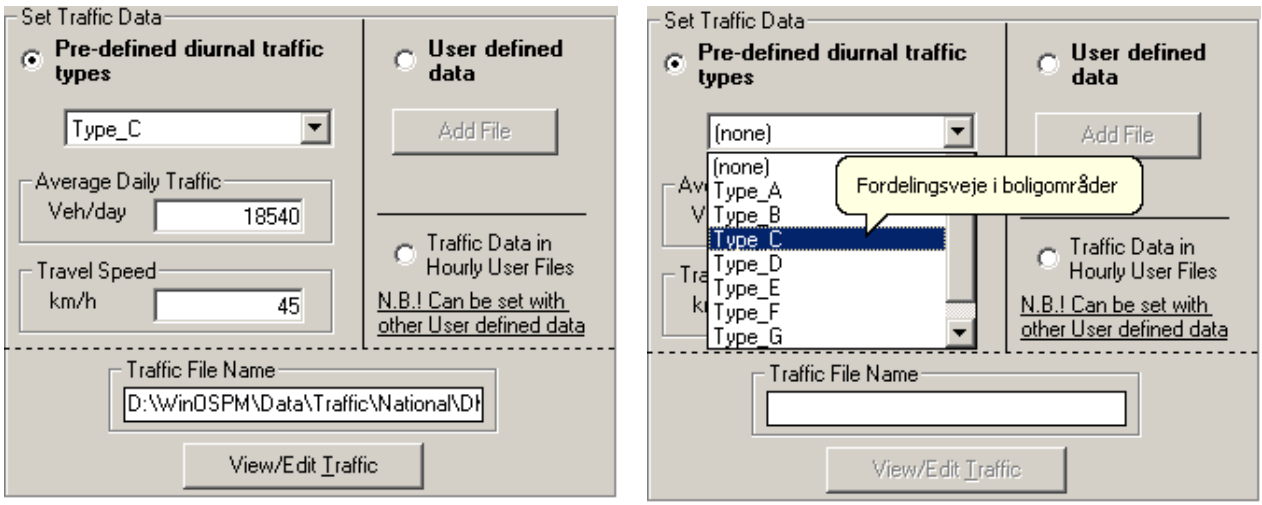


Fig. 7.1 Specification of traffic data in the "New Project" window. The same box is shown twice, once with an active drop-down list. Pre-defined files are for Denmark.

2. User defined data

Select the option button "User defined data". The "Add File" button becomes active, and pressing it will open the "Add New File" dialog box (*Fig. 7.2*, left). The name of the file with traffic data (including full path) can be typed here, or the user can press the "Browse" button to open the standard Windows "Open File" dialog box. When the choice of file is confirmed with "OK" the file name is displayed in the Traffic File Name text box (*Fig. 7.2*, right). .

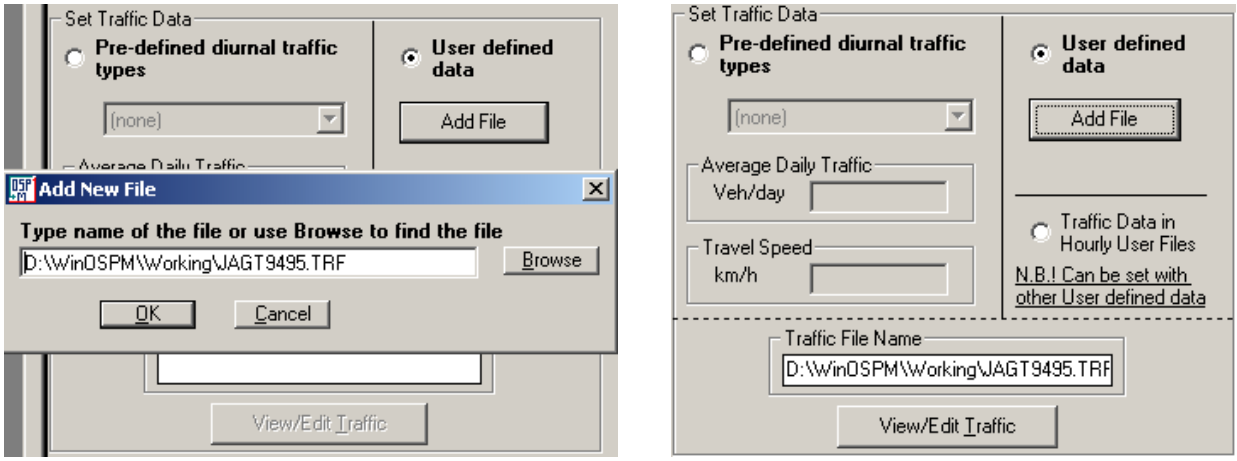


Fig. 7.2 Adding a user-defined traffic file to the project.

If the selected traffic file contains traffic data given as number of vehicles per hour, the "Average Daily Traffic" and the "Travel Speed" text boxes will remain inactive (greyed). However, if the user provided file is of the "Default" type, i.e. the traffic data are given as fraction of the daily total, these text boxes will become active (*Fig. 7.3*). The user must type values for the Average Daily Traffic and Travel Speed, similarly to what is done for pre-defined diurnal traffic types.

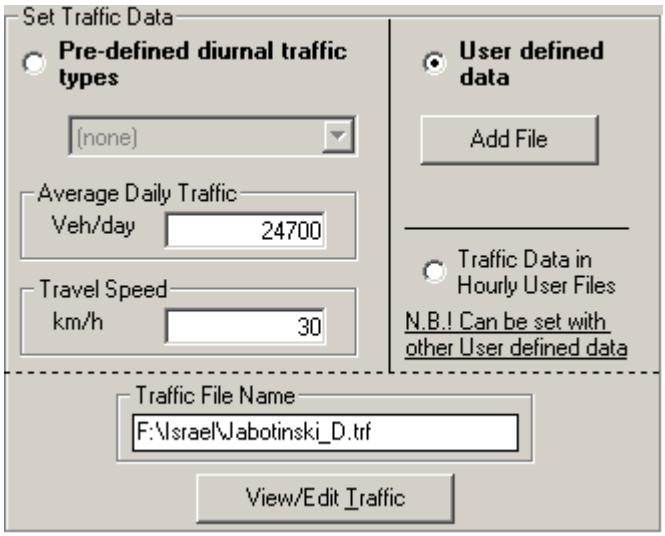


Fig. 7.3 Example of user-defined traffic data of "Default" type, requiring information about Average Daily Traffic and Travel Speed.

3. Traffic Data in Hourly User Files

When the option button "Traffic Data in Hourly User Files" is selected, traffic data must be provided in a file (or several files) containing hour by hour values of the number of vehicles for the particular hour. These files can be specified together with other user defined input data, using the option "User defined data" in the right frame of the New Project window. However, this will exclude the possibility of simultaneously using the pre-defined meteorological and background data (see Chapter 9). Therefore, the user provided files with hourly traffic data can best be assigned to the project using the options available from the "Calculation" window (see Section 7.2).

7.1.1 Viewing/Editing Traffic Data

When a traffic data file (either pre-defined or user provided) is assigned to the project and appears in the Traffic File Name text box, the "View/Edit Traffic" button becomes active. Pressing this button opens the "Traffic Data Editor", which can be used to view or modify the traffic data. A more detailed discussion of using the "Traffic Data Editor" is given in section 7.3, but it should be noted that when the traffic data are modified while still creating the Project, the modified data must be saved to a new traffic file before they can be used in the Project. Traffic data modified in an existing project can be used without first saving them to a file.

7.2 Assigning and Changing Traffic Data Files in an existing Project

For an existing project, changes of data take place through the "Calculation" window. *Fig. 7.4* displays the part of the "Calculation" window that is relevant for traffic data.

- In the upper left frame, next to the label "Trf.File", the name and path of the currently used Traffic Data file is displayed. This is for information only; nothing can be changed by the user here.
- In the upper right frame, the name of the currently used traffic data file is displayed in a list box under the heading "Average Diurnal Traffic". This is an active part of the window, and the list box can be used to change the data file. The file name in this list box may not contain the full path. If the full path is not specified, the standard convention on file locations is applied (see Appendix C).

To change the Traffic File, the user has several options.

- With the mouse, select the name of the file (important: single click only). The "Change File" button becomes activate, and pressing it will open the "Change File" dialog box (*Fig. 7.5*, left). The name of the new traffic file can be typed here, or the new file can (after pressing the "Browse" button) be selected using Windows standard "Open File" dialog box.

- Exactly the same result can be achieved using the menu item **Project / Set Traffic File** or the corresponding toolbar icon (*Fig. 7.5*, right).

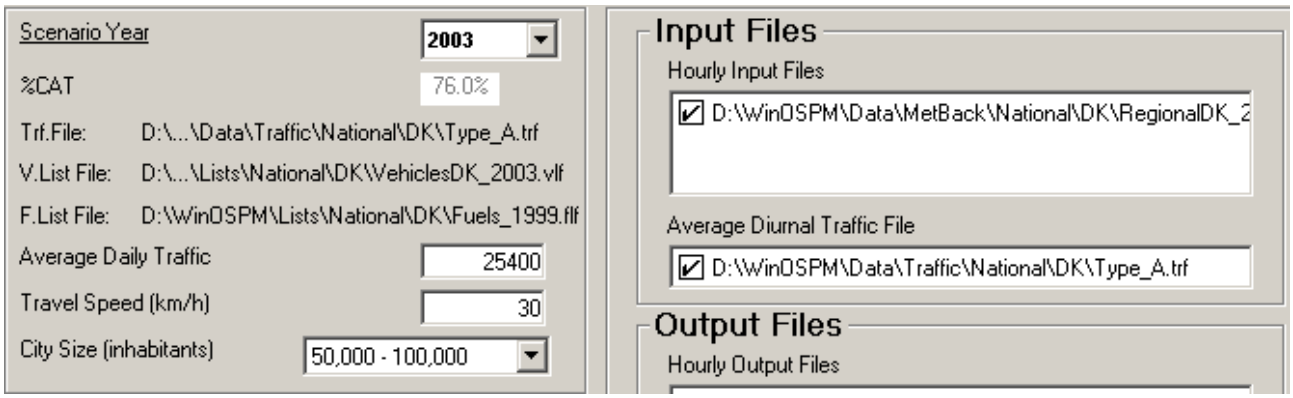


Fig. 7.4 Part of the "Calculation" window relevant for assignment of traffic data

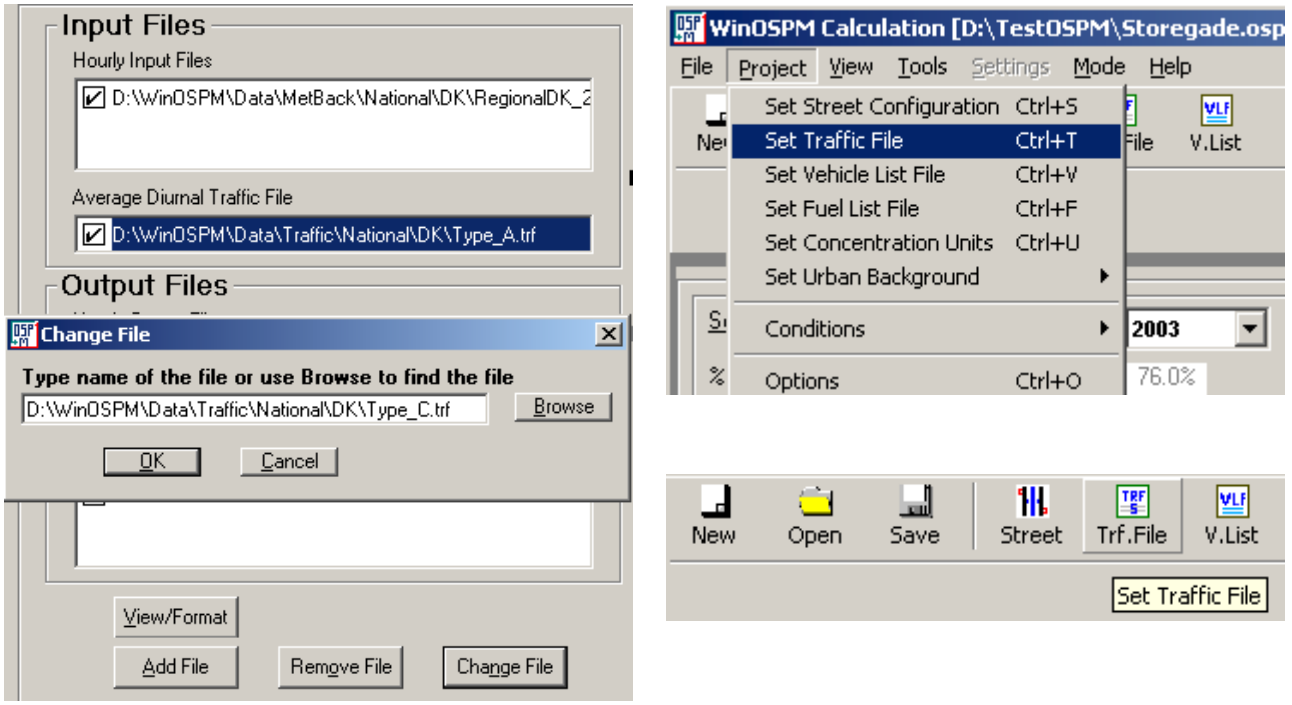


Fig. 7.5 Two methods for changing Traffic file are illustrated (left and right).

When a new Traffic Data File has been selected, it will replace the file previously assigned to the project. If no Traffic Data File was assigned previously, the new file will be added to the project. Note that this procedure applies only to files with diurnal traffic profiles data, and not to files with hour by hour traffic data. To add hour by hour traffic data, the procedure for "Hourly Input Files" must be followed (see Chapter 9).

When a new traffic file is selected, the program recognises automatically its type.

If the file is of the "Default" type, i.e. contains traffic data given as fraction of daily total, the two text boxes in *Fig. 7.4* labelled "Average

Daily Traffic" and "Travel Speed (km/h)", become activated. The appropriate values for the Average Daily Traffic (ADT) and Travel Speed can be typed in these text boxes. As a default value, 10 000 veh/day is given for ADT and 40 km/h for the travel speed. If other values have been specified previously in the current session (current project), these values will be used as default values for any new traffic file of the "Default" type.

If the file is not of "Default" type, but contains traffic data given as number of vehicles per hour, these two text boxes are inactive (greyed). All required data are already provided within the traffic file.

Besides changing the traffic file, the user can add an additional traffic file to the current project. This can be done using the "Add File" button, as shown in *Fig. 7.5*, left. Before pressing the "Add File" button, the field with the traffic file name must be selected (single click only!). The additional traffic file is added by typing its name in text box of the "Add File" dialog box, or by using the "Browse" button. The name of the additional traffic file will not appear immediately in the list box under the heading "Average Diurnal Traffic" but an up-down button will appear at the right end of this box (*Fig. 7.6*). By scrolling this box, using the up-down button, the user can see which traffic files are currently available. Only one of the traffic files can be the active traffic file, namely the one with a selected check box. Only the active traffic file is used in the calculations. The name of the currently active traffic file appears in the upper-left frame of the "Calculation" window, next to the label "Trf.File" (*Fig. 7.4*). Only the name of the currently active traffic file is saved together with the project file. This behaviour is different from all other Input/Output files.

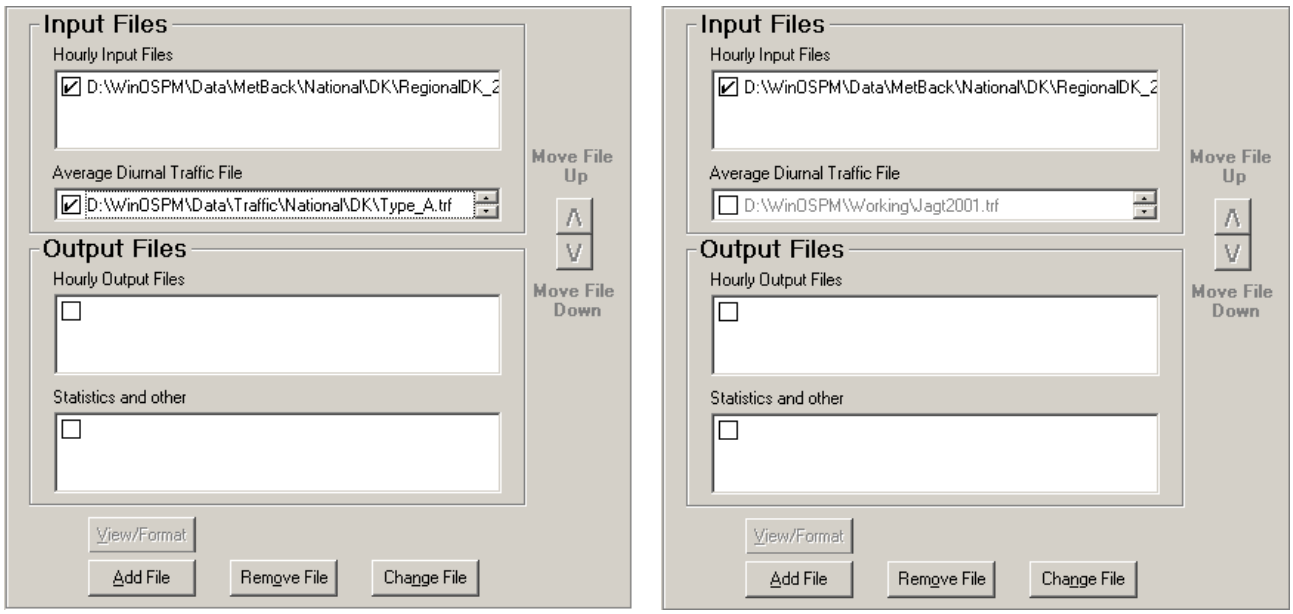


Fig. 7.6 Changing the file with Average Diurnal Traffic

7.3 Modifying Traffic Data

Traffic data can be modified in the "Traffic Data Editor". There is access to this editor both from the "New Project" window and from the "Calculation" window.

To view or edit the traffic data via the "New Project" window, the user has to press the **View/Edit Traffic** button (*Fig. 7.1*).

For an existing project, in the "Calculation" window, there are several ways to start the "Traffic Data Editor".

- Double click the name of the traffic file. The traffic file must be active, i.e. the check box to left of the file name must be checked.
- Select the traffic file name (single click) and press the **View/Format** button (see e.g. *Fig. 7.5*). The traffic file must be active, i.e. the check box to left of the file name must be checked.
- Select the traffic file name (single click) and use the menu **View /View/Edit Traffic Data** or the corresponding toolbar button (*Fig. 7.7*)**.** The traffic file must be active, i.e. the check box to left of the file name must be checked.

Any of these actions will lead to the "Traffic Data Editor"

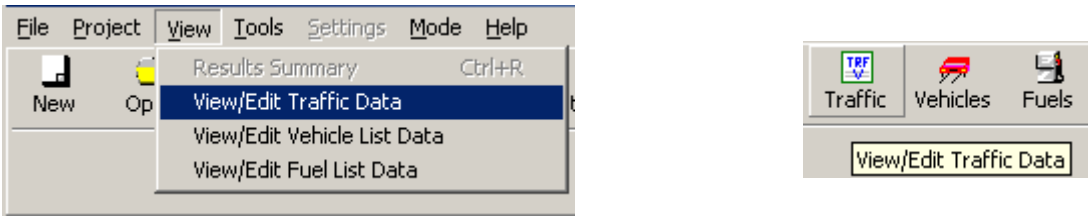


Fig. 7.7 Two ways to access the "Traffic Data Editor": Through a menu and through a toolbar button.

The "Traffic Data Editor" provides tools for both displaying and visualising traffic data and traffic emissions. The "Traffic Data Editor" can also be used as a stand-alone program (TrafEdit). The TrafEdit program can be used to edit or view traffic files, which are not associated with any OSPM project.

Irrespective of the type of the currently opened traffic file, the traffic data can be shown in three different modes

- *Mode 1.* As number of vehicles per hour – the "Show as Number of Vehicles" option button is pressed (*Fig. 7.8*).
- *Mode 2.* As fraction of daily total – the "Show as fraction of Daily Total" option button is pressed (*Fig. 7.9*).
- *Mode 3.* As fraction of all vehicles – the "Show as fraction of All Vehicles" option button is pressed (*Fig. 7.10*).

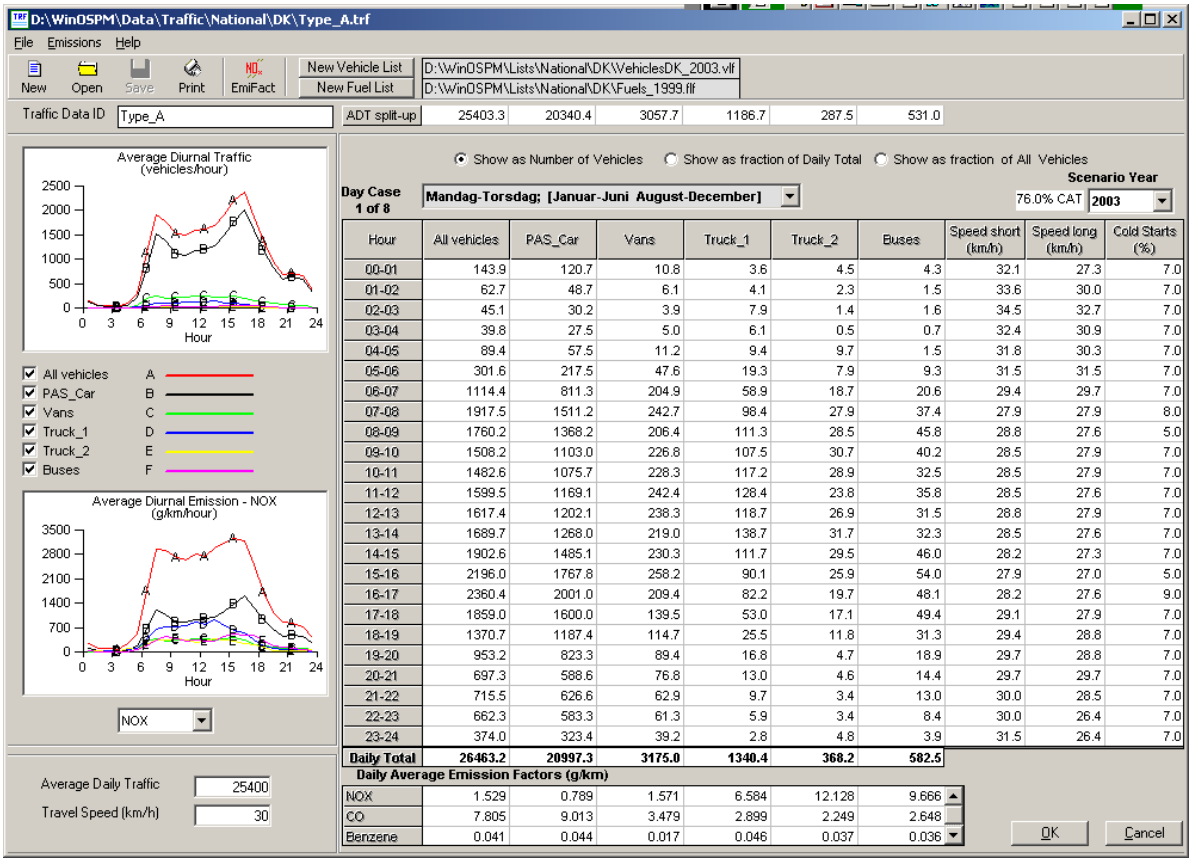


Fig. 7.8 Traffic file displayed in "Mode 1": As numbers of vehicles.

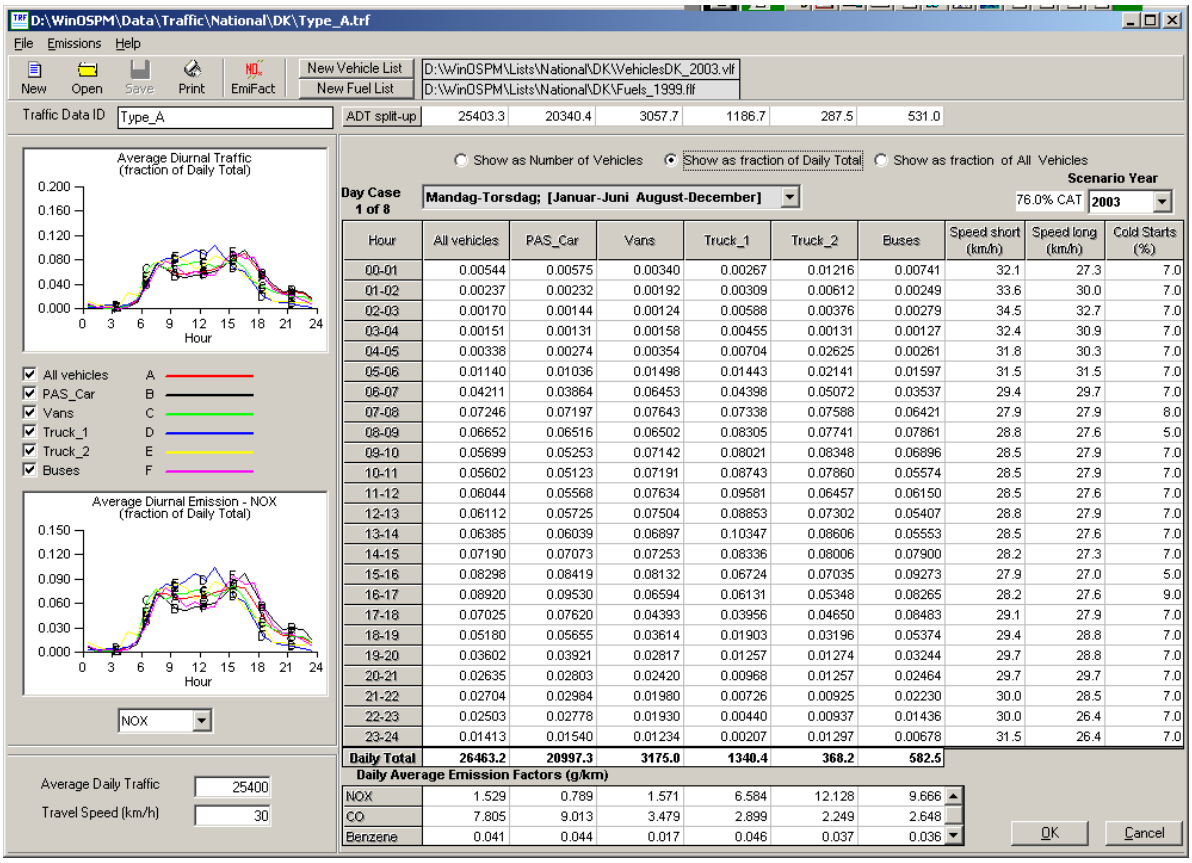


Fig. 7.9 Traffic file displayed in "Mode 2": As fraction of daily total.

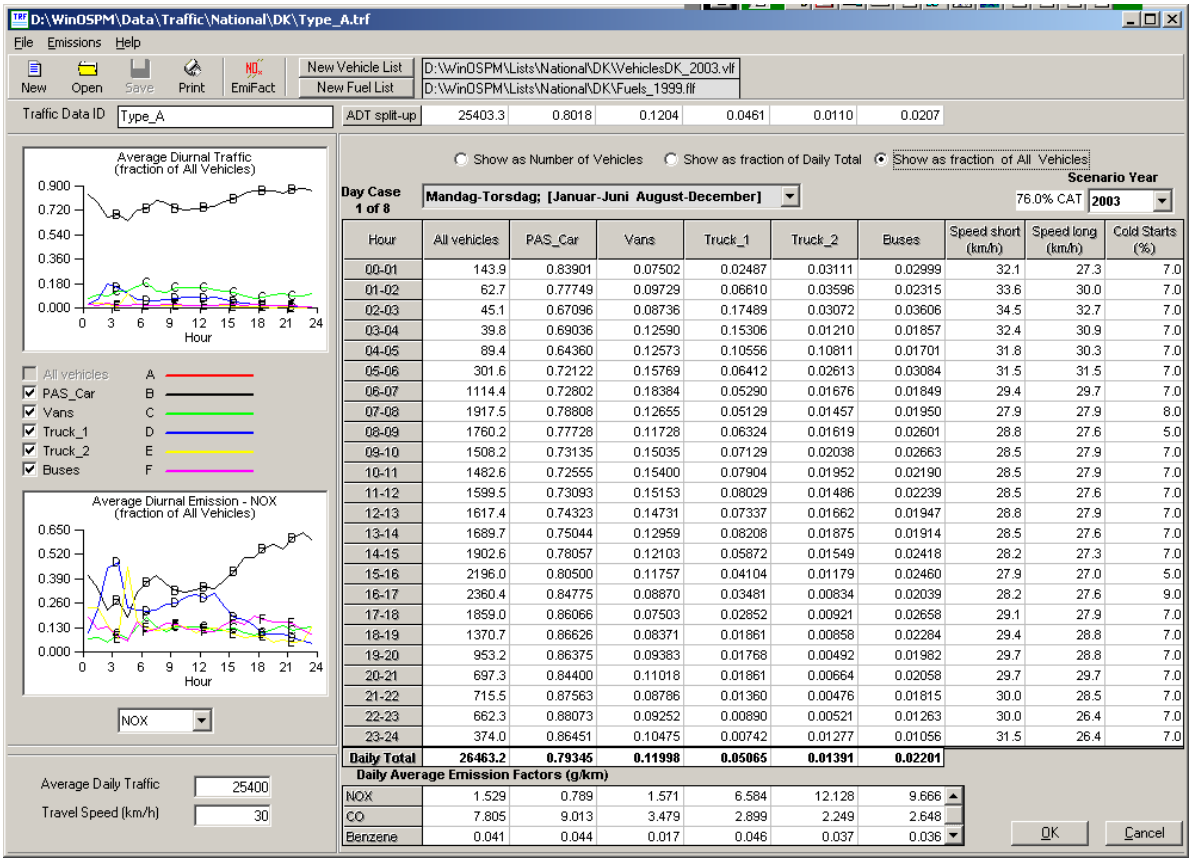


Fig. 7.10 Traffic file displayed in "Mode 3": As fraction of all vehicles.

When the traffic file is of the "Default" type, i.e. if the traffic data are specified as fraction of daily total, the two text boxes in the lower left corner of the program window become active. The currently specified values of the Average Daily Traffic (vehicles per day as an average over the year) and Travel Speed are displayed here. For files with traffic data given as number of vehicles per hour, these two text boxes are inactive (greyed).

The traffic data are shown for one particular Day Case (i.e. selected weekdays and months). The Day Case can be changed from the drop-down list box, where all the available cases (as specified in the traffic file) are listed (*Fig. 7.11*). The language used for the names of the weekdays and months depends on the current Country setting. In the example shown in *Fig. 7.11*, the weekday and months names are in Danish.

Fig. 7.11 List of "Day Cases" for Danish conditions.

The traffic data are shown in three tables.

The uppermost table

The *uppermost (one-row) table,* right of the label "ADT split-up", contains average annual data split up on vehicle types. When the traffic data are shown in Mode 1 or Mode 2, the values given in this table for each particular vehicle type are identical to the Average Daily Traffic for that vehicle type. When the Mode 3 is applied, the values given in this table are identical to the annual average diurnal fraction of the total traffic. The value in the first cell is always the total Average Daily Traffic. All values in this table can be edited by the user. Changes made in one of the cells automatically trigger an update of all the remaining values, both in this and other tables.

Below the uppermost table, a Day Case is selected in a list box. This choice determines the contents of the main table:

The main table

The *main table* contains data on the hourly distribution of the traffic, traffic speed and percentage of cold-starts. When in Mode 1, all values in this table can be edited by the user. When in Mode 2, only the traffic speed and the percentage of cold-starts can be edited by the user. When in Mode 3, only the values for "All vehicles", traffic speed and cold-starts can be edited by the user. A change made in one of the cells automatically triggers an update of all the remaining values, both in this and other tables.

The row of values right of the label "Daily Total" contains data which have been split up on vehicle types for the particular Day Case. When the traffic data are shown as Mode 1 or Mode 2, the values given in this table for each particular vehicle type are identical to the Average Daily Traffic for this vehicle type. When the Mode 3 is applied, the values given in this table are identical to the average diurnal fraction of the total traffic. The value in the first cell is always the total Average Daily Traffic for the particular Day Case. All values in this table can be edited by the user. Changes made in one of the cells automatically triggers an update of all the remaining values, both in this and other tables.

The lowermost table provides values of the daily average of the vehicle emission factors for all directly emitted pollutants, which can be included in the model calculations. None of the values here can be edited by the user. They are given for information only. The average emission factors are calculated as traffic weighted values for the particular Day Case. The diurnal variation of the vehicle emission factors is due to the diurnal variation of the traffic speed and percentage of cold-starts (see Chapter 8 on the Vehicle Emissions).

When the edited traffic file is associated with an existing (or newly created) project, the changes made to the traffic data can be applied in the current project without first saving the changes to a file. However, if the modified data should be used when a project is opened next time, the changes must be saved to a file.

When editing a traffic file in the "New Project" window, the changes to the traffic data must be saved to a file in order to be used in the project.

When saving the traffic data it should be noted that the data will be saved according to the currently selected "Show" Mode, regardless of

the type of the original file. When the traffic data are shown as Mode 1, the saved file will contain traffic data given as number of vehicles per hour. When the traffic data are shown as Mode 2, the saved file will contain traffic data given as fraction of daily total ("Default type"). In Mode 3 it is not possible to save the traffic data.

The Traffic Editor also provides a graphical presentation of the traffic data and the resulting emissions. These graphs can be saved to a file (a .bmp file), copied to the clipboard or printed. Additionally, the user can save the emission data shown by the emission graph to a file. A pop-up menu, which appears when right-clicking with the mouse on the appropriate graph, provides the respective menu items (*Fig. 7.12*).

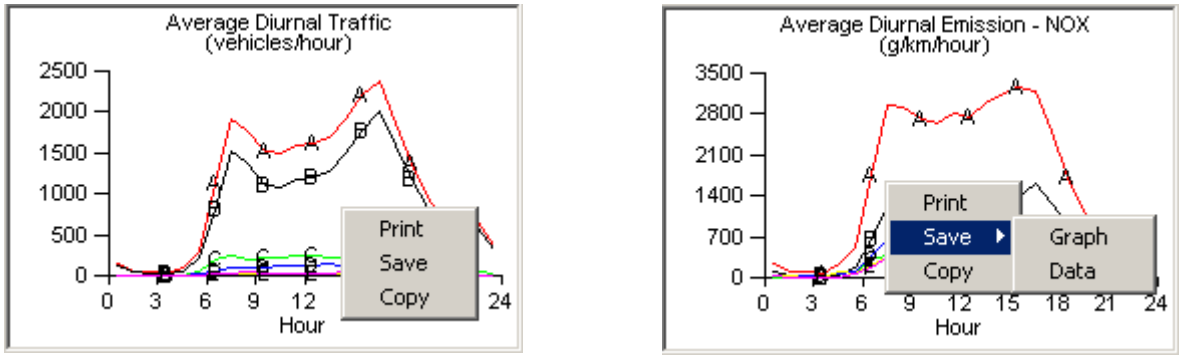


Fig. 7.12 The graphs can be saved to a file, copied to the clipboard or printed. Additionally, the user can save the emission data shown by the emission graph to a file.

8 Traffic Emissions

The traffic emissions are calculated in WinOSPM based on the traffic flow in the street (vehicles/hour) and the emission factors (g/vehicle/km). The traffic flow in a street is normally specified in terms of vehicle counts for few vehicle types only. These types can e.g. be passenger cars, vans, trucks and buses. Each of these vehicle types can, however, be composed of several different vehicle sub-categories depending on the type of the fuel, the technology and size of the engine, the emission reduction equipment (such as catalytic converters) and also the age of the vehicle. Emission factors for these sub-categories can differ substantially. The decomposition of the vehicle traffic into the sub-categories is normally not known on the level of a single street but, at best, can be estimated on the national level.

The methodology for calculations of emission factors that is adapted in WinOSPM is based on the European Emission Model COPERT (http://vergina.eng.auth.gr/mech/lat/copert/copert.htm).

In the COPERT model the emission factors are specified for a number of vehicle sub-categories covering the majority of European vehicle types. The emission factors specified for each of the vehicle categories are assumed to be universal, i.e. they don't depend on the Country setting. However, the subdivision into the sub-categories is country specific. It depends o the national fleet share.

The expressions for emission factors that are given in COPERT are based on analysis of a very large amount of data from several European vehicle-testing laboratories. The original purpose of COPERT was to provide tools for estimation of transport emissions on the national level. The application of COPERT emission factors for street level calculations has never (to our best knowledge) been tested before. Therefor, the concrete values for the vehicle emission factors resulting from the COPERT expressions should be taken with some precaution. Critical evaluation of the COPERT results using field data on the relevant pollution concentrations in streets is required. Due to the methodology adapted in WinOSPM, all the expressions for the emission factors can be easily modified and this can be done by the users of the software.

The emission factors in COPERT are given as functions of the actual vehicle speed. However, it's important to note that this speed does not refer to the instantaneous vehicle speed but to the average traffic speed in the street – the travel speed. The emission expressions that are currently adapted in WinOSPM cover such pollutants as NO_x, CO, benzene and PM_{10}. New pollutants will be added in the future.

Beside the basic emission factors, a number of correction expressions is provided. These expressions cover such conditions as the effect of cold-starts on the emissions and the deterioration of emissions with the age of vehicles (actually their mileage). For such pollutants as benzene, the emission factors depend also on the fuel quality, i.e. on

the content of benzene in the fuel. For future applications, the fuel composition is in WinOSPM also given for sulphur and for lead.

The sub-division of vehicles into the sub-categories follows basically the European legislation criteria for road transport. The emission expressions provided in COPERT are not only given for the present vehicle fleet but also for the future vehicle types, based on the expected emission reduction norms. This makes it possible to conduct calculations not only of the present but also of the future, expected, air quality in streets. This requires, however, that also a forecast of the future traffic composition is available.

8.1 Scenario List File

Because the traffic composition is changing over the years, the actual year is the key parameter for determination of the emissions. The traffic emissions are thus calculated depending on the Country setting and the selected calculation year – the Scenario Year.

Depending on the Country setting, different set of Scenario Years is available for calculations.

The list of the available pre-defined scenario data is specified in the file Scenarios.lst, the Scenario List File. This is a text file (ASCII) and can be edited by any text editor. However, it's recommended to use the **Settings / Scenarios** menu option to edit this list file. The program, EmiFact, which is distributed together with WinOSPM, can also be used for automatic modification of this list and generation of the necessary data referenced by this list.

The location (path) of the Scenarios.lst file is given by:

[AppPath]\Lists\National\[CountryCode]\Scenarios.lst

where [AppPath] is the path of WinOSPM on the local drive, as specified during installation of the software. [CountryCode] is the Country Code corresponding to the actual Country setting.

One Scenarios.lst file must reside in each of the [AppPath]\Lists\National\[CountryCode] folders. At least 1 (one) scenario dataset must be referenced by this list.

The structure of the Scenarios.lst file is explained using an example shown in *Listing 8.1*.

The first line contains the information on the name of a database file with data on the national vehicle fleet share for the period of years given by the two following the name of the database file (First and Last Scenario year). The database file must be a Microsoft Access file with a pre-defined structure of Tables and Queries. The presence of such a database file is not mandatory but the database is used for automatic generation of the scenario data. If no such database file exists, the name of the file must be replaced by two quotes only (""). In this case the First and the Last Scenario year values are not used in

the program. These values can be replaced by any values, but can't be missing.

The actually available scenario years combinations are listed in the following lines. The two files that follow after the year value are the key files that contain all the information required for the particular scenario calculation. In the following, these files are referenced as the Vehicle List Files and the Fuel List Files. The names of these files are saved together with the project file. There are no restrictions on these file's names but it's most convenient to use extensions ".vlf" and ".flf" for Vehicle and Fuel List files, respectively. In the example shown in *Listing 8.1* the actual path of these files is replaced by ".\". This means that the files are assumed to be located in the default directory for this type of files. The default directories for the different types of files and the general rules for path specification are listed in Appendix C.

Listing 8.1

```
".\FleetDK.mdb",1985,2030
1990,".\Vehicles_1990.vlf",".\Fuels_1990.flf"
1995,".\Vehicles_1995.vlf",".\Fuels_1995.flf"
1999,".\Vehicles_1999.vlf",".\Fuels_1999.flf"
2005,".\VehiclesDK_2005.vlf",".\Fuels_1999.flf"
```

8.1.1 Vehicle List Files

The Vehicle List Files contain basically "pointers" to other files, which actually contain data used for calculations of emission factors. Only the first line provides information on the Country Code, the Scenario Year and the list of pollutants for which the emission factors are specified. Actually, both the Country Code and the Scenario Year are given for information only. The data provided in the referenced files are already specific for the particular Country setting and the actual Scenario year. The list of pollutants is important because their names and order is used by the program to assign the particular emission factor files to the right pollutants.

A Vehicle List File consists of several blocks. Each block contains information relevant for a particular vehicle category. For convenience, the first line of each block in *Listing 8.2* is highlighted.

The first line of a block starts with the name of the respective vehicle category. This name is only used internally in the program and any text string can be specified. The only restriction is that this name must be unique, i.e. different vehicle categories can't share the same name. In the example shown in *Listing 8.2*, the first referenced vehicle category refers to passenger gasoline cars.

The name of the vehicle type, as it is used in connection with the street traffic data, is the next text variable. This name must exactly correspond to the vehicle type name used in the traffic files. In the example shown in *Listing 8.2*, the first referenced vehicle type refers to all passenger cars, i.e. passenger cars irrespective of the used fuel and engine type.

The actual fuel type is given as the text “Gasoline”, identifying the vehicle category as a gasoline car. The fuel name must correspond exactly to the name given for the respective fuel type in the corresponding Fuel List file.

The next variable refers to the length class of the respective vehicle category. It can only have a value of 1 (short vehicles) or 2 (long vehicles). The length class specification is used in OSPM in connection with calculation of the traffic produced turbulence, which depends on the physical size of the vehicles and their speed.

The last text variable specifies the long name of the vehicle and is only used for presentation of the emission factors data by the EmiFact program.

Listing 8.2

```
DK  1999  NOX CO BNZ PM10
"PasGasoline","PAS_Car","Gasoline",1,"Passenger Cars"
".\FleetShareDK_1999.xls","PasGasoline"
".\PasGasolineNOX.emi",".\PasGasolineCO.emi",".\PasGasolineVOC.emi",".\PasGasolinePM10.emi"
".\PasGasolineNOX.ccr",".\PasGasolineCO.ccr",".\PasGasolineVOC.ccr",".\PasGasolinePM10.ccr"
".\MileageDK_1999.xls","PasGasoline"
".\PasGasolineNOX.mcr",".\PasGasolineCO.mcr",".\PasGasolineVOC.mcr",""
"PasDiesel","PAS_Car","Diesel",1,"Passenger Cars"
".\FleetShareDK_1999.xls","PasDiesel"
".\PasDieselNOX.emi",".\PasDieselCO.emi",".\PasDieselVOC.emi",".\PasDieselPM10.emi"
".\PasDieselNOX.ccr",".\PasDieselCO.ccr",".\PasDieselVOC.ccr",".\PasDieselPM10.ccr"
"",""
"","","",""
"PasLPG","PAS_Car","LPG",1,"Passenger Cars"
".\FleetShareDK_1999.xls","PasLPG"
".\PasLPGNOX.emi",".\PasLPGCO.emi",".\PasLPGVOC.emi",".\PasLPGPM10.emi"
".\PasLPGNOX.ccr",".\PasLPGCO.ccr",".\PasLPGVOC.ccr",""
"",""
"","","",""
"VanGasoline","Vans","Gasoline",1,"Vans"
".\FleetShareDK_1999.xls","VanGasoline"
".\VanGasolineNOX.emi",".\VanGasolineCO.emi",".\VanGasolineVOC.emi",".\VanGasolinePM10.emi"
".\VanGasolineNOX.ccr",".\VanGasolineCO.ccr",".\VanGasolineVOC.ccr",".\VanGasolinePM10.ccr"
".\MileageDK_1999.xls","VanGasoline"
".\VanGasolineNOX.mcr",".\VanGasolineCO.mcr",".\VanGasolineVOC.mcr",""
"VanDiesel","Vans","Diesel",1,"Vans"
".\FleetShareDK_1999.xls","VanDiesel"
".\VanDieselNOX.emi",".\VanDieselCO.emi",".\VanDieselVOC.emi",".\VanDieselPM10.emi"
".\VanDieselNOX.ccr",".\VanDieselCO.ccr",".\VanDieselVOC.ccr",".\VanDieselPM10.ccr"
"",""
"","","",""
"TRC1Gasoline","Truck_1","Gasoline",2,"Trucks <32t"
".\FleetShareDK_1999.xls","TRC1Gasoline"
".\TRC1GasolineNOX.emi",".\TRC1GasolineCO.emi",".\TRC1GasolineVOC.emi",".\TRC1GasolinePM10.emi
"
"","","",""
"",""
"","","",""
"TRC1Diesel","Truck_1","Diesel",2,"Trucks <32t"
".\FleetShareDK_1999.xls","TRC1Diesel"
".\TRC1DieselNOX.emi",".\TRC1DieselCO.emi",".\TRC1DieselVOC.emi",".\TRC1DieselPM10.emi"
"","","",""
"",""
"","","",""
"TRC2Diesel","Truck_2","Diesel",2,"Trucks >32t"
".\FleetShareDK_1999.xls","TRC2Diesel"
".\TRC2DieselNOX.emi",".\TRC2DieselCO.emi",".\TRC2DieselVOC.emi",".\TRC2DieselPM10.emi"
"","","",""
"",""
"","","",""
"BusDiesel","Buses","Diesel",2,"Buses"
".\FleetShareDK_1999.xls","BusDiesel"
".\BusDieselNOX.emi",".\BusDieselCO.emi",".\BusDieselVOC.emi",".\BusDieselPM10.emi"
"","","",""
"",""
"","","",""
```

The data on the national fleet composition for the particular scenario year is, in the shown example given in an Excel file “FleetShareDK_1999.xls”. The actual path of this file is again replaced here by “.\”, what means that the file resides in the default directory for this kind of files. The file must be an Excel file but the name is

arbitrary. Using the country code and the scenario year as a part of the file name is only for mnemonic reasons. The same excel file can be used for all vehicle categories, but this is not a requirement. The actual reference to the data is in the name of the spreadsheet contained in the Excel file. In the shown example the name of the spreadsheet is "PasGasoline". It is accidental, but practical that the same name is given to the spreadsheet as to the respective vehicle category for which the data are given in the spreadsheet. The structure of the vehicle composition files is presented and discussed in the next section.

The names of files, which actually contain the emission factor expressions and expressions for the cold-start corrections, are given in the two subsequent lines. These files need not necessary be the files that are supplied with the distributed version of WinOSPM. Users can construct their own files adapting their own emission expressions and cold-start corrections. The rules that such files must obey are discussed later in this Chapter. The emission expression files must be given for all vehicle categories and for all the pollutants listed at the beginning of the Vehicle List file. The cold-start correction files can be omitted. If a cold-start correction file for a particular vehicle category and pollutant is missing, no cold-start correction will be made to the emission factors. In the shown example these files are only provided for passenger cars and vans. The space reserved for these files in the Vehicle List file, must however be replaced by two quotes ("").

The file names given in the two last lines of the vehicle category block refer all to mileage correction data. Mileage correction is used in order to correct the basic emission factors for the deterioration of vehicle emission with age of vehicles (more exactly their mileage). According to the COPERT methodology, this correction is only provided for vehicles equipped with 3W catalytic converters, and this is presently only the case for gasoline cars. However, the space reserved for the mileage correction files in the Vehicle List files must, in the case of missing files, be replaced by two quotes. The data on mileage of the respective vehicle categories are given in Excel files. In the shown example the name of the Excel file is "MileageDK_1999.xls". The name of the respective spreadsheet, that contains the data, follows the name of the Excel file. It's accidental that the name of the spreadsheet is the same as the name of the spreadsheet with the corresponding vehicle fleet data. This mnemonic rule is, however, practical. The structure of the vehicle mileage files and the corresponding mileage correction expression files is discussed later in this chapter.

8.2 Vehicle Fleet files

As an example, listing of an Excel spreadsheet file with data on the national composition of gasoline passenger cars in 1999 in Denmark is shown in *Listing 8.3*. This listing as a copy of the spreadsheet "PasGasoline" contained in the Excel file "FleetShareDK_1999.xls" and referenced previously in *Listing 8.2*. Note that the data in the

original Excel file might be given with higher precision than shown in the listing. For sake of clarity of presentation, the data are here formatted differently as in the Excel file.

Listing 8.3

Engine Capacity	PRE ECE	ECE 15-00/01	ECE 15-02	ECE 15-03	ECE 15-04	Improved Conv	Open Loop	Euro I	Euro II	Euro III	Euro IV
cc:<1.4l	0.12	1.25	0.60	8.18	14.12	0	0	15.21	9.50	0	0
cc:1.4-2.0l	0.09	0.87	0.38	4.63	9.59	0	0	17.42	13.07	0	0
cc:>2.0l	0.01	0.08	0.03	0.67	1.28	0	0	1.72	1.19	0	0
fraction of all Pas_Car	0.94										

The numbers in the cells of the table in *Listing 8.3* represent the fraction (in %) of a particular vehicle class in relation to all, in this case, gasoline passenger cars in Denmark in the year 1999. A single vehicle class is defined as a combination of the engine technology (using the terminology adapted in COPERT) and the engine capacity. As an example (the greyed cell), 17.42% of all gasoline passenger cars registered in this period in Denmark where "EURO I" cars and with engine of capacity of "cc:1.4-2.0l". The sum of all values in the cells under the engine technology headings and engine capacity row titles must be 100%.

The fraction that the gasoline passenger cars constitute with respect to all passenger cars (i.e. regardless fuel type) is given in the last line. In the shown example (*Listing 8.3*) the fraction is 0.94.

The user can construct own vehicle fleet files using different split-up into vehicle classes and also specify alternative emission factor expressions. The only criteria is that the files must obey one important rule:

The text in the headings and row titles (highlighted in Listing 8.3) must correspond exactly, (including spaces but not the case) to the corresponding text used in the files with expressions for vehicle emission factors. The order in which the particular vehicle classes are referenced in the vehicle fleet files and emission factor expression files must also be the same.

8.3 Emission factor expression files

All the emission factor expressions, used by WinOSPM, are text (ASCII) files. The files will normally have the extension ".emi", and as a standard located in the directory

[AppPath]\Data\Emission\Shared\

where [AppPath] is the path of WinOSPM on the local drive, as specified during installation of the software.

If wanted, the location of the emission factor expressions can be changed by the user.

As an example, a listing of NO_x emission factor expressions for gasoline passenger cars is given in *Listing 8.4*. The file can be edited by any text editor, but a special editing software is provided with WinOSPM. The program, EmiFact can be used both for editing and graphical visualisation of the vehicle emission factors. This software can be used as a stand-alone program or can be invoked from WinOSPM.

The structure of the emission factor expression files must correspond to the structure of a corresponding vehicle fleet file. The emission factor expressions are given in blocks starting with the heading that specifies the engine technology. Each line with the emission factor expressions is preceded with the text specifying the particular engine capacity class. Due to the way in which the files are read by the software, each vehicle engine technology heading must also contain a number specifying the number of the following lines in the block (i.e. the number of referenced engine capacities).

Beside the basic split-up into classes depending on the engine technology and capacity, an additional grouping is used too. In the particular example shown in *Listing 8.4* this grouping (shown by a highlighted text) consists of all conventional vehicles (prior to the catalytic converters technology) and catalyst vehicles. The numbers that follow the name of the group refer to the number of vehicle classes (engine technologies) in each of the groups. This grouping (aggregation) is used only in connection with presentation of emission factor data by the EmiFact program. Also in WinOSPM and in the Traffic Editor Program (TrafEdit), the percentage of passenger catalyst cars is displayed, but for information only.

It is important that all files with emission factor expressions for different pollutants have exactly the same structure. Even if a pollutant is not emitted by a particular vehicle class, an expression text must be provided in the file. In this case the expression will just read "0", what means that the emission is zero.

The emission factor expressions must follow the normal rules for mathematical formulas. The only variable that can be used in any of the expressions is the vehicle speed variable "V". Otherwise, any combination of mathematical operators and functions and also logical operators (such as AND, OR, IIF, etc.) is allowed. Users familiar with writing mathematical formulas in e.g. Excel should be familiar with the syntax. It is, however, recommended to use the tools provided with EmiFact, where the results of modifications can immediately be seen in form of graphs and numerical values.

Listing 8.4

```
"Conventional",7
    "PRE ECE",3
     "cc:<1.4l",  "1.173 + 0.0225 * V - 0.00014 * (V ^ 2)"
     "cc:1.4-2.0l",  "1.36 + 0.0217 * V - 0.00004 * (V ^ 2)"
     "cc:>2.0l",  "1.5 + 0.03 * V + 0.0001 * (V ^ 2)"
    "ECE 15-00/01",3
     "cc:<1.4l",  "1.173 + 0.0225 * V - 0.00014 * (V ^ 2)"
     "cc:1.4-2.0l",  "1.36 + 0.0217 * V - 0.00004 * (V ^ 2)"
     "cc:>2.0l",  "1.5 + 0.03 * V + 0.0001 * (V ^ 2)"
    "ECE 15-02",3
     "cc:<1.4l"  "1.479 - 0.0037 * V + 0.00018 * (V ^ 2)"
     "cc:1.4-2.0l"  "1.663 - 0.0038 * V + 0.0002 * (V ^ 2)"
     "cc:>2.0l"  "1.87 - 0.0039 * V + 0.00022 * (V ^ 2)"
    "ECE 15-03",3
     "cc:<1.4l",  "1.616 - 0.0084 * V + 0.00025 * (V ^ 2)"
     "cc:1.4-2.0l",  "1.29 * Exp(0.0099 * V)"
     "cc:>2.0l" , "2.784 - 0.0112 * V + 0.000294 * (V ^ 2)"
    "ECE 15-04",3
     "cc:<1.4l",  "1.432 + 0.003 * V + 0.000097 * (V ^ 2)"
     "cc:1.4-2.0l",  "1.484 + 0.013 * V + 0.000074 * (V ^ 2)"
     "cc:>2.0l",  "2.427 - 0.014 * V + 0.000266 * (V ^ 2)"
    "Improved Conv",2
     "cc:<1.4l",  "-0.926 + 0.7192 * Log(V)"
     "cc:1.4-2.0l",  "1.387 - 0.0014 * V + 0.000247 * (V ^ 2)"
    "Open Loop",2
     "cc:<1.4l",  "-0.921 + 0.616 * Log(V)"
     "cc:1.4-2.0l",  "-0.761 + 0.515 * Log(V)"
"Catalyst",4
    "EURO I",3
     "cc:<1.4l",  "0.5595 - 0.01047 * V + 0.000108 * (V ^ 2)"
     "cc:1.4-2.0l",  "0.526 - 0.0085 * V + 0.0000854 * (V ^ 2)"
     "cc:>2.0l",  "0.666 - 0.009 * V + 0.0000755 * (V ^ 2)"
    "EURO II",3
     "cc:<1.4l",  "0.36 * (0.5595 - 0.01047 * V + 0.000108 * (V ^ 2))"
     "cc:1.4-2.0l",  "0.36 * (0.526 - 0.0085 * V + 0.0000854 * (V ^ 2))"
     "cc:>2.0l",  "0.36 * (0.666 - 0.009 * V + 0.0000755 * (V ^ 2))"
    "EURO III",3
     "cc:<1.4l", "0.24 * (0.5595 - 0.01047 * V + 0.000108 * (V ^ 2))"
     "cc:1.4-2.0l",  "0.24 * (0.526 - 0.0085 * V + 0.0000854 * (V ^ 2))"
     "cc:>2.0l",  "0.24 * (0.666 - 0.009 * V + 0.0000755 * (V ^ 2))"
    "EURO IV",3
     "cc:<1.4l",  "0.13 * (0.5595 - 0.01047 * V + 0.000108 * (V ^ 2))"
     "cc:1.4-2.0l",  "0.13 * (0.526 - 0.0085 * V + 0.0000854 * (V ^ 2))"
     "cc:>2.0l",  "0.13 * (0.666 - 0.009 * V + 0.0000755 * (V ^ 2))"
```

8.4 Cold-start correction expression files

All the files with expressions for cold-start correction factors, used by WinOSPM, are text (ASCII) files. The files will normally have the extension ".ccr", and as a standard located in the directory

[AppPath]\Data\Emission\Shared\

where [AppPath] is the path of WinOSPM on the local drive, as specified during installation of the software.

If wanted, the location can be changed by the user.

As an example, a listing of expressions for cold-start corrections for NO_x emission factors of gasoline passenger cars is given in *Listing 8.5*. The files can be edited by any text editor, but a special editing software is provided with WinOSPM. The program, EmiFact can be used both for editing and graphical visualisation of the vehicle emission factors. This software can be used as a stand-alone program or can be invoked from WinOSPM.

The structure of cold-start correction files is exactly the same as that of emission factor expression files, and will not be discussed any further. The presence of these files is however not mandatory. Also expressions for some of the vehicle classes might be absent in a file but in this case they have to be replaced by two quotes ("").

Listing 8.5

```
"Conventional",7
    "PRE ECE",3
     "cc:<1.4l",  "MAX((0.14 - 0.006 * T),0)"
     "cc:1.4-2.0l",  "MAX((0.14 - 0.006 * T),0)"
     "cc:>2.0l",  "MAX((0.14 - 0.006 * T),0)"
    "ECE 15-00/01",3
     "cc:<1.4l",  "MAX((0.14 - 0.006 * T),0)"
     "cc:1.4-2.0l",  "MAX((0.14 - 0.006 * T),0)"
     "cc:>2.0l",  "MAX((0.14 - 0.006 * T),0)"
    "ECE 15-02",3
     "cc:<1.4l",  "MAX((0.14 - 0.006 * T),0)"
     "cc:1.4-2.0l",  "MAX((0.14 - 0.006 * T),0)"
     "cc:>2.0l",  "MAX((0.14 - 0.006 * T),0)"
    "ECE 15-03",3
     "cc:<1.4l",  "MAX((0.14 - 0.006 * T),0)"
     "cc:1.4-2.0l",  "MAX((0.14 - 0.006 * T),0)"
     "cc:>2.0l",  "MAX((0.14 - 0.006 * T),0)"
    "ECE 15-04",3
     "cc:<1.4l",  "MAX((0.14 - 0.006 * T),0)"
     "cc:1.4-2.0l",  "MAX((0.14 - 0.006 * T),0)"
     "cc:>2.0l",  "MAX((0.14 - 0.006 * T),0)"
    "Improved Conv",2
     "cc:<1.4l",  "MAX((0.14 - 0.006 * T),0)"
     "cc:1.4-2.0l",  "MAX((0.14 - 0.006 * T),0)"
    "Open Loop",2
     "cc:<1.4l",  "MAX((0.14 - 0.006 * T),0)"
     "cc:1.4-2.0l",  "MAX((0.14 - 0.006 * T),0)"
"Catalyst",4
  "EURO I",3
   "cc:<1.4l",  "IIf(V<25, MAX((-0.245+0.00738*T+0.0461*V),0), MAX((-0.384+0.0234*T+0.0513*MIN(V,45)),0))"
   "cc:1.4-2.0l",  "IIf(V<25, MAX((-0.236+0.00747*T+0.0458*V),0), MAX((-0.315+0.0228*T+0.0484*MIN(V,45)),0))"
   "cc:>2.0l",  "IIf(V<25, MAX((-0.173+0.00566*T+0.0343*V),0), MAX((-0.272+0.0172*T+0.0375*MIN(V,45)),0))"
  "EURO II",3
   "cc:<1.4l",  "2.0*(IIf(V<25, MAX((-0.245+0.00738*T+0.0461*V),0), MAX((-0.384+0.0234*T+0.0513*MIN(V,45)),0)))"
   "cc:1.4-2.0l", "2.0*(IIf(V<25, MAX((-0.236+0.00747*T+0.0458*V),0), MAX((-0.315+0.0228*T+0.0484*MIN(V,45)),0)))"
   "cc:>2.0l",  "2.0*(IIf(V<25, MAX((-0.173+0.00566*T+0.0343*V),0), MAX((-0.272+0.0172*T+0.0375 * MIN(V,45)),0)))"
  "EURO III",3
   "cc:<1.4l",  "1.33*(IIf(V<25, MAX((-0.245+0.00738*T+0.0461*V),0), MAX((-0.384+0.0234*T+0.0513*MIN(V,45)),0)))"
   "cc:1.4-2.0l","1.33*(IIf(V<25, MAX((-0.236+0.00747*T+0.0458*V),0), MAX((-0.315+0.0228*T+0.0484*MIN(V,45)),0)))"
   "cc:>2.0l",  "1.33*(IIf(V<25, MAX((-0.173+0.00566*T+0.0343*V),0), MAX((-0.272+0.0172*T+0.0375*MIN(V,45)),0)))"
  "EURO IV",3
   "cc:<1.4l",  "1.38*(IIf(V<25, MAX((-0.245+0.00738*T+0.0461*V),0), MAX((-0.384+0.0234*T+0.0513*MIN(V,45)),0)))"
   "cc:1.4-2.0l", "1.38*(IIf(V<25,MAX((-0.236+0.00747*T+0.0458*V),0), MAX((-0.315+0.0228*T+0.0484*MIN(V,45)),0)))"
   "cc:>2.0l",  "1.38*(IIf(V<25, MAX((-0.173+0.00566*T+0.0343*V),0), MAX((-0.272+0.0172*T+0.0375 MIN(V,45)),0)))"
```

The expressions contain here two variables. The vehicle speed variable, denoted by "V", and the ambient temperature variable, denoted by "T".

The cold-start correction is made in the program using the following formula

$$q = q_{basic} * (1 + ColdStart * ColdCorr)$$

where q is the resulting emission factor, q_{basic} is the emission factor without cold-start correction (hot engine), ColdStart is the fraction of vehicles running with cold engine (given in the traffic files) and ColdCorr is the correction factor that is calculated using the correction expressions.

8.5 Mileage correction

The data on average mileage for the respective vehicle classes are provided in one or more Excel files with one spreadsheet for each of the vehicle categories.

As an example, listing of an Excel spreadsheet file with mileage data of gasoline passenger cars in 1999 in Denmark is shown in *Listing 8.6*. This listing as a copy of the spreadsheet "PasGasoline" contained in the Excel file "MileageDK_1999.xls" and was referenced previously in

Listing 8.2. For the sake of clarity of the presentation, the listing doesn't contain all the columns from the original Excel file.

The mileage data Excel files have somewhat different structure than the vehicle fleet Excel files. The column headings (highlighted in *Listing 8.6*) contain both the name of the vehicle engine technology and the engine capacity. The two parts are joined using an underscore sign (_). As is the case for all other emission files, the correct spelling of the class names is important (but not case sensitive).

According to the COPERT methodology, the increase of vehicle emissions is mainly due to degradation of the functioning of the emission reduction equipment (catalytic converters) with the mileage of the vehicles. This process is assumed to be linear with the mileage but with no further increase of emissions after the mileage reaches 120 000 km. In order to estimate an average mileage correction for the national vehicle fleet, two parameters are required. The first is the average mileage of vehicles, but only considering vehicles with mileage < 120 000 km. The other parameter is the fraction of vehicles with mileage > 120 000 km. In *Listing 8.6* the first parameter for the vehicle class EURO I and the engine capacity cc:>2.0l is 21775 km (greyed cell). For the same class, the fraction of vehicles with mileage > 120 000 is 0.79.

Listing 8.6

Mileage parameters	Euro I_cc:<1.4l	Euro I_cc:1.4-2.0l	Euro I_cc:>2.0l	Euro II_cc:<1.4l	Euro II_cc:1.4-2.0l
Average Mileage (< MaxMileage), km	19667	23616	21775	53955	53955
Fraction above MaxMileage	0.81	0.77	0.79	0	0
MaxMileage for degradation, km	120000	120000	120000	120000	120000

The corresponding files with the expressions for the mileage correction have exactly the same structure as emission factor expression or cold-start correction files. The presence of these files is not mandatory. If they are absent, no mileage correction is performed in the calculations of the emission factors

Both the Excel files with the mileage data and the corresponding correction expressions can be edited using the tools available in EmiFact. EmiFact provides also graphical visualisation of the effects of the mileage correction.

8.6 Fuel List Files

The Fuel List Files not only contain "pointers" to files with data on the actual fuel composition but also contain expressions for the fuel composition correction used for calculation of the emission factors.

An example of a Fuel List File for the fuel data in Denmark in the year 1999 is shown in *Listing 8.7*.

The file heading has the same structure as in a Vehicle List File (section 6.1.1). The year specification needs, however not necessary be the same as in the associated Vehicle List File. In the Scenarios.lst file shown in *Listing 8.1*, the same Fuel List File, i.e. "Fuels_1999.flf" is used both for the Scenario Year 1999 and Scenario Year 2005. It's assumed that the fuel composition will not change during this period.

A Fuel List File consists of several blocks, with one block for each fuel type. The fuel name (highlighted in *Listing 8.7*) starts each block. Again, the actual data on the fuel composition are provided in Excel files with one spreadsheet for each of the fuel types. The compound names, for which the fuel composition data are provided are listed for each fuel. For each of the compounds, the units in which the composition is specified, is also given. The expressions used for correction of emission factors are provided in the last line of each fuel block. These expressions are given for each pollutant specified in the heading of the file and must follow in the same order as the pollutants names. However, the correction expression might not be given for all the pollutants. Actually, in the shown example, the only correction expression is given for emissions of benzene. The variable that is related to the contents of benzene in the fuel is denoted by "fBNZ". For the future applications, when also the contents of sulphur and lead in the fuel will be taken into account, the variable names "fS" and "fPb" are reserved for these compounds.

Listing 8.7

```
DK 1999 NOX CO BNZ PM10
"Gasoline"
".\FuelDK_1999.xls","Gasoline"
"Benzene","Sulphur","Lead"
"%","ppm","g/l"
"","","fBNZ*(6 * 12 + 6) / (12 + 1.8) / 100",""
"Diesel"
".\FuelDK_1999.xls","Diesel"
"Benzene","Sulphur","Lead"
"%","ppm","g/l"
"","","fBNZ*(6 * 12 + 6) / (12 + 1.8) / 100",""
"LPG"
".\FuelDK_1999.xls","LPG"
"Benzene","Sulphur","Lead"
"%","ppm","g/l"
"","","fBNZ*(6 * 12 + 6) / (12 + 1.8) / 100",""
```

8.6.1 Fuel Composition files

An example of a fuel composition file with data on composition of gasoline in 1999 in Denmark is shown in *Listing 8.8*. This is a copy of the spreadsheet "Gasoline" included in the Excel file "FuelDK_1999.xls" referenced in *Listing 8.7*.

Listing 8.8

Component	Benzene (%)	Sulphur (ppm)	Lead (g/l)
Contents	1	0	0

The structure of this file is obvious and needs no further explanation.

8.7 Assigning and changing Emission Scenarios in an OSPM Project

8.7.1 When starting a new project

Starting a new OSPM project using the New Project window results in automatic initialisation of the necessary emission scenario data. The available scenario data depend on the contents of the Scenario List File (Scenarios.lst file, Section 8.1). The actually used Scenario List File depends on the Country setting.

One of the Scenario Years listed in the Scenario List File is automatically selected as the actual Scenario Year and will be displayed in the Scenario Year dropdown list box. The selected year will depend on the current calendar year. If the calendar year corresponds to one of the Scenario Years listed in the Scenario List File, this year will be automatically selected as the actual Scenario Year. If not, the nearest available Scenario Year, but chronologically less than the current calendar year, will be selected. As an example, if the collection of the available Scenario Years is as shown in Fig. 8.1, and the current calendar year is 2002, the year 1999 will automatically be selected as the actual Scenario Year.

The list of the available Scenario Years that is displayed by the drop-down list box will also depend on whether or not a national fleet share database is referenced in the actual Scenario List File.

If there is no reference to such a database, the list of the Scenario Years that the user can select will be limited only to those years for which there in the Scenario List File is a reference to a Vehicle and Fuel List File (Section 8.1). An example corresponding to such a condition is shown in *Fig. 8.1*. The user can select any of the years from the list, and this year will be the actual Scenario Year in the project. The names of the Vehicle and Fuel List files corresponding to this Scenario Year will be saved together with the project data.

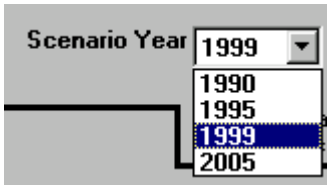


Fig. 8.1 An example of the list of the predefined Scenario Years.

It a fleet share database is referenced in the Scenario List File, all the years (from First Scenario Year to Last Scenario Year, Section 8.1) will be displayed in the drop-down list (*Fig. 8.2*). However, the only Scenario Years for which the Vehicle and Fuel List Files are assigned to in the Scenario List File, are immediately available for the project. A message text, informing whether or not the data are already available for a particular year, will appear when the mouse pointer is hovered over the list items.

If the selected year is not one for which the data are already available, the data will be generated based on the information contained in the fleet database file. However, these data will only be temporary. It will be possible to conduct calculations with these data in the current project but no information on these data will be saved with the project. To create permanent data, which can also be used next time a saved project is opened, use the EmiFact program.

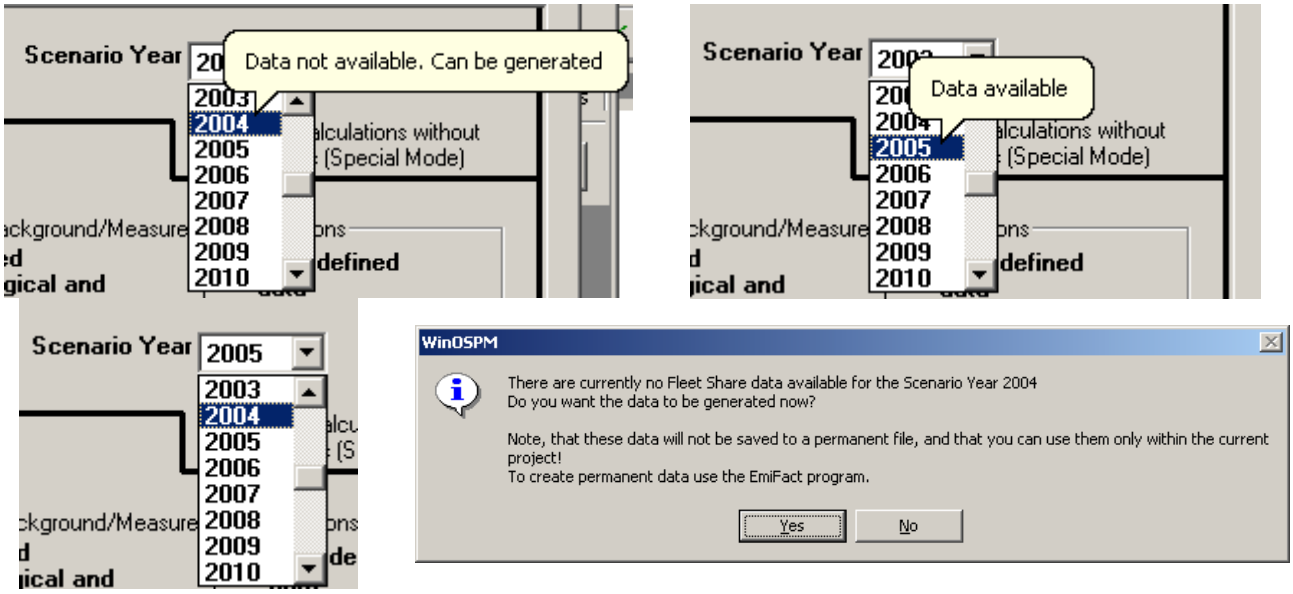


Fig. 8.2 A message text, informing whether or not the data are already available for a particular year appear when the mouse pointer is hovered over the list items. Selecting a Scenario Year for which the data are not yet available results in a message informing that these data can be generated, but will not be permanent.

8.7.2 When working with a saved project

The traffic emission scenarios can also be modified when working in the "Calculation" window. The procedure is the same both in the case when the user enters the "Calculation" window after finishing creation of a new project or when a previously saved OSPM project is re-opened.

The information on the actual Scenario Year, the assigned Vehicle and Fuel List Files is provided in the upper left frame of the "Calculation" window (*Fig. 8.3*, left).

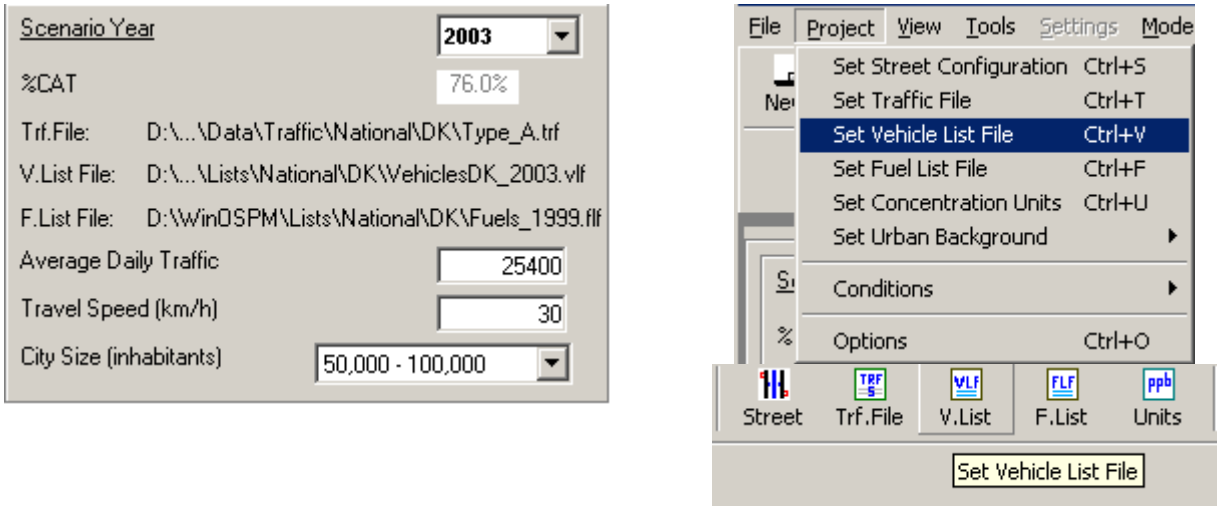


Fig. 8.3 The information on the actual Scenario Year, the assigned Vehicle and Fuel List Files is provided in the upper left frame of the "Calculation" window. The Vehicle and the Fuel List Files can be selected using the "Project" menu item or the associated toolbar icon.

The Scenario Year can be changed using the drop-down list box and selecting one of the year items displayed in the list (*Fig. 8.4*). The displayed list will depend on the current Country setting. However, the only year entries that will be available are those, which have a set of Vehicle and Fuel Files associated with them in the national Scenario List file (Section 8.1). New fleet share data cannot be generated from within the "Calculation" window.

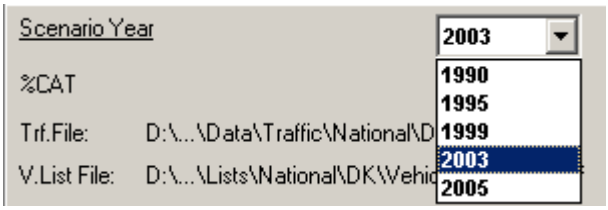


Fig. 8.4 The Scenario Year can be changed using the drop-down list box.

New Vehicle and Fuel List Files can also be associated with the project without changing the Scenario Year. The menu item **Project/Set Vehicle List** or the associated toolbar icon (*Fig. 8.3*, right) opens a dialog box where the name of a new Vehicle List File can be typed or selected from the Windows Open File dialog box. The procedure is the same for the Fuel List Files. It's important to note that these files need not to be the same as referenced in the Scenario List file. Because all the information on the national fleet composition and the fuel quality is contained in the Vehicle and Fuel List files (or more precisely, in the files that are referenced to in these list files), assigning these files to a project is sufficient to determine all the emission scenario conditions.

The information on the Scenario Year and the Vehicle and Fuel List files will be saved together with the project data.

If the project was created using fleet share data that where generated as temporary data only (Section 8.7.1), both the Scenario Year and the

name of the Vehicle List will be marked with brackets ([]) when entering the "Calculation" window (*Fig. 8.5*, upper). In this case, the information on the assigned fleet share data will not be saved with the project data. An information message on this will be issued by the program when user attempts to save the project (*Fig. 8.5*, lower).

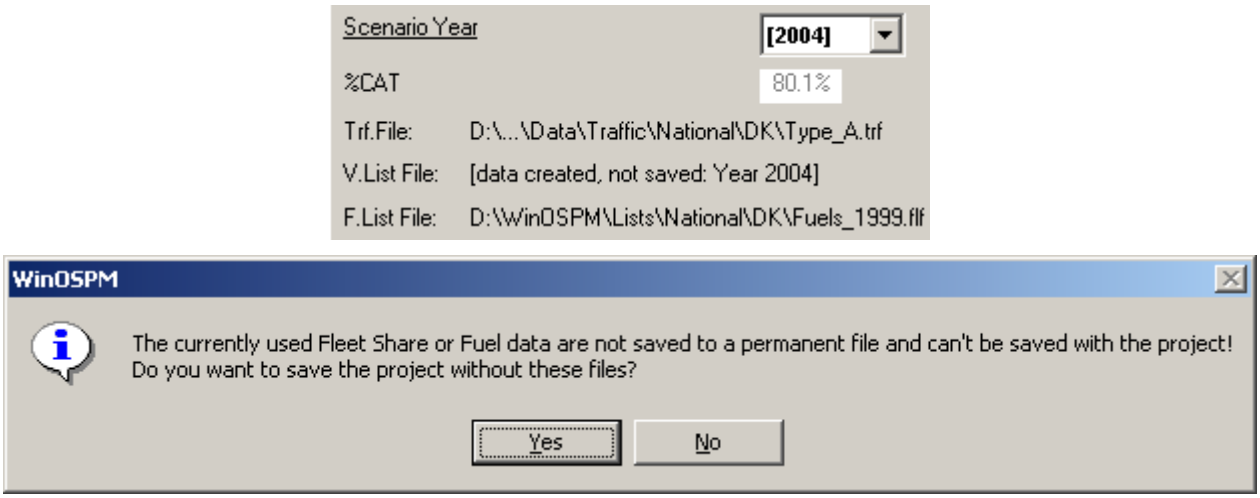


Fig. 8.5 When using temporary data, the name of the Vehicle List file and the Scenario Year are shown with brackets. No reference to these data can be saved with the project.

8.7.3 Viewing and editing the Vehicle and Fuel List Files

The contents of the currently assigned Vehicle and Fuel List files can be viewed or edited using the tools provided by WinOSPM. The menu item View /View/Edit Vehicle List Data, or the associated toolbar icon (*Fig. 8.6*) opens the Vehicle List in the List Editor window (*Fig. 8.7*). A corresponding menu item starts the List Editor for a Fuel List File.

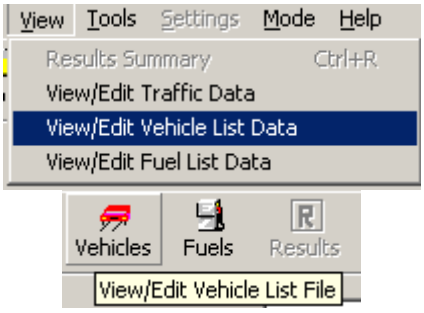


Fig. 8.6 The contents of the currently assigned Vehicle or Fuel List Files can be viewed using the "Tools" menu item or the associated toolbar icon.

The List Editor shows a complete listing of all the data contained in a Vehicle or a Fuel List File. The data listing is organised in pages with one page for each vehicle type or fuel type. The data in the list can be edited and the contents of the referenced files can be viewed (not edited!). If the changed data are saved to a file, the modified Vehicle or Fuel List is re-opened by the program and the modified list is used in the calculations.

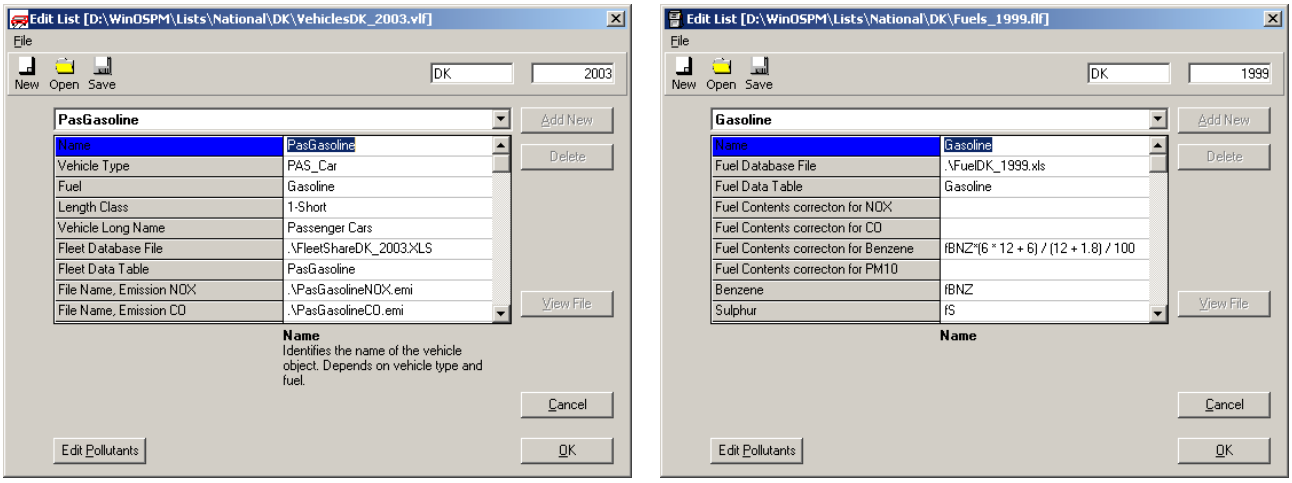


Fig. 8.7 The List Editor Window with examples of a Vehicle and Fuel List File.

The List Editor can also be used to create new List Files. However, it's not recommended to use this facility from within the "Calculation" window. The List Editor is also available from the EmiFact program and it's recommended to use the editing facilities only when working with the EmiFact program.

If a new pollutant was included in the Pollutants List (see Section 3, Pollutants), this pollutant can also be added to a Vehicle and a Fuel List. The new pollutant can be selected in the "Edit Pollutants window, which is activated with the "Edit Pollutants" button (*Fig.* 8.8, left). Corresponding files with emission factor expressions for this pollutant must be added to the List too ((*Fig.* 8.8, right).

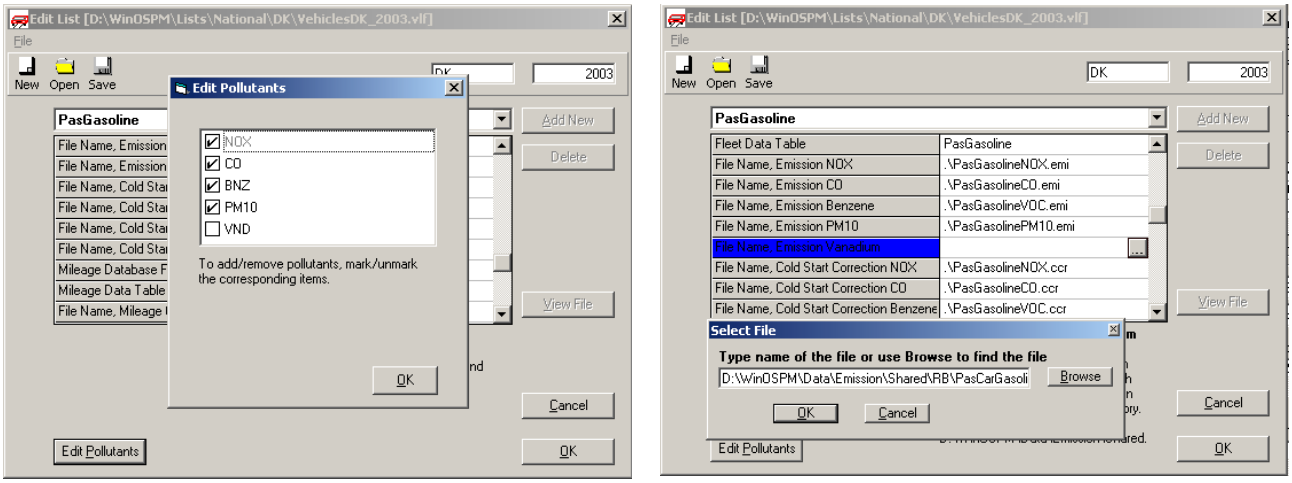


Fig. 8.8 New pollutants, included in the Pollutants List, can be added to the Vehicle or Fuel List File. Corresponding files with emission factor expressions must be added to the List too.

9 Meteorology, background and other user provided Hourly Input Data

OSPM requires that meteorological and urban background data are available for each calculation hour. The required data are wind speed, wind direction, temperature and global radiation. Wind speed and wind directions are assumed to represent the conditions above roof level in the city. Temperature and global radiation are used to calculate the chemical transformation between NO, NO_2 and O_3. The urban background represents the general background pollution level in the city, e.g. as measured above roof level.

In Chapter 4 the way of assigning predefined meteorological and urban background data was described. It is, however, possible, and often required to use own, user provided meteorological and urban background data.

In the "Calculation" window, click on the box **Hourly Input Files,** thus making the button **Add File** active. Click the button **Add File** to obtain a dialog box where a new file can be named.

The name of the file containing the data can be directly typed in the text field of the dialog box or using the “Browse” button selected by the standard Windows “Open File” Dialog Box.

The name of the selected file will appear in the list of the Hourly Input Files. If the selected file is of type Excel or Access, the name of a worksheet or table will be given too. If the file contain more than one worksheet or table, the user can select the appropriate worksheet from a list that will be displayed after the Excel or the Access file is selected.

If the data are provided in text files, the variables in the file can be separated by a blank (at least one), a comma or by a semicolon. The decimal sign can either be a dot or a comma. Obviously, the comma sign can’t be used as a separator if it is used as a decimal sign.

The file name will be displayed in red in the Hourly Input Files List as a warning, indicating that the variable list is empty (*Fig. 9.1*). The user has to specify the variables.

Double click on the new file name, or select it and then click on the button **View/Format**. The dialog box in *Fig. 9.2* appears.

The user has to type the names of the variables contained in the input file. These names must correspond exactly to the predefined WinOSPM Input Variable Names and can be selected from the list that will appear as soon the user starts typing. The variables must be defined in the same order as they appear in the file. In the case that the input file contains some variables that should not be used by the program, the name of these variables must be replaced with a question mark – “?”.

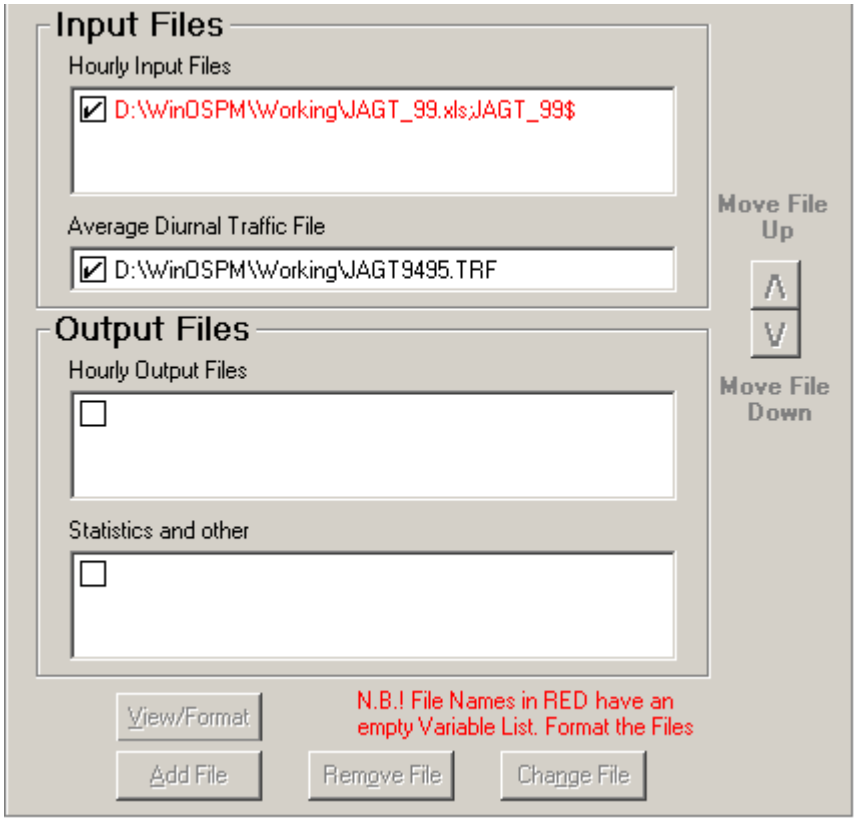


Fig. 9.1 The selected hourly input file appears in the Hourly Input Files List. When shown in red colour, it indicates that the variable list for this file needs yet to be specified.

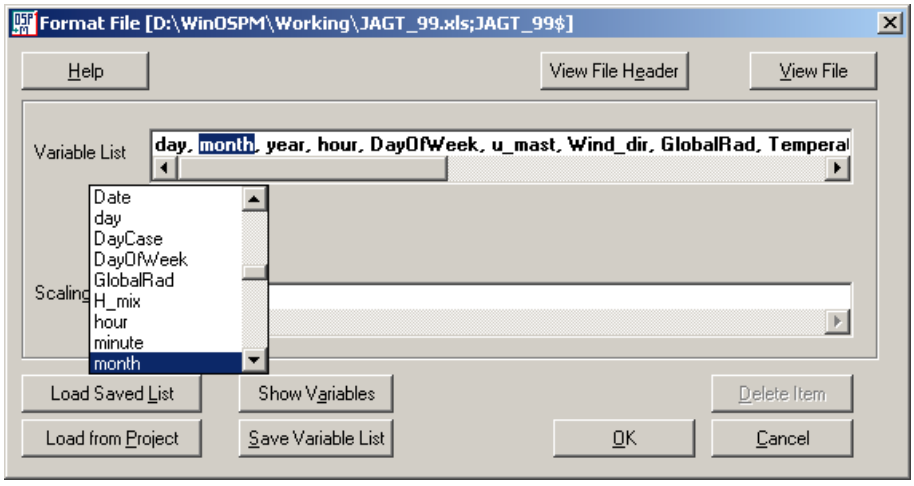


Fig. 9.2 The variable list for the selected hourly input file should be typed in the Variable List box. The names of the variables can be selected from the list that will appear as soon the user starts typing.

A file variable list can be saved (use "Save Variable List" button) for use with other files. A file with extension ".fmt" is created. This file can be retrieved using the "Load Saved List" button.

The file variable list can also be retrieved from other files associated with the project. For this use the "Load form Project" button.

The list of all available variable names can also be shown in a separate window. This window is activated using the "Show Variables" button (*Fig. 9.3*)

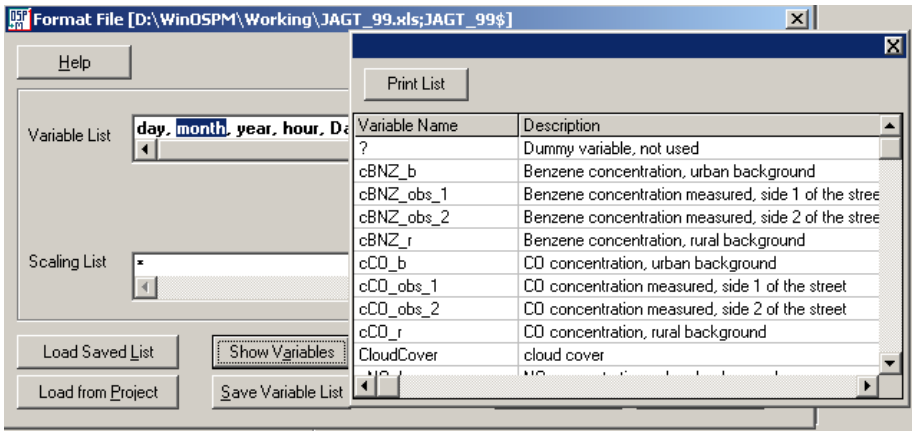


Fig. 9.3 A list with all available variable names is shown in a separate window when the "Show Variables" button is activated.

If the input file contains a file header (the first line of the file provides the names of file columns) this file header can be shown too. For this press the "View File Header" button (*Fig. 9.4*).

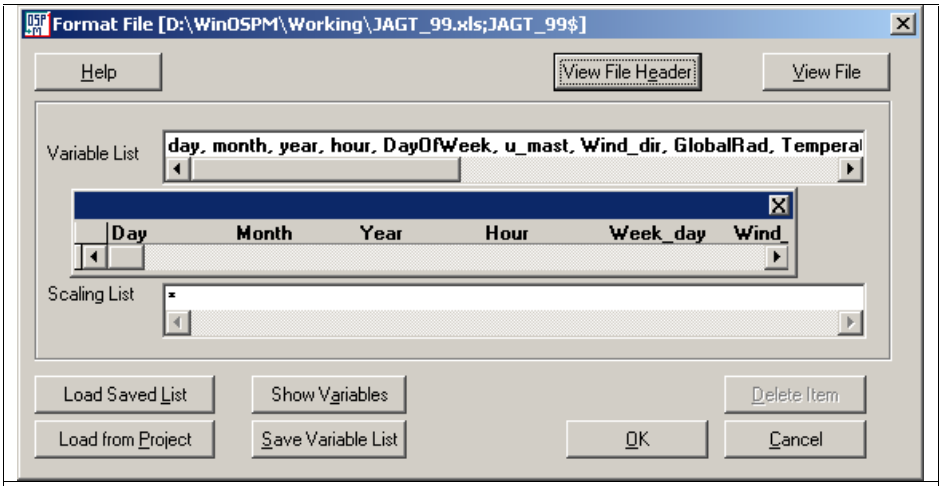


Fig. 9.4 The File Header window provides hints on variables in the input file.

Note that the file header needs not to be identical with the actual variable list. It should only be used as help for defining the variable list (see *Fig. 9.2*)

The contents of the file can be viewed (but not edited) by pressing the "View File" button.

The input data can be contained in several files. In this case the above-described procedure must be repeated for each of these files. When data are provided in more than one file, it's important to insure that these data are synchronised in time. If the same variable name is contained in more than one file, the value given in the last file will be used in the calculations. The order of files in the list can be changed using the **Move File Up** and **Move File Down** buttons placed right to the file list (*Fig. 9.1*).

The hourly input files can also contain data on the measured street concentrations. This is useful when the user wants to compare the modelled results with the measurements. Likewise, hour-by-hour traffic and/or emission data can be provided in the user defined hourly input files. The predefined names of the traffic and emission variables can be selected from the list of WinOSPM Input Variables that appears when typing the names in the Variable List box (*Fig. 9.2*)

When using the user provided input data, the user needs also to specify the units for the concentrations provided in the files. The procedure for definition of the concentration units is described in Chapter 12.

The user provided input data need not to cover the whole year. Calculations will be done only for these hours for which the data are available. Also, if some of the required meteorological or urban background data are missing for a particular hour, the calculations for this hour will be skipped. The missing values should be indicated in the input files either by a blank field or by a negative value that is outside the range of possible variable values, as e.g. –99.

The hourly input data must contain information on the actual date for each of the hours contained in the file. The date can be specified in different ways. It can be provided in one of the date formats corresponding to the locale setting of the Windows system, as e.g. 01/01/2001, or it can be given as day, month, year variables. The hour must either be indicated in the date variable or provided as a separate variable. The files may, or may not contain the number corresponding to the day in the week (Monday = 1, Sunday = 7). The weekdays are used to select the appropriate Day Case for the traffic data (see Chapter 7). If the weekday number is not explicitly provided in the input file, it is calculated in the program based on the actual date.

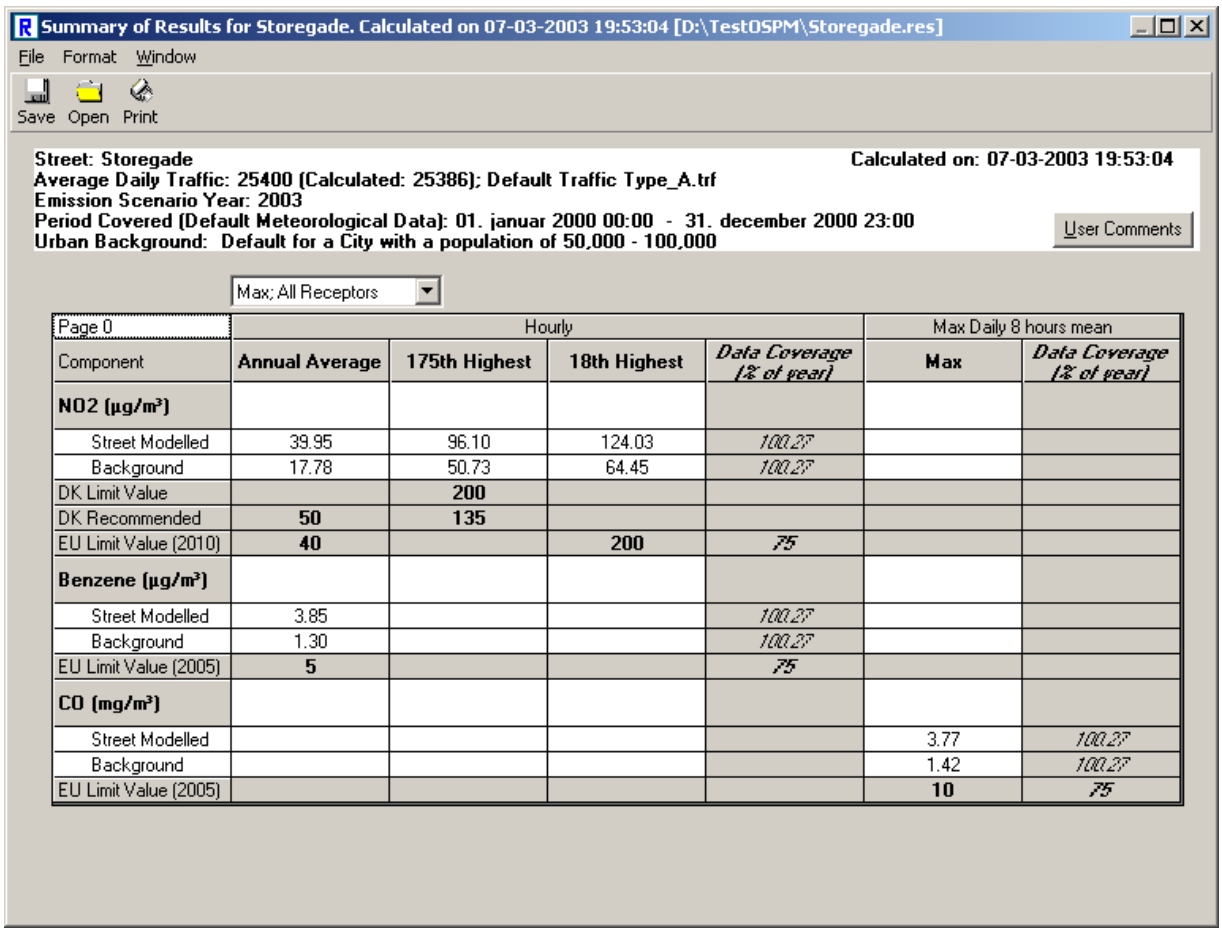
Note that the year variable given in the hourly input files has no effect on the selection of the Emission Scenario Year (Chapter 8).

10 Results: Summary Table

The results of OSPM calculations are summarised in a table where model results are compared to air quality limit values (example *Fig. 10.1*).

Note that the layout and content of the table can be controlled by settings under the menu **Project / Options,** as discussed in Chapter 12).

As a supplement to the summary table, it is possible to create one or more files with an hourly time-series, and to create one or more files with various statistical parameters and daily averages. The user has much flexibility in defining which parameters should be displayed. *User-defined output files* are described in details in Chapter 11, whereas the present chapter has its focus on the *standard summary table*.



Page 0	Hourly				Max Daily 8 hours mean	
Component	Annual Average	175th Highest	18th Highest	Data Coverage (% of year)	Max	Data Coverage (% of year)
NO2 (µg/m³)						
Street Modelled	39.95	96.10	124.03	100.27		
Background	17.78	50.73	64.45	100.27		
DK Limit Value		**200**				
DK Recommended	**50**	**135**				
EU Limit Value (2010)	**40**		**200**	75		
Benzene (µg/m³)						
Street Modelled	3.85			100.27		
Background	1.30			100.27		
EU Limit Value (2005)	**5**			75		
CO (mg/m³)						
Street Modelled					3.77	100.27
Background					1.42	100.27
EU Limit Value (2005)					**10**	75

Fig. 10.1 "Result" window: Summary table with modelled concentrations.

The "Result" window in *Fig. 10.1* displays this standard summary of results, where various statistical parameters are compared to limit values. The calculations are for receptor 1 and receptor 2 on each side of the street. The user may display the results for each receptor separately by choosing the appropriate item from the drop-down list

box. The first item (default) shows the maximum for the two receptors.

The concentrations labelled "Street Modelled" are the calculated concentrations in the street. They include the contribution from the traffic in the street and the contribution from the urban background. The concentrations labelled "Background" indicate the concentrations in the urban background, and represent concentrations away from the street, e.g. at roof top level.

The user can save the results in a file and view the results later. Use the **File / Save** menu or the **Save** button to save the results (*Fig. 10.1*).

To open and view a previously saved results file, use **File /Open** or the **Open** button (*Fig. 10.1*).

To retrieve the saved results from the "Calculations" window, use the menu **File / Open Saved Results File / Single Street** (*Fig. 4.8*).

It's possible to shift quickly between several opened Result files. This can be done using the **Window** menu (*Fig. 10.1*). **Window** displays a list of all currently opened files. To view a file from the list, click on the appropriate item.

Note: The opened files remain in the **Window** list only until the Result window is not closed. Next time the "Results" window is reopened from the "Calculation" window, the list will contain only the last Result file. It is, however, necessary to close the "Result" window in order to revert to the "Calculation" window.

The currently viewed Result Table can be printed using **File / Print** menu or the **Print** button. In the Printer dialog, the user can specify whether to print all the Pages (results for all receptors incl. the summary with maximum of all receptor results) or only one of the Pages. Page 0 is always the summary Table with maximum results.

Options to control layout and content of the summary table can be set under the menu **Project / Options**. Note that some of the cells in the table are empty (*Fig. 10.1*). Figures are only shown for parameters where a limit value is defined. This is so because the option "Show only if a Limit Value is given" is selected in the property sheet **General** (*Fig. 12.1*). This is the default setting. A detailed description of the various settings affecting the shown Results Table are discussed in Chapter 12.

11 Results: User-defined output files

By default, the results of WinOSPM calculations are summarised in a table where it is possible to compare the model results with air quality limit values (Chapter 10).

As a supplement to this summary table, it is possible to create a file with an hourly time-series, and also to create a file with various statistical parameters or daily averages. The present chapter describes in greater details how to create:

- Output files for hourly time-series
- Output files for user-defined tables with statistical parameters.

11.1 Output files for hourly time-series

In the "Calculation" window, click on the box **Hourly Output Files,** thus making the button **Add File** active. Click the button **Add File** to obtain a dialog box where a new file can be named.

Hint: Give the output file the extension .XLS to obtain an Excel file

The user has to specify the extension of the file. With the extension ".xls" output data will be generated in Excel format. This is often to be preferred. The extension ".mdb" will create a file in Access database format. All other extensions (e.g. .txt, .dat etc.) will result in a text format output.

If an Excel or Access format is chosen the user will be asked to specify the name of the worksheet, since Excel and Access files may consist of several worksheets or tables.

When the user specifies a file name, it is displayed in red as a warning, indicating that the variable list is empty. The user has to specify the variables.

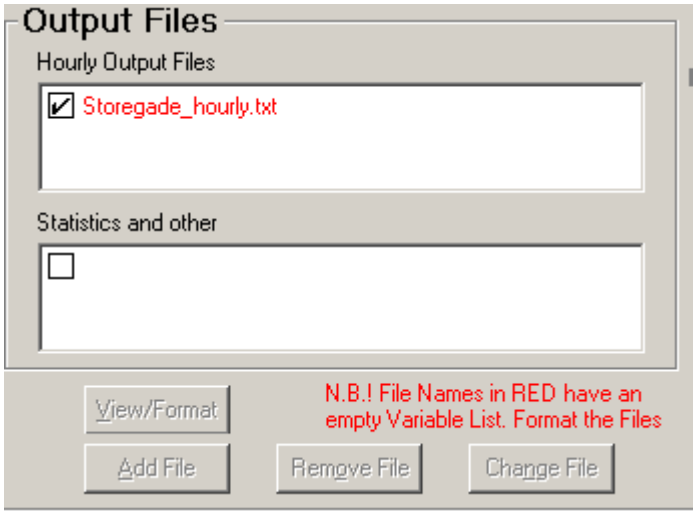


Fig. 11.1 Text displayed in red warns that the variable list is empty and that it has to be specified.

Double click on the new file name, or select it and then click on the button **View/Format**. The dialog box in *Fig. 11.2* appears.

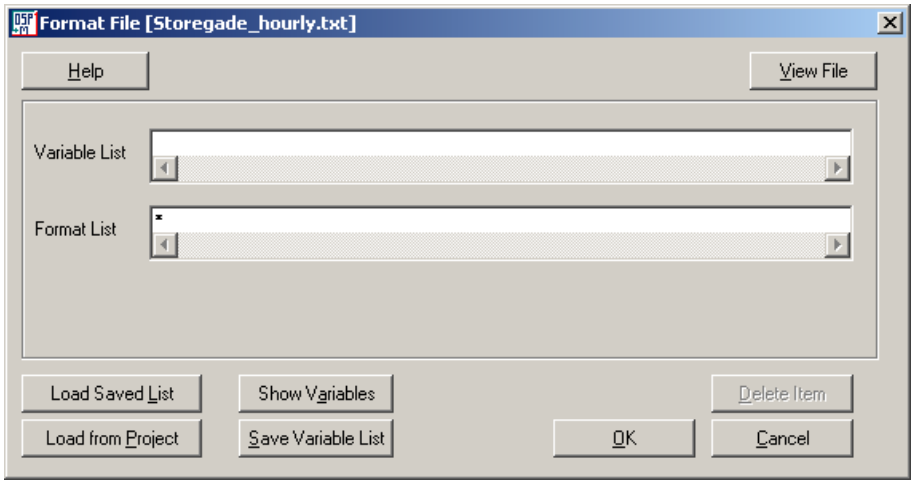


Fig. 11.2 Dialog box appearing after clicking the button **View/Format**. The field *Variable List* has to be filled in while the field *Format List* usually can be left unchanged.

The field "Variable List" has to be filled in, while the field "Format List" may be left unchanged (with an asterix).

All the rules and help options for creating the Variable List, described in Chapter 9 for the hourly input files, apply also for the hourly output files. However, the "View File Header" option is not available.

Leave the dialog box "Format file" by pressing the **OK** button. Now, calculations can be initiated with a click on **Run**.

View the output file

At the end of calculations, the user can view the data in the output file. Close the window "Summary of Results" which is automatically displayed after calculations. Mark the newly created file (e.g. Storegade_hourly.txt) and click on the button **View/Format**, or just double-click on the file name The same dialog box as before is shown (*Fig. 11.2*). Click the **View File** button to view the file.

11.2 Output files with statistics

The approach is similar to the one outlined above, but in the "Calculation" window "**Statistics and other**" should be selected instead of "**Hourly Output Files**".

However, the options are different when the variable list is specified (*Fig. 11.3*). It is possible to define columns and rows in a table. In the example shown, the average, the max hourly and 98 hourly percentile value will be outputed for modelled concentrations of NO_x, CO and PM10 at receptor 1. Be aware that not all combinations are possible, since the parameters calculated are controlled by the settings in **Tools/Options**. Make sure that these settings allow the required parameters to be calculated.

Note that the first variable in the "Variable List Columns" must be a text. This text is given as a heading for the first column in the output file. This column will contain the names of the variables specified in the "Variable List Rows".

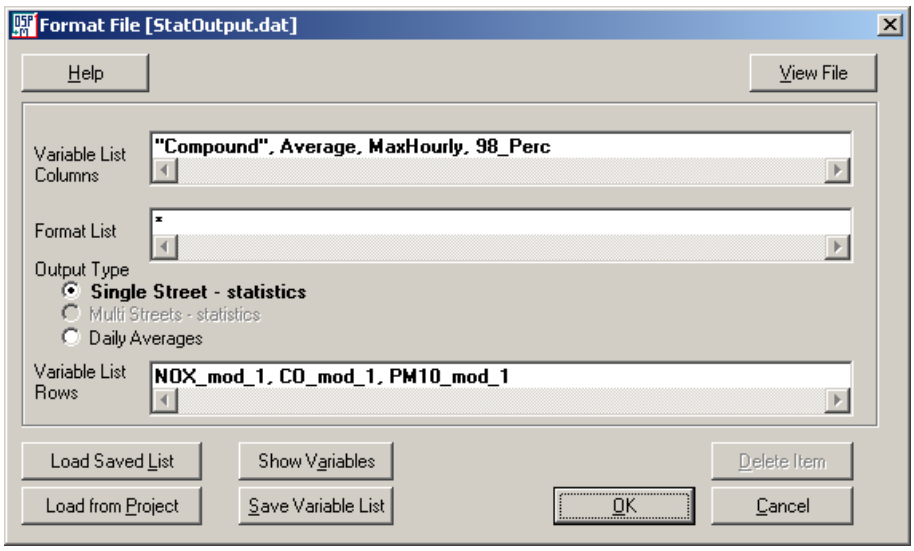


Fig. 11.3 Dialog box to define output file with statistics.

An example of an output file with statistical data produced according to the specifications given in the Variable List of *Fig. 11.3* is shown in *Fig. 11.4*.

Compound	Average	MaxHourly	98_Perc
NOX_mod_1	104.4947	785.7125	295.6976
CO_mod_1	0.7141472	4.301693	1.82844
PM10_mod_1	-99	-99	-99

Fig. 11.4 An example of a statistical output file generated according to the variable list specified in *Fig. 11.3*

In the example shown here, the PM10 concentrations are given by a value of –99. This means that the results for PM10 were missing. In this particular case, the PM10 concentrations could not be calculated because no urban background data for PM10 were available in the hourly input file.

11.3 Output files with daily averages

Output files with daily averages can also be generated when the file is listed in the **Statistics and other** list box. The procedure is similar to the one outlined in Section 11.2 but the definition of the Variable List is different.

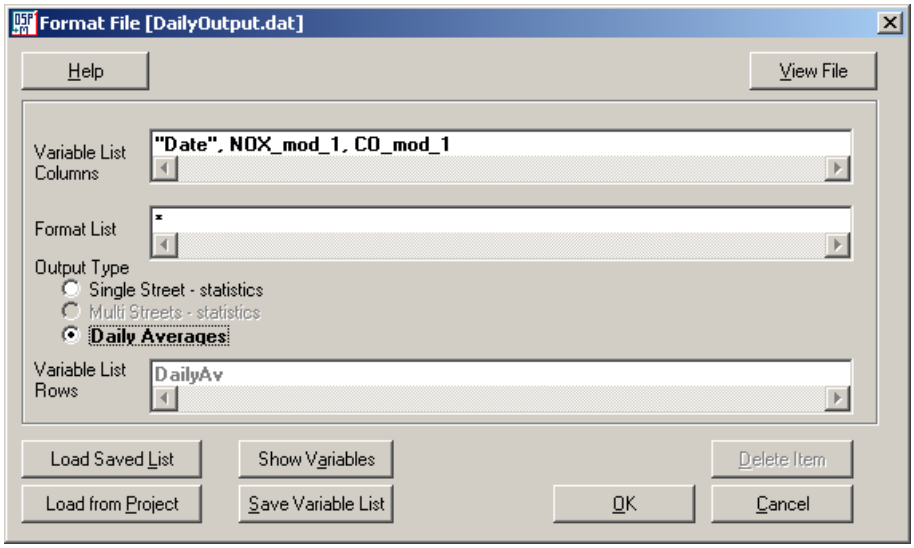


Fig. 11.5 In order to generate a file with daily averages, the "Variable List Rows" must contain only the variable name – "DailyAv".

In order to generate a file with daily averages, the variable name provided in the "Variable List Rows" text box must be – "DailyAv". This should be the only parameter specified in the list. Checking the checkbox "Daily Averages" gives the desired result. In the example shown in *Fig. 11.5* the output file will contain all daily averages of modelled NO_x and CO concentrations for the receptor point 1. An extraction of such a file is shown in *Fig. 11.6*.

Date	NOX_mod_1	CO_mod_1
01/01/99	44.42896	0.5612587
02/01/99	44.10983	0.6573757
03/01/99	70.42191	0.6634368
04/01/99	96.87202	0.6775851
05/01/99	86.3973	0.6315719

Fig. 11.6 An example of an output file with daily averages generated according to the variable list specified in *Fig. 11.5*.

12 Options

Settings under **Project / Options** are valid for all projects which are saved in the folder of the current projects. These settings are saved in a file (Run.opt) located in this folder.

The property sheets will be shown and briefly commented, one by one.

Property sheet General:

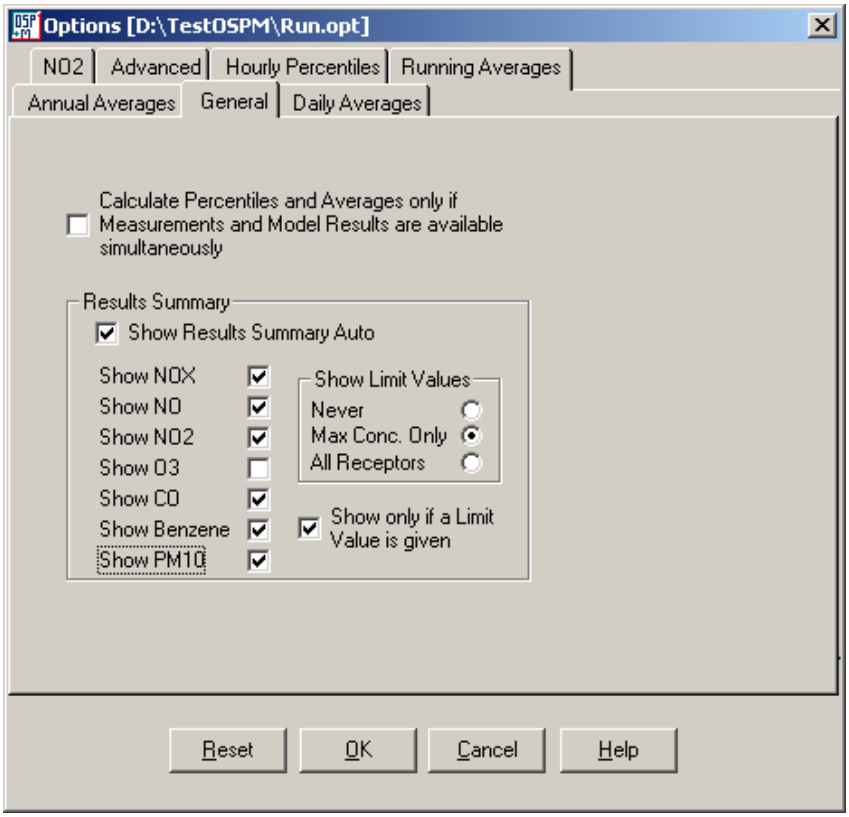


Fig. 12.1 The property sheet *General*. Note that the option "Show only if a Limit Value is given" is selected. In this way the summary result table becomes simple and uncluttered since some calculations are not displayed.

- Checkbox "*Calculate Percentiles and Averages only if Measurements and Model Results are available simultaneously*"

If checked, the statistical values will only be calculated making use only of the simultaneously available observations. This condition might be desired when comparing modelled and measured results.

The remaining options on the property sheet refer to the standard Results Summary Table

- Checkbox "*Show Results Summary Auto*"

Determines whether or not the standard Results Summary Table is automatically displayed after the calculations are finished (or interrupted). If the checkbox is unchecked, the standard Results

Summary Table can be displayed thorough the menu **View / Results Summary** or by pressing the **Results** button.

- Checkboxes "*Show NOX*" etc.

The checkbox for a compound must be checked if results shall be presented in the standard Results Summary Table.

Important: If the checkbox - "*Show only if a Limit Value is given*" - is also selected, the compound may not be included in the standard Results Summary Table.

- Option buttons "*Show Limit Values*"

The standard Results Summary Table contains several 'pages': One for each receptor and one referring to the maximum for all receptors.

The Limit Value for a compound can be shown on all the 'pages', or only on the page with maximum values, or be not be show at all.

- Checkbox "*Show only if a Limit Value is given*"

By selecting this, the Results Summary Table becomes relatively simple and uncluttered since some results are not displayed.

However, make sure to uncheck this, if you want to have all results displayed!!!

Property sheet Annual Averages:

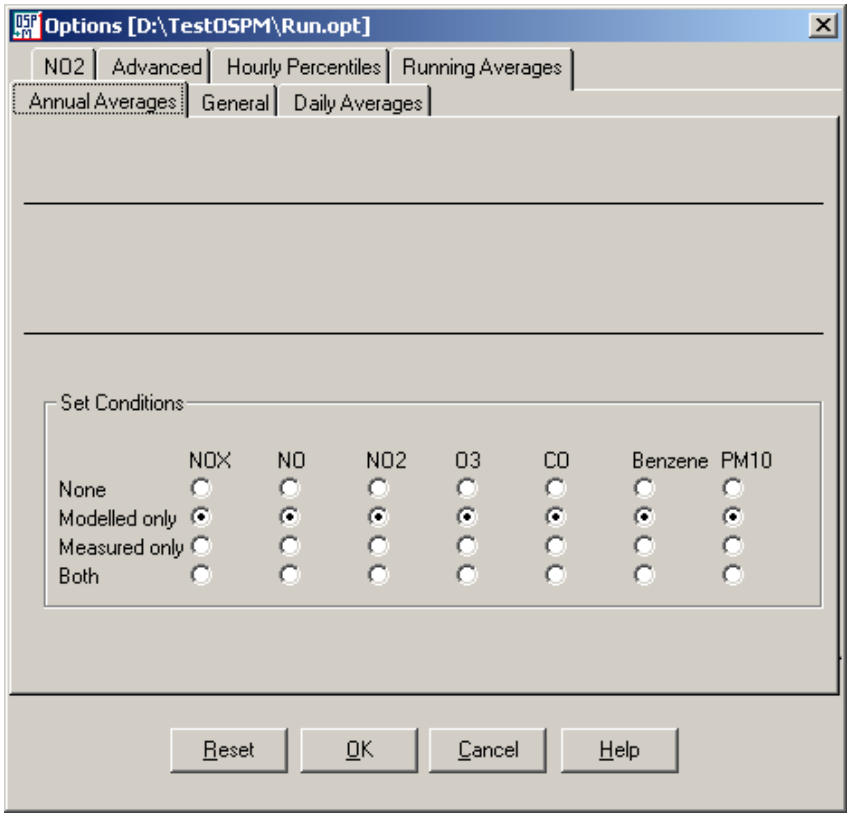


Fig. 12.2 Property sheet *Annual Averages.* This form makes it possible for the user to select pollutants, for which annual averages can be shown in the summary results table.

The options on the property sheet Annual Averages refer to the standard Results Summary Table

This property sheet makes it possible for the user to select pollutants, for which annual averages should be shown.

Furthermore, the user can specify whether annual averages should be shown for both modelled and measured data.

Note: As default, averages over all available observations (measured and/or modelled) are calculated by OSPM for all the compounds. The options here determine which parameters are to be displayed.

Important: Whether or not the calculated values are actually shown in the standard Results Summary Table depends additionally on the options specified on the property sheet "**General**".

Property sheet Hourly Percentiles:

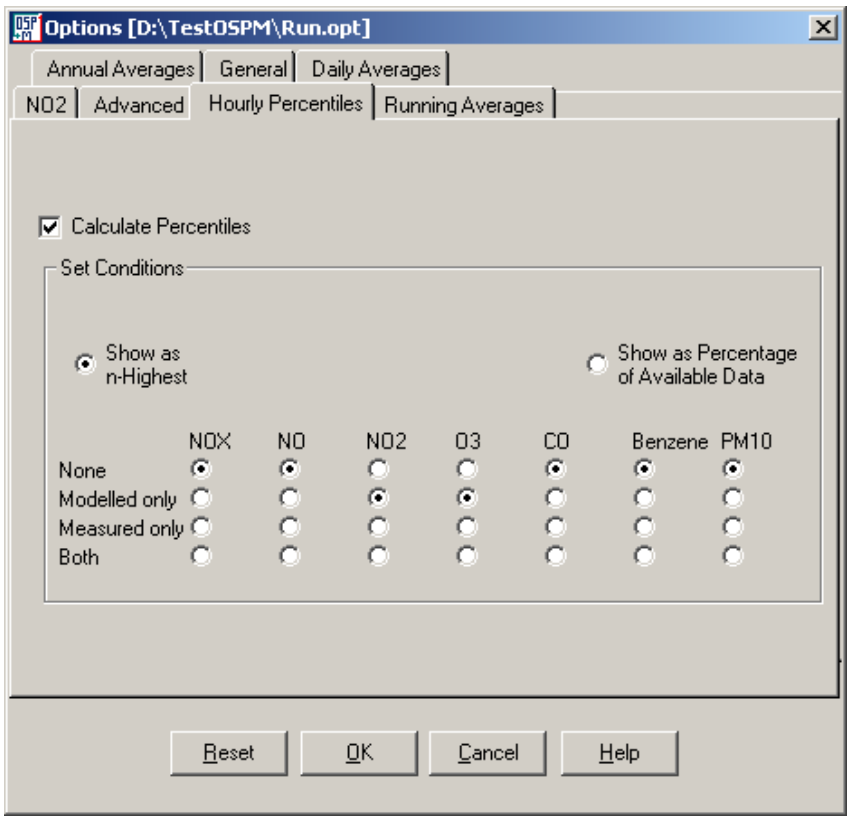


Fig. 12.3 Property sheet *Hourly Percentiles*. The user may omit calculation of percentiles and may exclude selected pollutants from the calculations. It's also possible to define here whether the percentile values should be shown as the fraction of the available data or as the n-Highest value.

- Checkbox "*Calculate Percentiles*"

Percentiles of hourly mean concentrations are calculated only if the checkbox is selected.

- Option buttons "*Show as...*"

These option buttons refer to the standard Results Summary Table

If the available data covers exactly one year (8760 hours), it does not matter which of the two option buttons is selected.

Otherwise, there is a difference between the two:

"*Show as Percentage of Available Data*": Percentile values are shown in the standard Summary Results Table as percentage of the available data.

"*Show as n-Highest*": Values are shown an n-th highest concentration, regardless the number of the available data.

- Checkboxes for *compounds*

The grid of checkboxes allows the user to select pollutants, for which hourly percentiles should be calculated.

Furthermore, the user can specify whether hourly percentiles should be calculated for both modelled and measured data.

Important: Whether or not the calculated values are actually shown in the standard Results Summary Table depends additionally on the options specified on the property sheet "**General**".

Property sheet Running Averages:

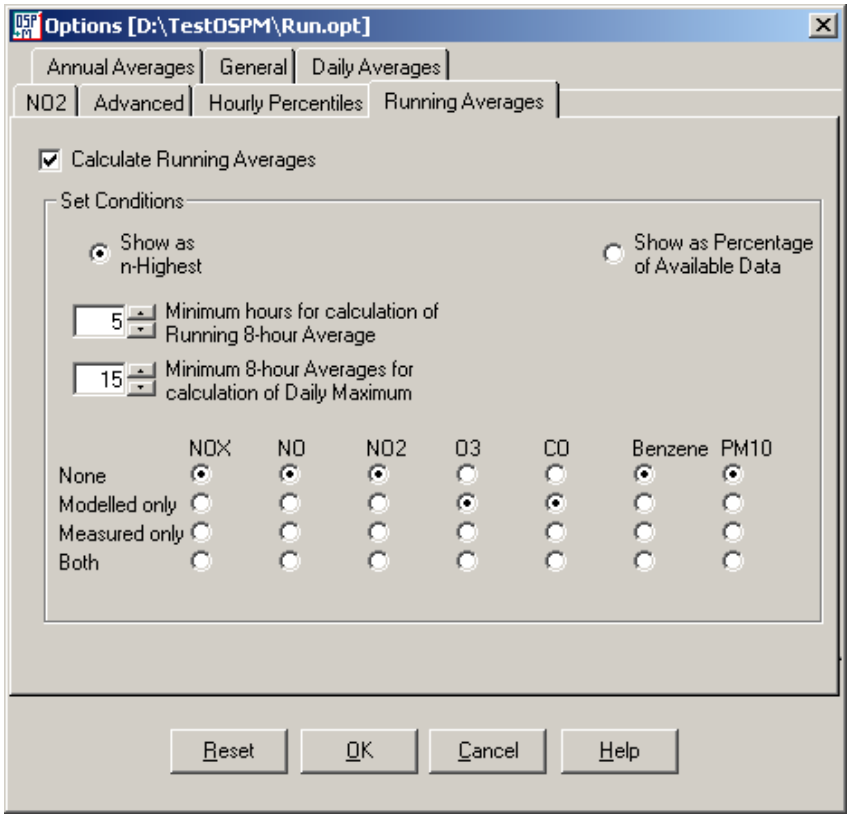


Fig. 12.4 Property sheet *Running Averages*. Some limit values are based on running averages. This option makes it possible for the user to select those pollutants, for which running averages should be calculated. The user can also define the minimum hours required for calculation of the running averages and the daily maximum.

- Checkbox "*Calculate Running Averages*"

Running averages and percentiles of 8-hours running averages are calculated only if the checkbox is selected.

- Option buttons "*Show as...*"

These option buttons refer to the standard Results Summary Table

If the available data covers exactly one year (365 days), it does not matter which of the two option buttons is selected.

Otherwise, there is a difference between the two:

"*Show as Percentage of Available Data*": Percentile values are shown in the standard Summary Results Table as percentage of the available data.

"*Show as n-Highest*": Values are shown an n-th highest concentration, regardless the number of the available data.

- *Minimum hours for calculation of Running 8-hour Average*

The minimum number of the consecutive hours required for calculation of the 8-hours running averages.

When the number of non-missing observations (either measured or modelled) is less than the specified number, the 8-hours running average is not calculated.

The number must be in the range 1 to 8.

- *Minimum 8-hour Averages for calculation of Daily Maximum*

The minimum number of 8-hours running averages during a day required for calculation of the daily maximum.

When the number of non-missing observations (either measured or modelled) is less than the specified number, the daily maximum is not calculated.

The number must be in the range 1 to 24.

- Checkboxes for *compounds*

The grid of checkboxes allows the user to select pollutants, for which running 8-hour averages should be calculated.

Furthermore, the user can specify whether 8-hour running averages should be calculated for both modelled and measured data.

Important: Whether or not the calculated values are actually shown in the standard Results Summary Table depends additionally on the options specified on the property sheet "**General**".

Property sheet Daily Averages:

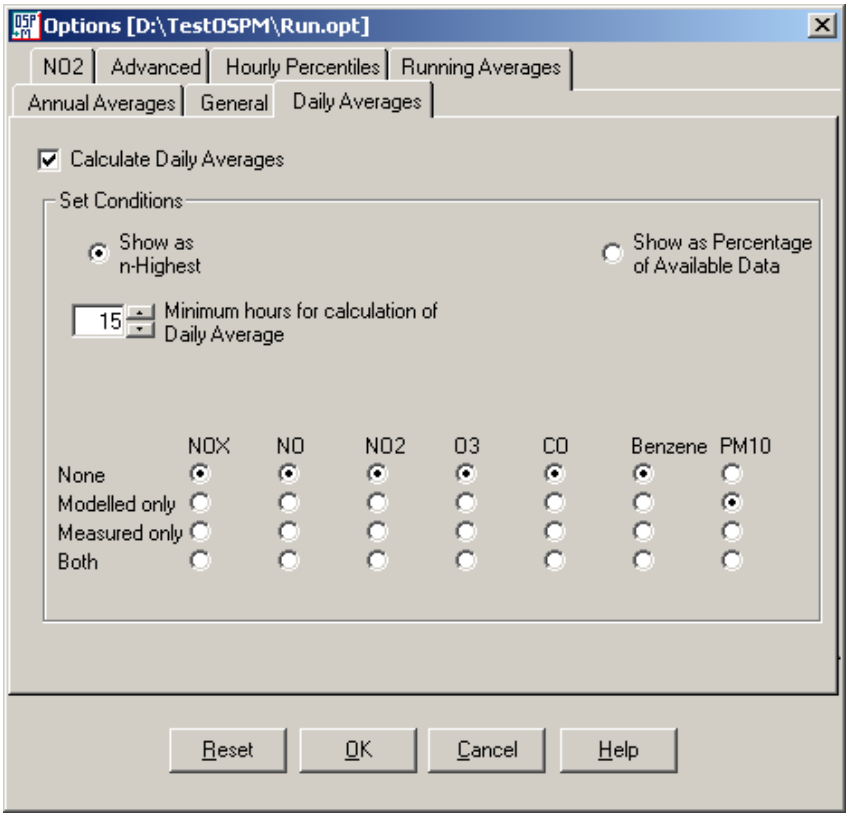


Fig. 12.5 Property sheet *Daily Averages*. Some limit values are based on daily averages. This option makes it possible for the user to select those pollutants, for which daily averages should be calculated. The user can also define the minimum hours required for calculation of the daily averages.

- Checkbox "*Calculate Daily Averages*"

Daily averages and percentiles of the daily averages are calculated only if this checkbox is selected.

- Option buttons "*Show as...*"

These option buttons refer to the standard Results Summary Table

If the available data covers exactly one year (365 days), it does not matter which of the two option buttons is selected.

Otherwise, there is a difference between the two:

"*Show as Percentage of Available Data*": Percentile values are shown in the standard Summary Results Table as percentage of the available data

"*Show as n-Highest*": Values are shown an n-th highest concentration, regardless the number of the available data.

- *Minimum hours for calculation of Daily Average*

The minimum number of the required hours during a day required for calculation of the daily average.

When the number of non-missing observations (either measured or modelled) is less than the specified number, the daily average is not calculated.

The number must be in the range 1 to 24.

- Checkboxes for *compounds*

The grid of checkboxes allows the user to select pollutants, for which daily averages should be calculated.

Furthermore, the user can specify whether daily averages should be calculated for both modelled and measured data.

Important: Whether or not the calculated values are actually shown in the standard Results Summary Table depends additionally on the options specified on the property sheet "**General**".

Property sheet NO2:

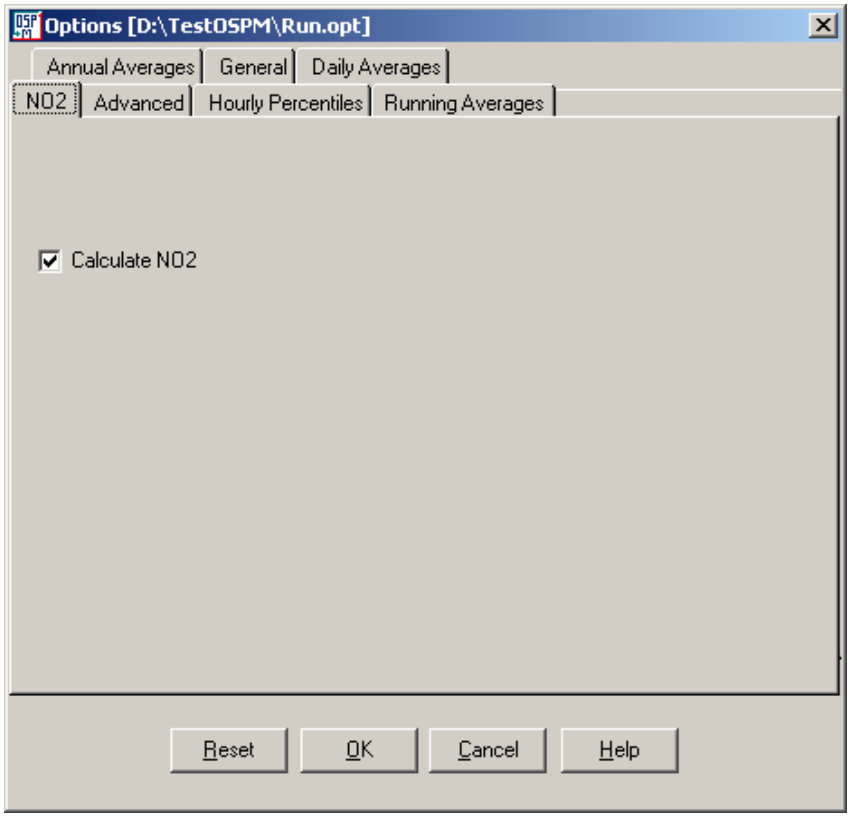


Fig. 12.6 Property sheet *NO2*. Calculations of NO_2 may be omitted to reduce the calculation time. Note that this property sheet has additional options when working in the Special Mode (Chapter 13).

Available options on the NO2 property sheet depend on mode: Standard or Special.

Standard Mode

- Checkbox "*Calculate NO2*"

When selected, the NO_2 concentrations are calculated, but only if the necessary input data are provided in the hourly input files. When this

checkbox is unchecked, the NO_2 concentrations are not calculated, regardless of the options specified elsewhere.

Omitting calculations of NO_2 will slightly reduce the calculation time.

Special Mode

- Checkbox *"Calculate NO2"*

When selected, the NO_2 concentrations are calculated together with the NO_x concentrations. The urban background concentrations of NO_x, NO_2 and O_3 must be specified in the corresponding textboxes (all in ppb). Also values for the temperature (in degrees C) and the global radiation (in W/m^2) must be provided (Chapter 12).

Property sheet Advanced:

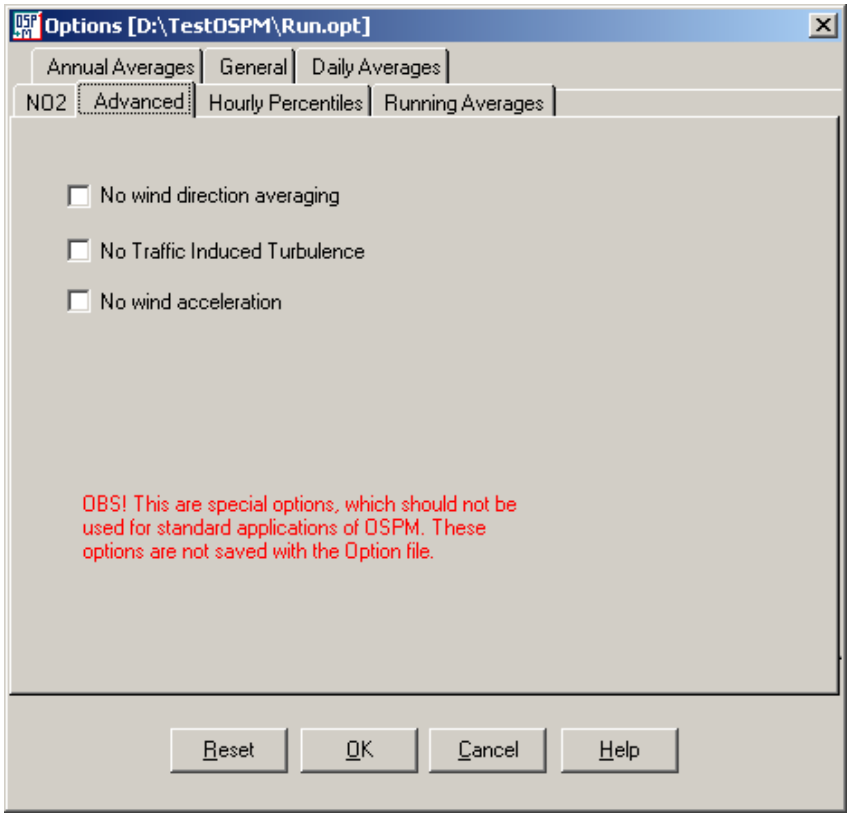


Fig. 12.7 Property sheet *Advanced*. For special studies, the user may choose to force the OSPM model to disregard certain effects which are normally simulated by the model, such as traffic induced turbulence. These options should not be selected for standard applications of the OSPM model.

For special studies, the user may choose to force the OSPM model to disregard certain effects which are normally simulated by the model, such as traffic induced turbulence. These options should not be selected for standard applications of the OSPM model.

- Checkbox *"No Wind Direction Averaging"*

As default, the OSPM calculations are performed taking into account wind meandering, i.e. the calculated concentrations are averaged over a certain wind direction angle, depending on the actual wind speed. Selecting this checkbox will suppress this wind direction averaging.

- Checkbox *"No Traffic Induced Turbulence"*

As default, the OSPM calculations are performed taking into account the additional turbulence created in the street by the moving vehicles.

Traffic produced turbulence will be disregarded if this checkbox is selected.

- Checkbox *"No wind acceleration"*

As default, the OSPM calculation are performed taking into account the acceleration of the wind speed when the wind direction is close to parallel to the street and the street becomes open at the end facing the wind ("channelling effect"). This effect will be disregarded if this checkbox is selected.

Important: None of these options are saved in the file with options (Run.opt). They are only active for the current project session and are set to the default values every time a new project is opened or initiated.

12.1 Concentration Units

Settings under **Project / Options** are valid for all projects which are saved in the folder of the current projects.

Set Concentration Units

Another menu, **Project / Set Concentration Units** leads to settings which are active for the *current project* only. These options refer to concentration units for user-defined files (see Chapter 11). Note that these settings only affect *user-defined files*, whereas they have no effect on the standard summary result table.

Concentration units can be set for user-defined input and output files. However, if standard input data are used, only the units for the output file can be changed.

The form for concentrations units is shown in *Fig. 12.8* for a project based on standard input data. Only concentration units for the output files can be changed.

The form for concentrations units shown in *Fig. 12.9* is for a project with only user-defined input files. Concentration units can be changed both for the input and the output files. Obviously, the concentration units specified for the input files must correspond to actual units of the data in these files. It's free for the user to select the output concentration units.

Note: The same concentration units are valid for all the files, i.e. input concentration units must be the same for all the input files and all the user defined output files (as well hourly, daily and statistics) will share the output concentration units.

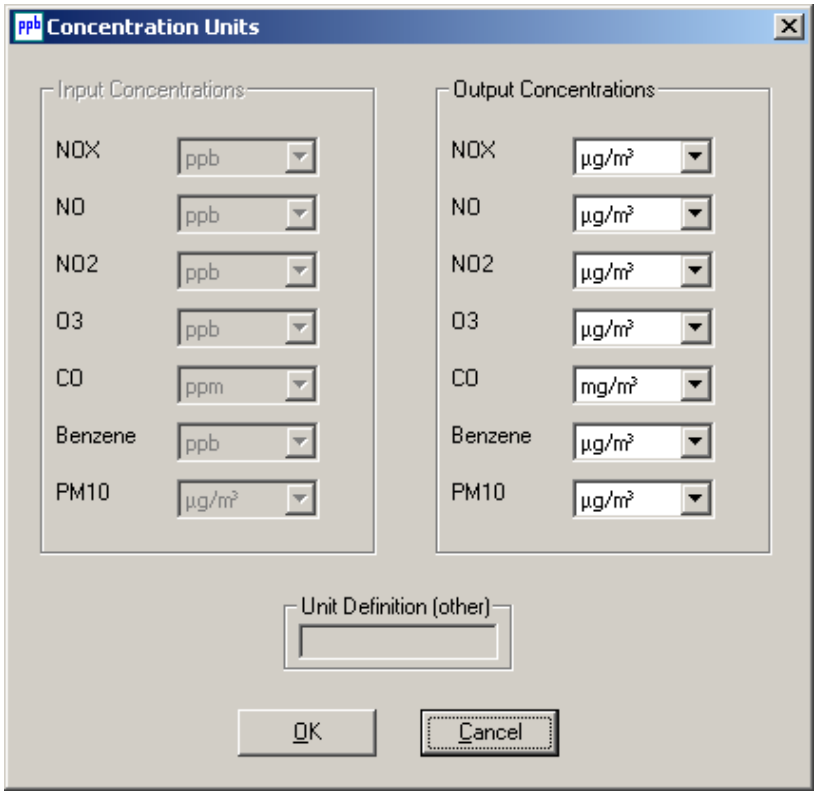


Fig. 12.8 Options for concentration units. In the example shown the units for input cannot be changed, because standard input files are used.

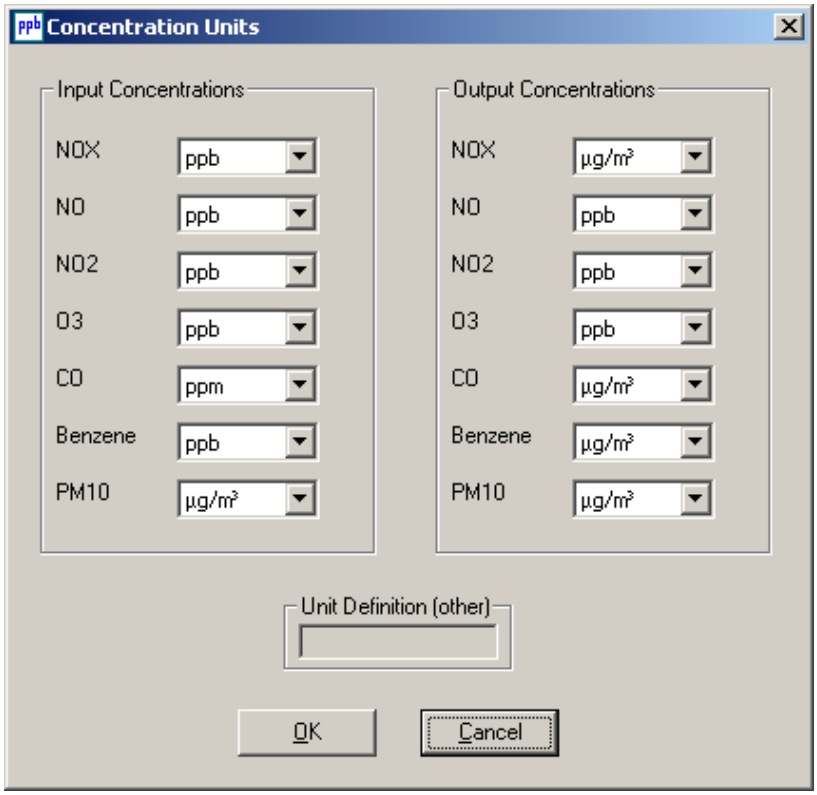


Fig. 12.9 Options for concentration units. In the example shown the units for both input and output files can be changed.

13 "Special Mode": Interaction between air quality, wind and street geometry

The OSPM model includes a tool, which allows the user to analyse how air quality depends on wind speed and direction for a given street geometry (Special Mode).

The calculations are performed for a combination of wind directions and wind speeds. The results are presented in graphical form.

At the time of writing, the user interface of the Special Mode tool is still a beta version, which is likely to undergo changes.

Two ways to start Special Mode

Calculations using the Special Mode may start from the "New Project" window (1) or from an existing project (2).

Start Special Mode from a new project

To start Special Mode from a new project (1) choose **File / Create New Project** and mark "*Accept calculations without Input Files (Special Mode)*" in the "New-Project" window (*Fig. 13.1*).

Fig. 13.1 Part of the "New Project" window where Special Mode can be started.

When this checkbox is marked, the user needs not to specify any input files referring to meteorology, urban background or traffic.

Next, click the button "*Set Street Configuration*" and specify the street geometry. The user is brought to the "Special Mode" window after clicking **OK** (*Fig. 13.2*).

Use an existing project to start Special Mode

Alternatively, Special Mode can be activated within an existing project (2). From the Calculation window press the button **Start Special** or use the menu **Mode** and choose **Special**. The Special Mode window is shown in *Fig. 13.2*.

The Special Mode window provides a simple 3D visualisation of the street canyon. The group of buttons with Zoom etc. allows the user to change the view mode.

In order to make changes to the combination of wind directions and wind speeds it is necessary to click on the button **Edit**. Up to eight values of wind speed can be specified. To activate/deactivate calculations for some of the wind speed values mark/unmark the checkbox left to the value. The wind directions are given by the range (From/To) and by the Step

Leave the edit mode by pressing **OK**.

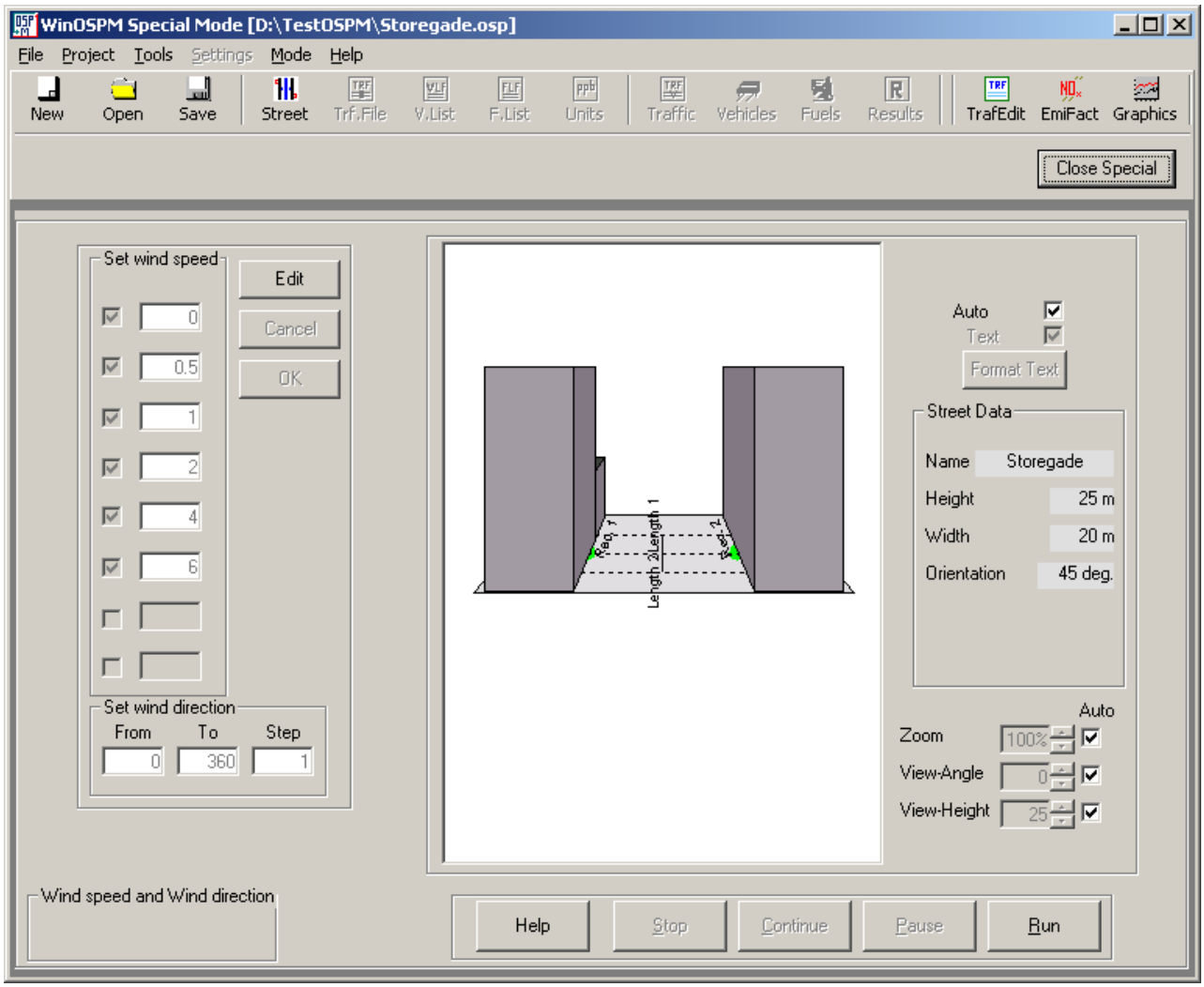


Fig. 13.2 Special Mode window.

Start calculations by pressing the **Run** button. The calculations take a few seconds while a wind speed and direction counter shows the progress.

Emissions used in Special Mode

In Special Mode, calculations of NO_x concentrations in the street are performed for one pre-defined emission value and traffic conditions. There is no link between these emission and traffic conditions and the values used in the Standard Mode.

The emission and traffic settings can be changed using the menu item **Project/Set Traffic/Emissions**. This activates the "Traffic/Emission" window (*Fig. 13.3*).

Usually there is no need to change the emissions for the purpose of studying the importance of the street configuration. The emission rate is constant and it is not possible to specify a diurnal variation. However, the traffic flow and composition (light and heavy vehicles), as well as the traffic speed, have an influence on the traffic produced turbulence. Changing these values will have effect on the dependence of the concentrations on the wind speed and direction.

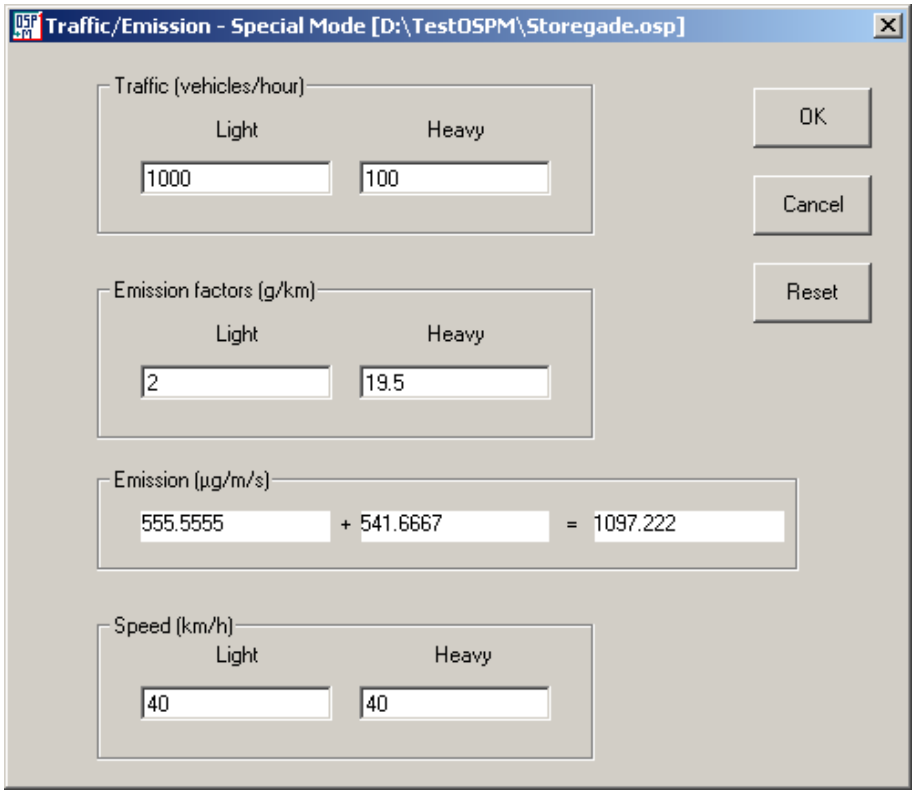


Fig. 13.3 The emission and traffic conditions used for calculations in the Special Mode can be changed using this form.

The calculated concentrations are automatically saved to 5 text files which are named: "**nox_1.dat**", "**nox_2.dat**", "**no2_1.dat**", "**no2_2.dat**" and "**ospmout.dat**" These files contain respectively, concentrations of NO_x for side 1 of the street, concentrations of NO_x for side 2 of the street, concentrations of NO_2 for side 1 of the street and concentrations of NO_2 for side 2 of the street. The last file, "ospmout.dat", contains all these data together, and additionally also the calculated ozone concentrations for both sides of the street.

Note: All these files will be located in the Working Directory of the project. Every time a new calculation is performed, these files are overwritten. To preserve these files, the user has to rename them or to move to another directory before performing a new calculation.

The results are not shown automatically when the calculations are finished. The contents of the "ospmout.dat" file can be viewed after pressing the button **Results** (*Fig. 13.2*).

In order to view a graphical presentation of the results, the user has to press the button **Graphics** (*Fig. 13.2*), which opens the **Graphics Window**. An example of the graphics, which can be displayed in this window, is shown in *Fig. 13.4*. The user can navigate between several charts using the menu item **Window**, which also provides the facility to cascade the charts and to tile them horizontally or vertically.

The user may save the charts as a BMP file (Windows Bitmap) using **File / Save As**. The graphics can be copied to the clipboard using **Edit / Copy** or printed using **File / Print**.

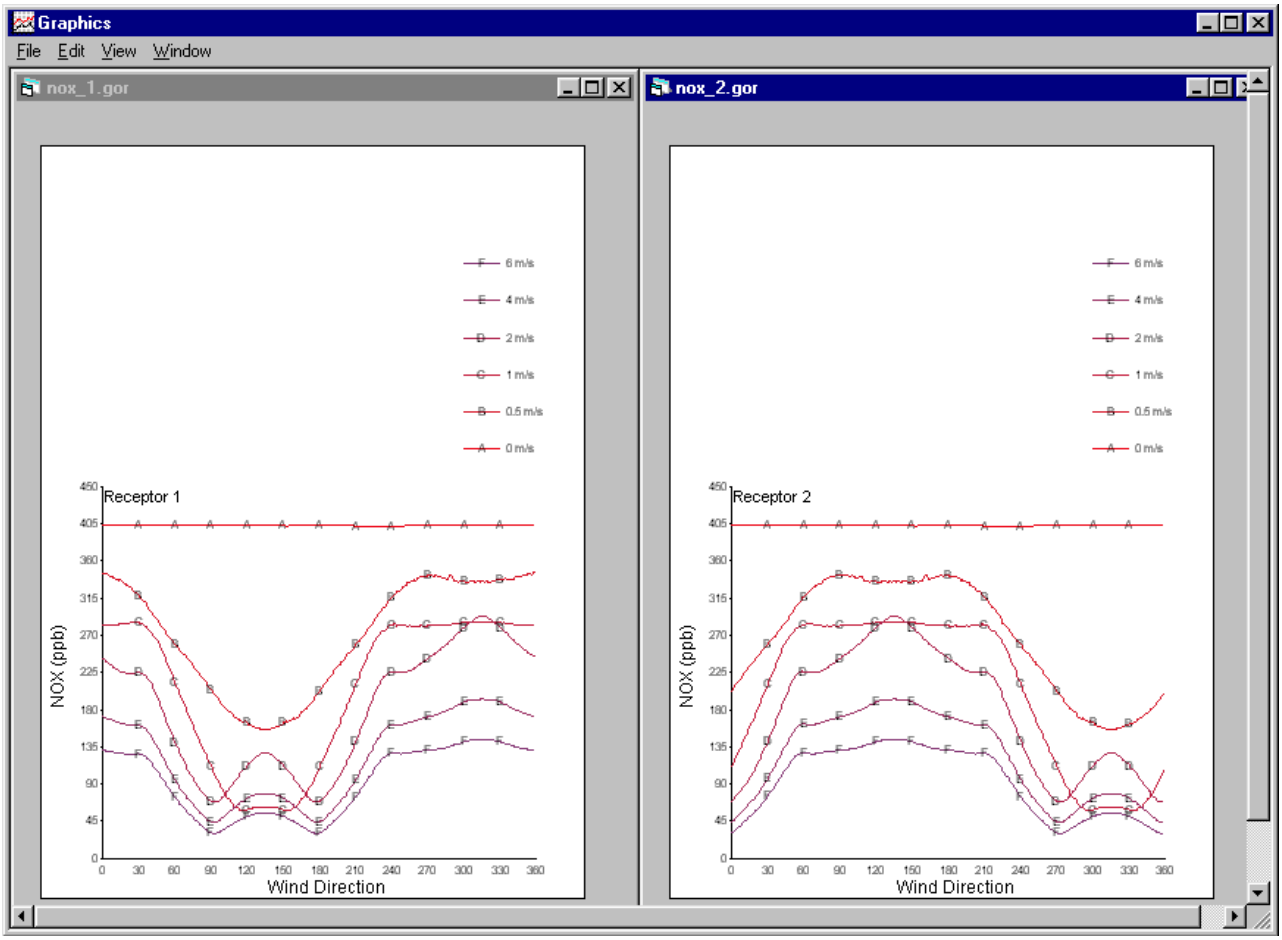


Fig. 13.4. Charts created based on a set of calculations in "Special Mode". The street configuration is the one from the example given in Chapter 3. The dependence of the NO_X concentrations in the street on wind direction and wind speed is show for both sides of the street.

The user needs not to close the **Graphics** window in order to perform new OSPM calculations. In order to view graphs with the latest results use the menu **File / Results**. In this way, the results from several OSPM runs can be viewed graphically simultaneously.

Note: As soon as the **Graphics Window** is closed, only the latest OSPM results will be available for the graphical presentation next time the **Graphics Window** is opened.

13.1 Settings affecting NO_2 calculations

Various settings that affect calculations of NO_2 in the Special Mode can be changed using the Options sheet "NO2" (*Fig. 13.5*). This Option Sheet is available when in the Special Mode from the menu item **Project / Options** (*Fig. 13.2*).

Note: The values specified here have no relationship at all to the corresponding values used in the Standard Mode calculations.

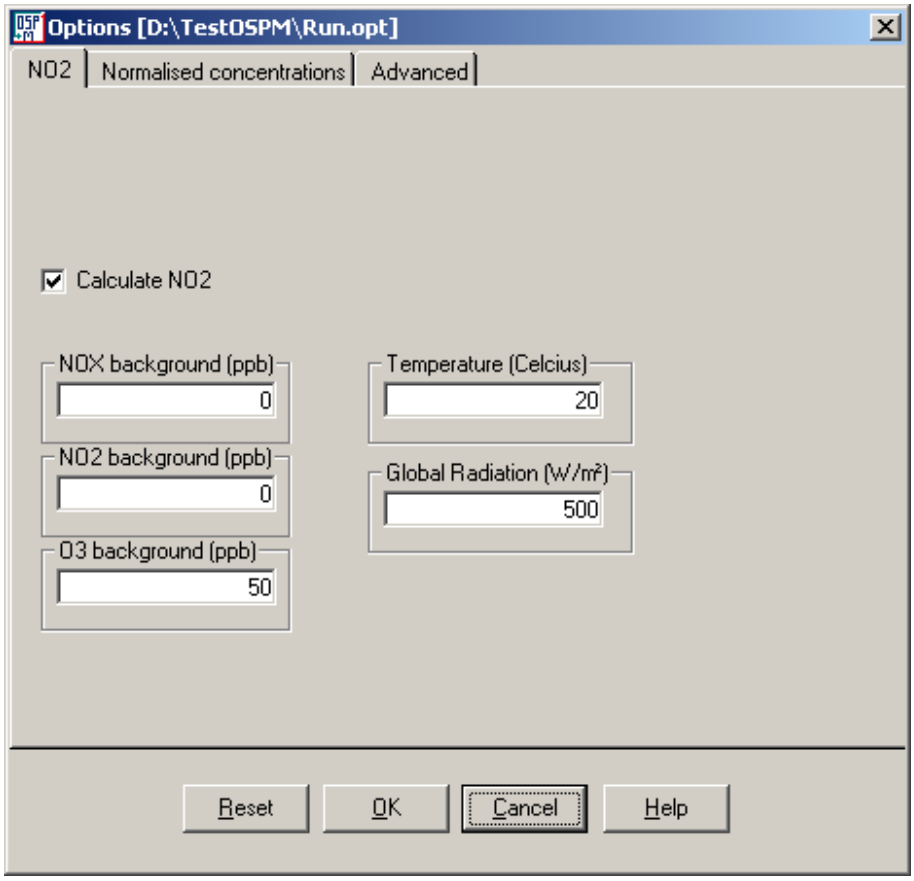


Fig. 13.5 The parameters that have effect for calculations of NO_2 in the Special Mode can be changed using this Options sheet.

14 Multi-Streets Mode – Creating new Project

In the multi-streets mode the calculations are performed for several streets at the same program run. The input data requirement are the same as for the single street operation but the procedure for creation of a project is different. The "New Project" window, when initiating a project in the multi-streets mode is shown in *Fig. 14.1*.

To start a Multi Streets project, you have to select the Multi Streets icon in the dialog box wind, that appears after pressing the menu item "New" in the WinOSPM main window (see *Fig. 4.1*)

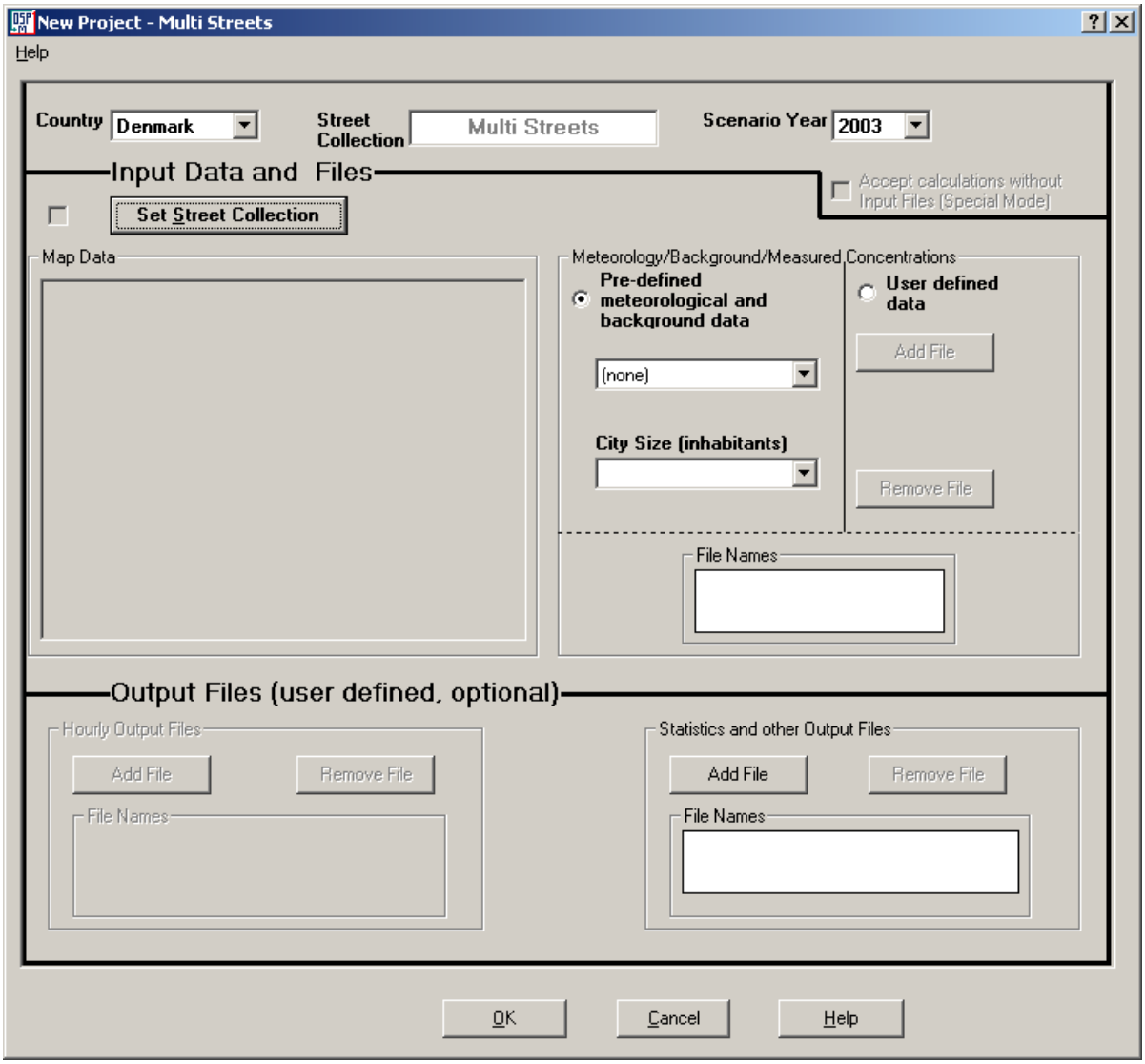


Fig. 14.1 The New Project window for a Multi Streets Project.

Definition of input files with meteorological and background data is the same as in the case of single street calculations, and will not be discussed further here. The main difference is in definition of the street data and traffic data.

Pressing the button “Set Street Collection”, opens a dialog window, as shown in *Fig. 14.2*.

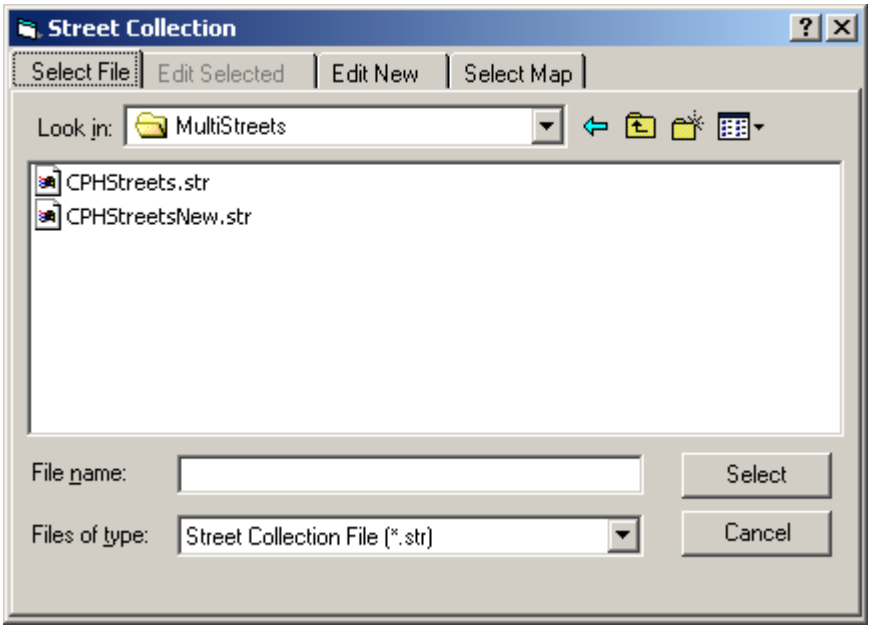


Fig. 14.2 The Select File window can be used to open an existing street collection file

This window is divided into several tab selectors. Pressing one of the tabs opens a new dialog window.

14.1 The Select File tab

The first dialog window is opened automatically when the project is initiated first time (empty project). If a data file with the required information exists, it can be selected for the project. The files with the street data could have been created in a previous project or edited manually using any text editor. These files are actually plain text files (ASCII), and although it is recommended to use the file extension “.str”, this is not mandatory.

The procedure for file selection follows the standard rules for MS Windows “Open File” dialog windows. Selection can be done by double clicking on the file name or by marking the file and subsequently pressing the “Select” button.

14.2 The Edit tab

The data contained in the selected data file are automatically displayed in the next “tab-window” – the “Edit” window (*Fig. 14.3*), which was initially deactivated (greyed).

The file with the street data collection consists of a number of records. One record for each of the streets. The data given in the records are the same data as required for single street calculations. However, beside the street geometry data, also information on the traffic in the

street is provided here. The traffic data are given as the name of the file with specification of the diurnal traffic variation (se Chapter 7), and if required, with specification of the Average Daily Traffic and the Travel Speed.

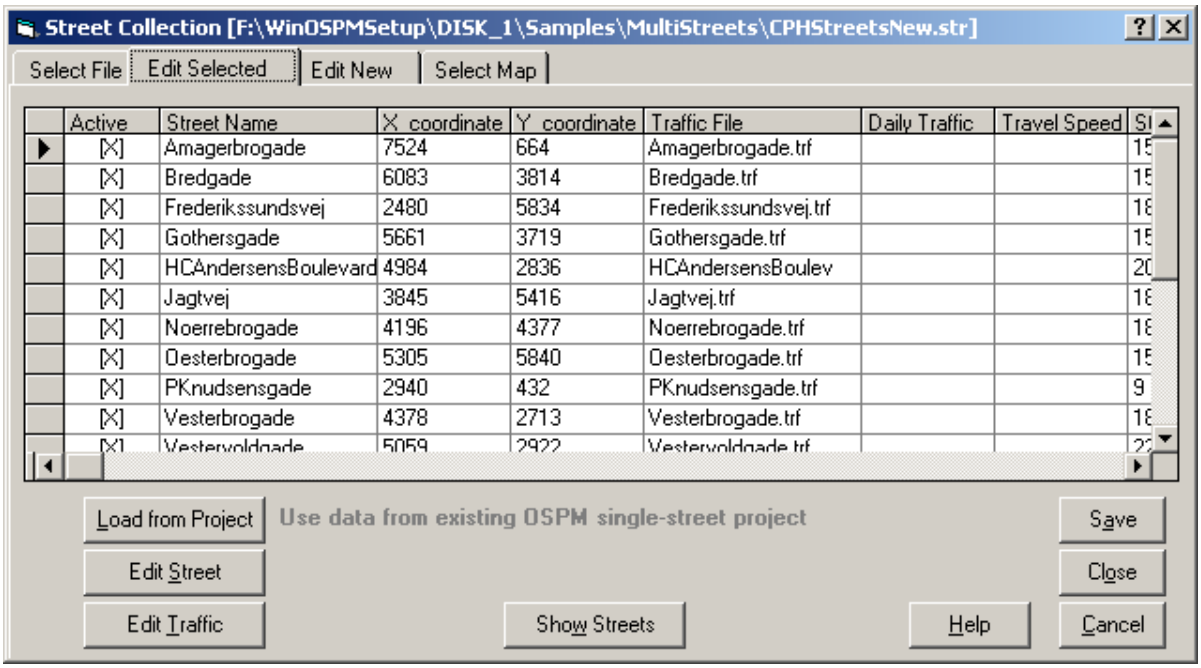


Fig. 14.3 The Edit window can be used to view and edit the actual street collection data.

Additionally to the street configuration data, the street collection file provides information on the geographical co-ordinates of the street (X_coordinate and Y_coordinate). These co-ordinates refer to co-ordinates of the middle of the street next to the receptor point. The geographical street co-ordinates are not required for OSPM calculations. They are only used in connection with graphical presentation of the results, as will be discussed later. However, the values for the street co-ordinates cannot be omitted (cannot be blank). Any dummy value can be given if the graphical presentation of the results is not in the scope of the project.

The first column in the data table, the column with the heading "Active", contains check boxes, which can be into 2 different states: [X] = TRUE and [--] =FALSE. If the state of the "Active" parameter is marked as FALSE, no calculations for the particular street will be performed. The street record with this condition is not deleted from the street collection, only the calculation conditions are affected. Clicking with the mouse on the check mark will change the state of the "Active" parameter.

All data contained in the street records can be edited by the user. New records can be added too, and records can be permanently deleted from the collection. The procedure for editing and adding new data is exactly the same for existing and for new data.

14.3 The New tab

The table shown in the "New" tab window (*Fig. 14.4*) is used to enter street data in the case when no pre-existing data are available.

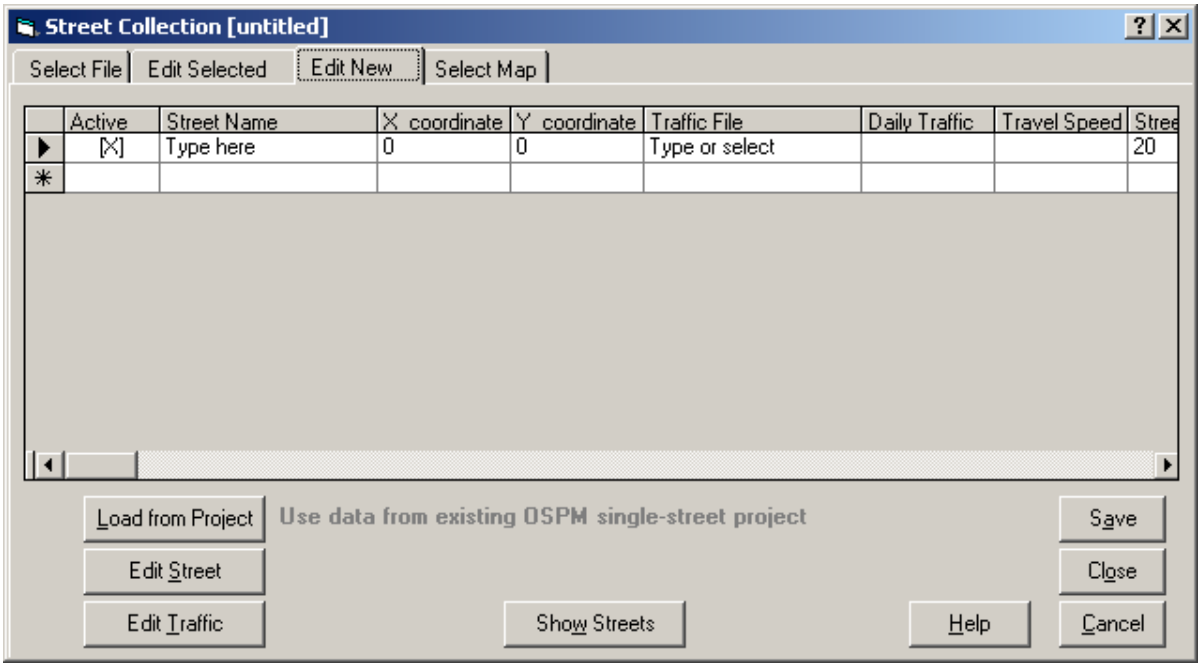


Fig. 14.4 The New window is used to enter new street collection data.

When a blank record collection is opened, at least one record, but with dummy data will be automatically created. These data should be edited by the user. There are several different ways in which the data can be modified and added. This will be discussed in the following.

14.3.1 Manual editing

All data can be directly typed in the corresponding columns. In the case that wrong type of data is entered, as e.g. some text data are entered in a field that must have a numerical value, an error message is issued – "Error entering data". A similar error message is issued if a field that requires some data is blanked. The dummy data in a record indicate which fields may, and may not be blank.

Note: Pressing space bar in a field that may remain blank does not leave this field blank but results in space characters. This can result in an error message if the value of the field must be of a numeric type.

The name of the traffic file can be directly typed in the corresponding field but can also be added using the Open File dialog window. This dialog window appears when the mouse courser is placed in the field with the Traffic File name and the user activates the button that appears in the field or presses the Enter key (*Fig. 14.5*).

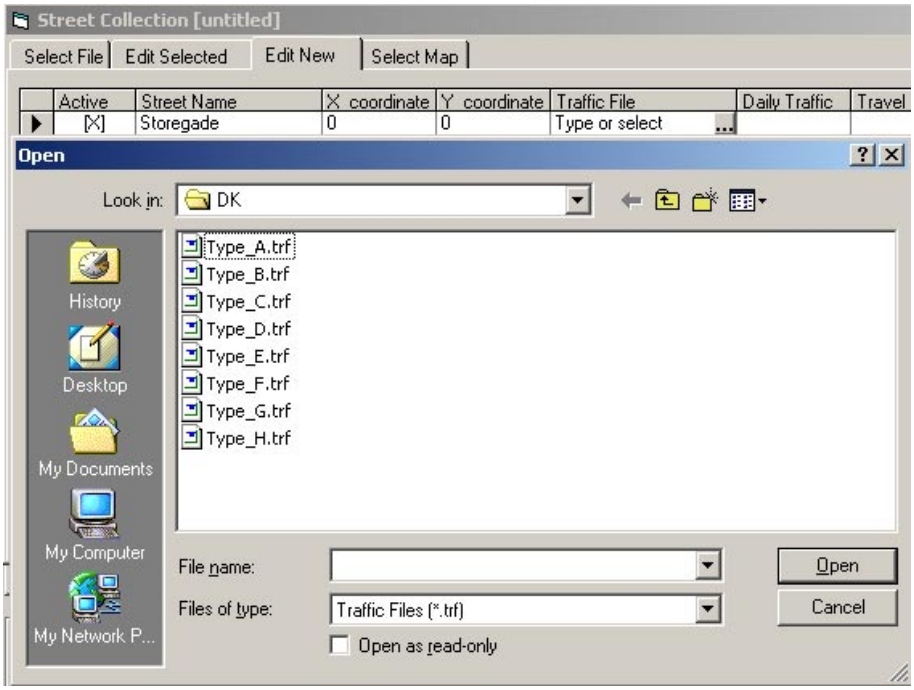


Fig. 14.5 A traffic file can be added to the street data using an Open File dialog box.

14.3.2 Entering data from an existing OSPM single-street project

Street data created in a single street OSPM project can directly be added to a multi street project.

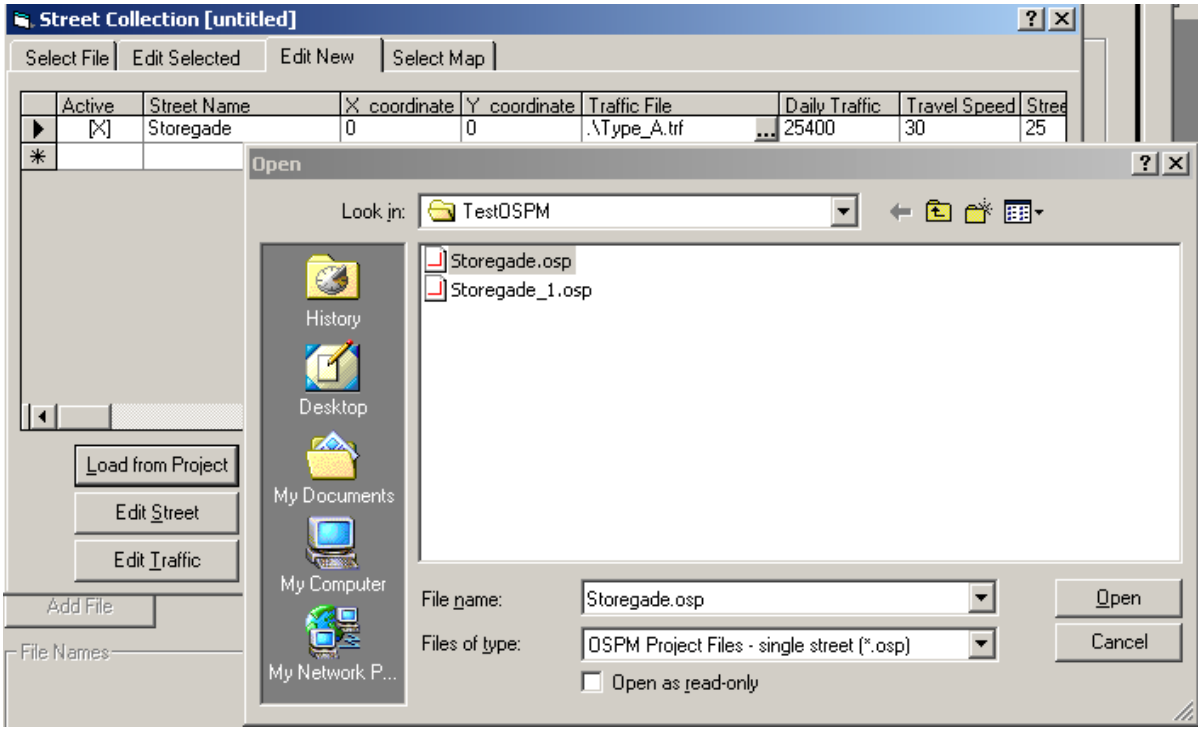


Fig. 14.6 Data from an existing single street OSPM project can be added to the street collection file.

This option is available both in the Edit tab window and the New tab window. The "Load from Project" button opens an Open file dialog box from which the appropriate OSPM file (single street) can be

selected. The data from this file are transferred to the street collection of the multi street project. The user can subsequently edit the data, if it is required.

The new data are always appended to the existing collection of data as the last record. The only exception is when the new data are added to a newly created data collection in the New tab window. In this case, the first record, which originally contained only dummy data is overwritten with the new data.

An important constrain on the records in the multi street collection is that the "Street Name" parameter must be unique. It's not allowed to have two records with the same street name. The street name is used as a record identifier, and must be unique.

14.3.3 Editing tools

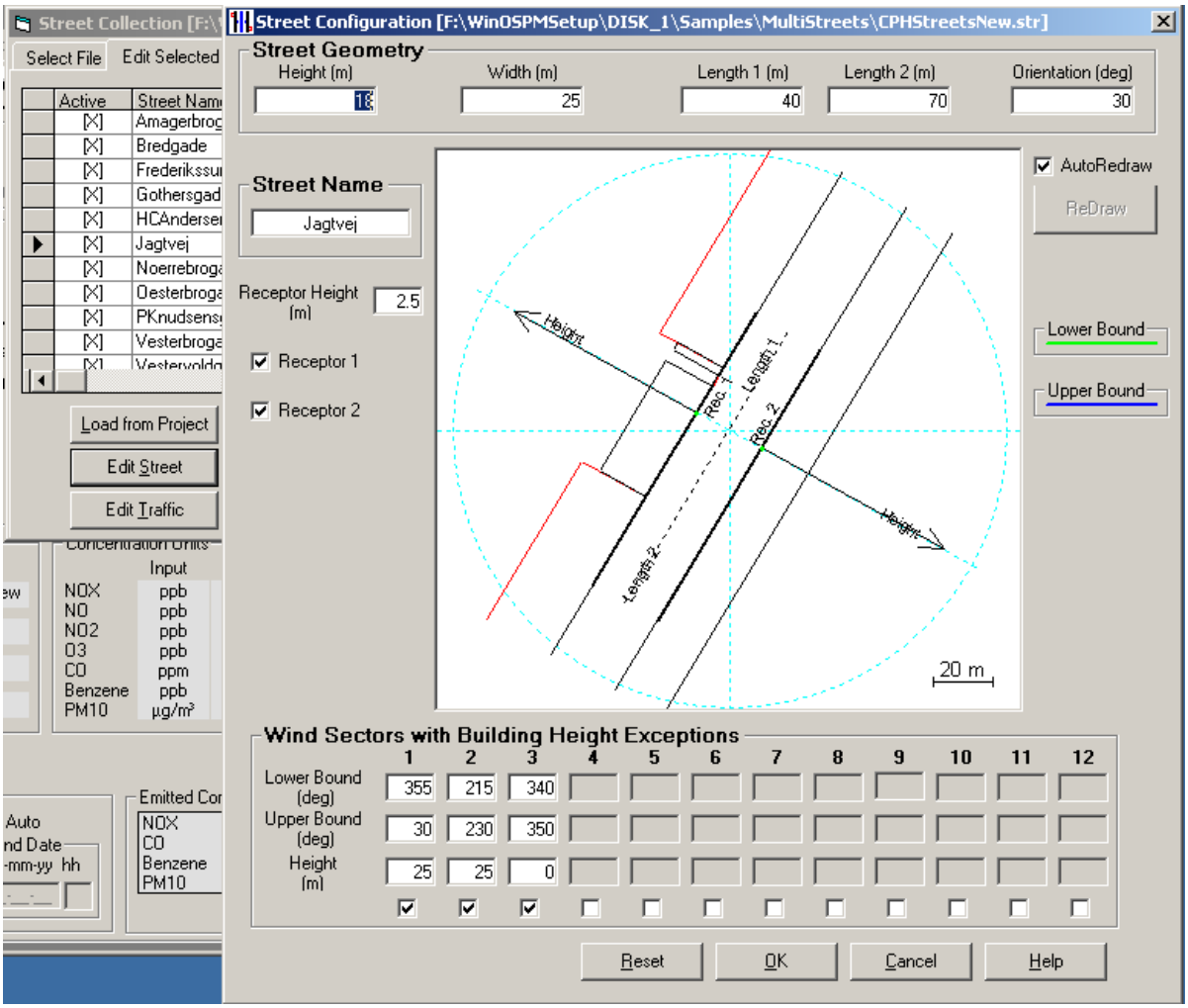


Fig. 14.7 The street configuration data can be edited using the Street Configuration editing tool.

The street configuration data can be edited using the "Edit Street Configuration" window, with the same facilities as in the single street project. This window is invoked using the "Edit Street" button (*Fig. 14.7*).

To edit data for a particular street, the record with this street must be the current record. The current record is indicated by the record pointer at the uppermost left edge of the street collection table. Any user action on a record makes the record the current record. The record needs not to be selected.

A similar procedure can be used for editing the traffic data. The traffic Editor, the same as in the case of a single street project, is activated by the "Edit Traffic" button.

When or if the data in the street collection windows (both the New and the Edit tabs) are edited, they must be saved to a file before they can be used with the project.

A message box appears if the user presses the "OK" button without previously saving the edited data. Pressing the "Cancel" button is equivalent with cancelling of the changes made to the data.

14.4 The Select Map tab

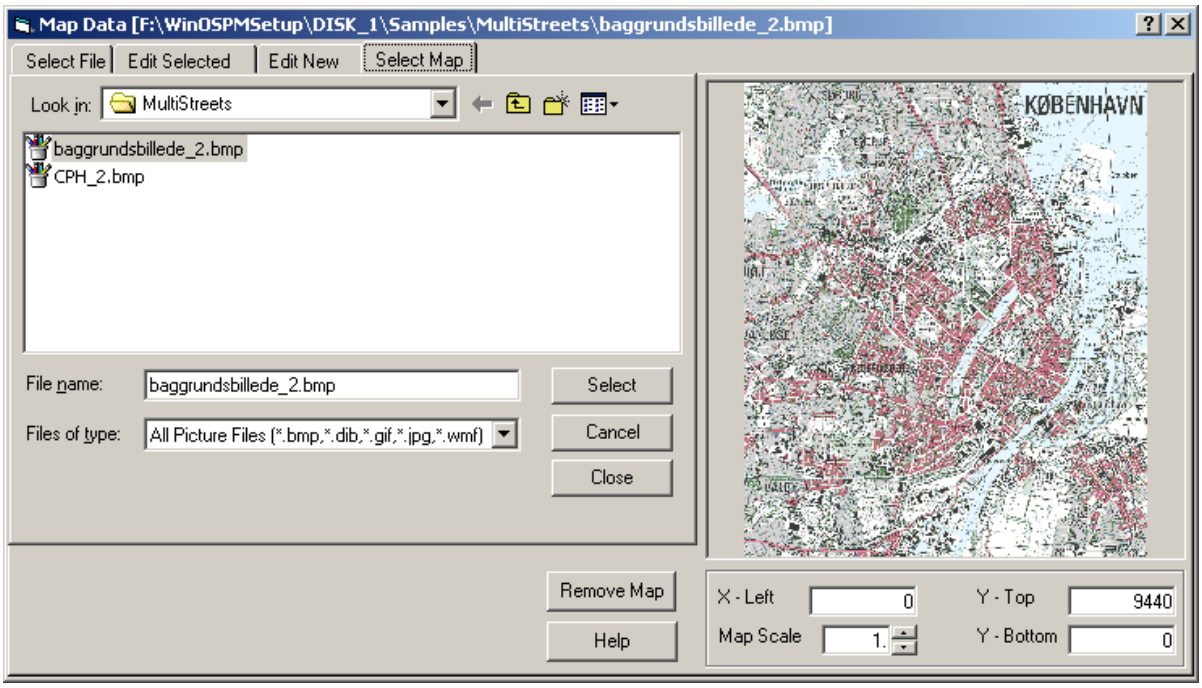


Fig. 14.8 A background map can be added to a multi street project. The map is used for graphical presentation of the results.

The "Select Map" window (*Fig. 14.8*) can be used to associated a background map to the multi street project. Presence of a map file is not mandatory but is useful for graphical presentation of the results.

The map can be any picture file in a Bitmap format (.bmp, .dib), GIF format (.gif), JPEG format (.jpg) Windows Metafile format (.wmf).

The picture contained in the selected file is shown for a preview in the picture box of the "Select Map" window.

The user must specify the geographical co-ordinates of the map. The "Y-Top" co-ordinate refers to the vertical co-ordinate of the upper border of the map. "Y-Bottom" co-ordinate refers to the vertical co-ordinate of the lower border of the map, "X-Left" to the horizontal co-ordinate of the left border. When showing the street segments on the map, the map co-ordinate system is used to position the streets on the map. All co-ordinate values must be given in metres.

The "Map Scale" parameter is used to scale the map view with respect to the original size of the map picture. A scale value of e.g. 2, will result that the map picture will be shown at a size that is twice of the original picture size.

14.5 Using the map for viewing and editing the street geographical co-ordinates

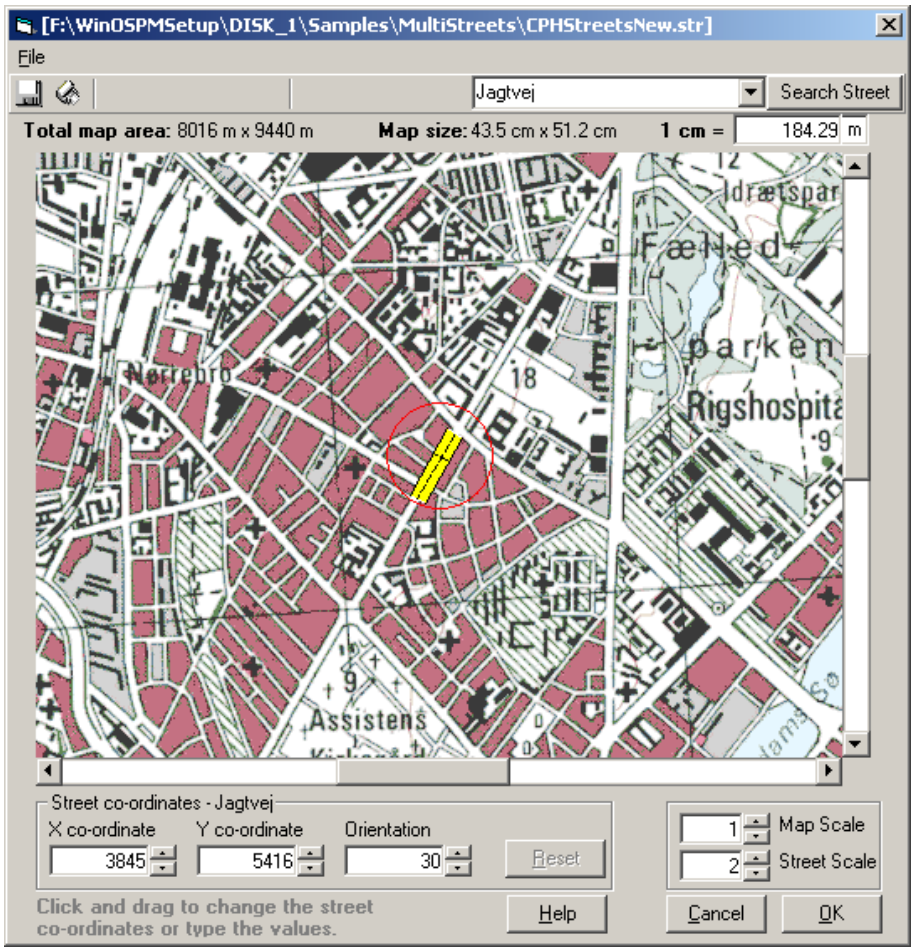


Fig. 14.9 The street co-ordinates can be edited by graphically re-positioning the street segments on the map.

A pre-view of the street positions on a map (*Fig. 14.9*) can be shown using the "Show Street" button in the Edit or the New tab window. The street segments are shown using the currently specified co-ordinates in the respective street collection file. Because the street segments can be very small, especially when the geographical area of the map is large, to streets can be shown scaled by a factor given in

the “Street Scale” text box. All geometrical dimensions of the street segments are proportionally scaled with this factor. This scaling factor is not saved with the project file. In order to make it easier to locate the street segments on the map, a Search Street function is implemented. Name of a particular street can be selected from the available drop-down box and pressing the “Search Street” button or the Enter key results in that the selected street is shown encircled on the map. The actual street co-ordinates (in meters) and the street orientation (in degrees with respect to North) are shown in the text boxes at the bottom of the map picture. All these values can be edited by the user. It’s also possible to change the street location (co-ordinates) on the map using the mouse. Click and drag to move the street segment across the map area. This facility makes it possible to change the dummy co-ordinate values that are initially given for a new street collection.

To find quickly a street on the map, the “Search Street” option can be used. The drop-down list box in the upper right corner of the *Fig. 14.9* contains a list of all the streets that are included in the Streets Collection. Select the street you want to locate on the map and press the “Search Street” button. The respective street will appear on the map encircled with a red circle.

The map picture can be saved to a file (in a “.bmp” format) or printed.

The modified street co-ordinates are transferred to the respective street collection table when the user accepts the changes by pressing the “OK” button.

14.6 Multi Streets Calculation and Results Windows

When a Multi Streets Project is opened in the main calculation window, the calculation procedure is exactly the same as for a Single Street Project. Pressing the “Run” button starts the calculations. A progress bar shows the number of the currently calculated street. The name of the street appears in the Street Data frame (*Fig. 14.10*).

After the calculations are finished the results are automatically displayed in the Multi Streets Results Window (*Fig. 14.11*). In this window the results of calculations are shown both graphically as a colour scale and also as a table with calculated values for all the streets. The component for which the results you wanted to be displayed and the statistical parameter (e.g. the annual average or a percentile value) can be selected from the two drop-down lists boxes in the upper part of *Fig. 14.11*. If a limit value exists for the particular pollutant, a list of all the specified limit values appears at the bottom of the window.

Clicking on one of the cells with a limit value results in that the statistical measure corresponding to this limit value is automatically selected in the box with the statistical measures and the table with the results is updated accordingly.

If a concentration for any of the streets exceeds the limit value, the cell is coloured red and the streets for which the limit value is exceeded are coloured red too.

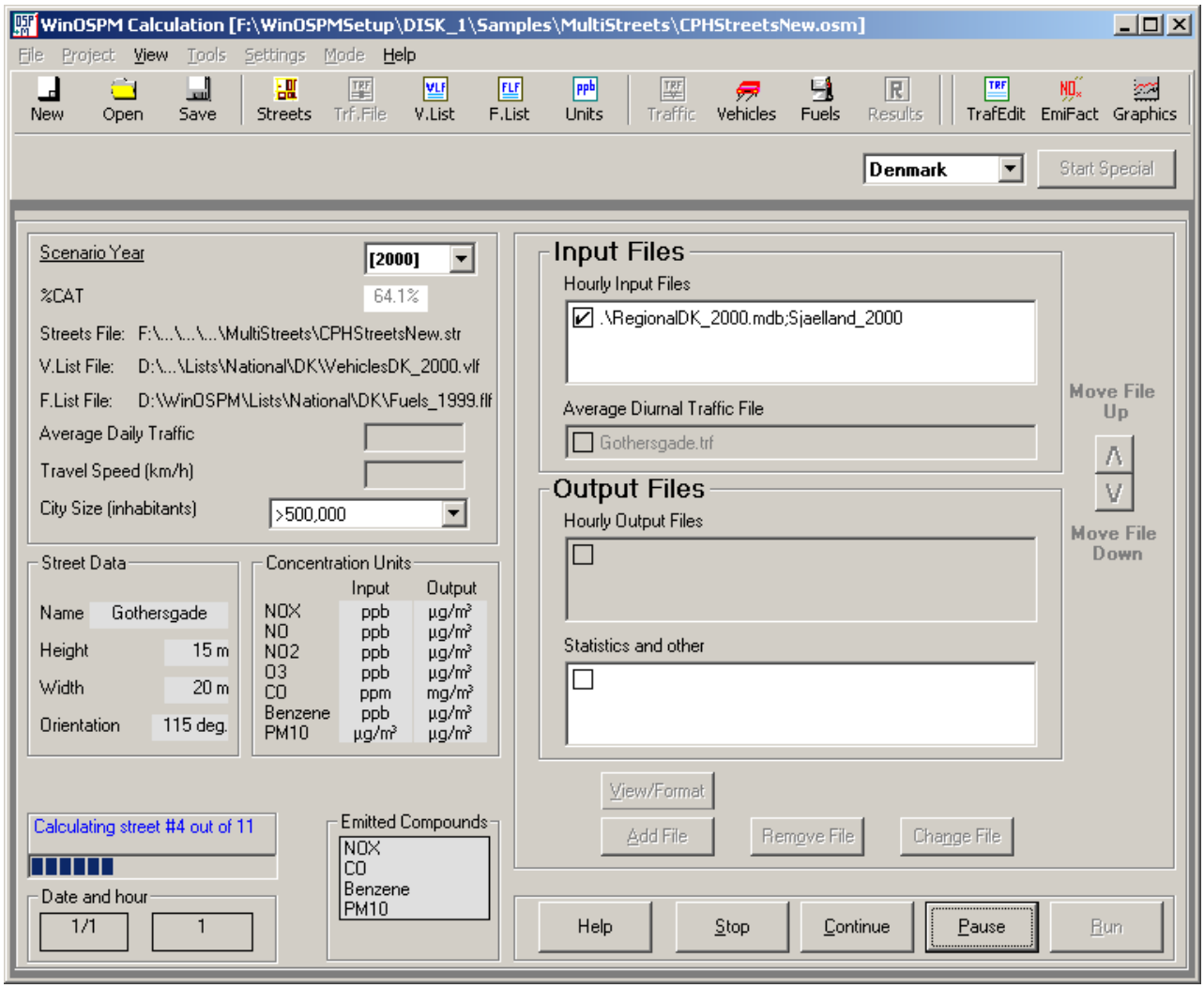


Fig. 14.10. The main Calculation Window for a Multi Streets Project. When the calculations are started, a progress bar shows the number of the currently calculated street. The name of the street appears in the Street Data frame.

The results can be shown in two ways. This is controlled by the two options buttons in the "Show Results" frame (*Fig. 14.11*). If the option button "Max only" is selected, the results are shown as maximum concentrations for both sides of the street. If the option button "Both Sides" is selected, the results are shown separately for each of the two sides of the street.

When the mouse cursor is hovered over one of the streets, a text is displayed with the name of the street and the calculated concentration for this street (*Fig. 14.12*, left). Whether the result corresponds to the maximum of both sides or to one of the sides only, depends on the selected display mode.

When the mouse cursor is hovered over the map area outside any of the streets, the map co-ordinates and the background concentration is displayed (*Fig. 14.12*, right).

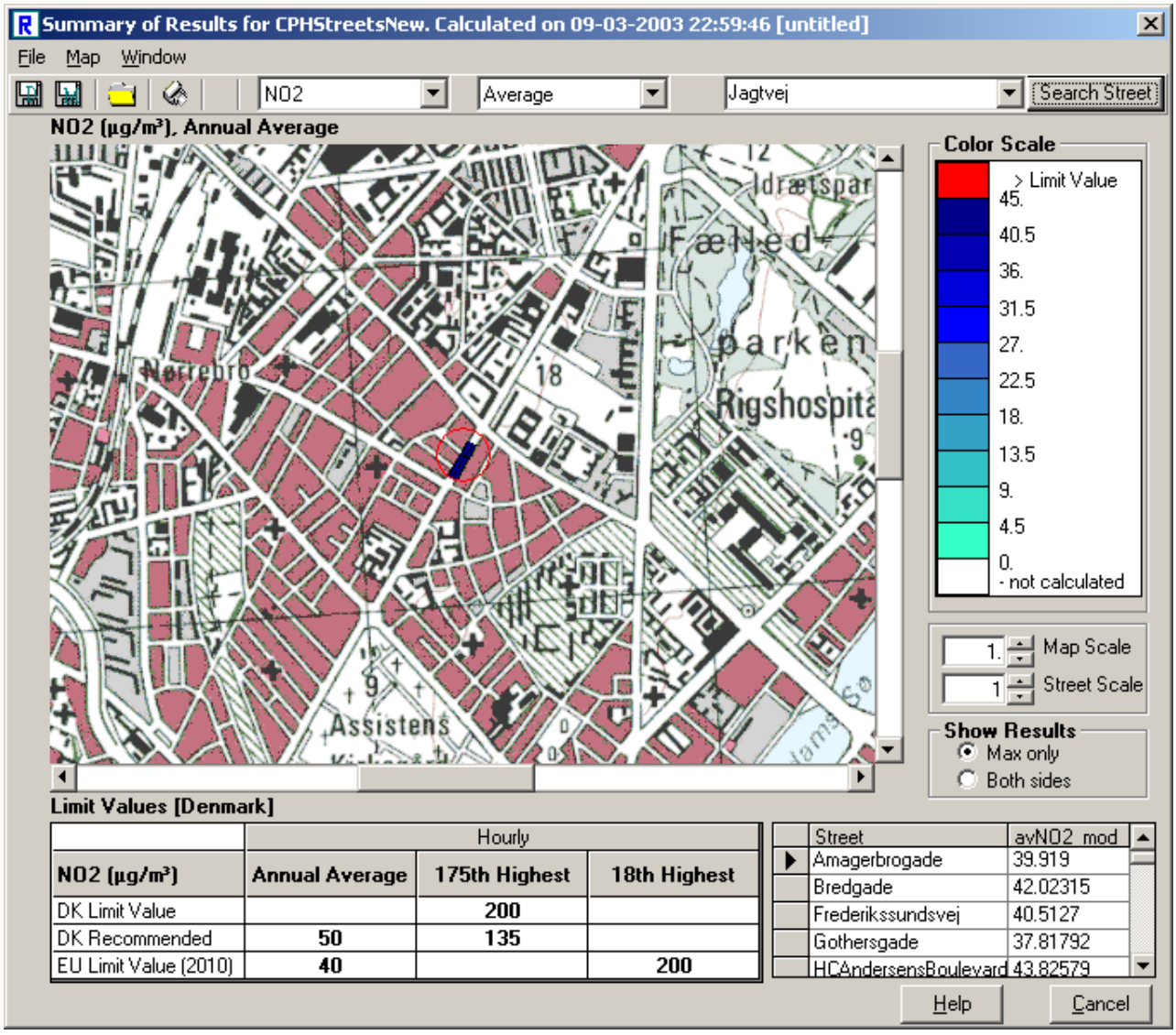


Fig. 14.11. Results of Multi Streets calculations are automatically displayed in a graphical window, where the calculated concentrations are shown both in a colour scale and as a table with calculated values for all the streets.

Fig. 14.12. When the mouse cursor is hovered over one of the streets, a text is displayed with the name of the street and the calculated concentration for this street (left). When the mouse cursor is hovered over the map area outside any of the streets, the map co-ordinates and the background concentration is displayed (right).

The results of the Multi Streets calculations can be saved to a file.

There are two different ways to save the results (*Fig. 14.13*).

1. **as a map picture**
2. **as a data file**

Fig. 14.13. The Multi Streets calculation results can be saved either as a map picture or as a file with numerical data. The corresponding menu items are shown at the left, while the associated icon buttons at the right. To open a previously saved result file you can use the File/Open menu item or the associated icon button.

When the results are saved as a map picture, only the currently displayed results are saved as a bitmap (".bmp") file. This bitmap picture can be viewed (or edited) in any bitmap editing program (e.g. Microsoft Paint).

More useful is saving the results as a data file. In this case all calculation results (for all pollutants and all statistical measures) are saved to file, which automatically gets the extension ".rem". This is a binary file and contrary to the Single Street results file (a ".res" file), it cannot be opened in a text editor. To open previously saved result files you can use **File / Open Saved Results File / Multi Streets** from the WinOSPM main window. Previously saved result files can also be opened from the "Result" Window. For this use **File / Open** or the button **Open Results file** (*Fig. 14.13*).

When the Multi Streets calculation results are saved to a data file, the map picture (if any) is not saved with the file. Only the name of the file with the map picture is saved. When a saved result file is retrieved for view, the file with the map picture must exist at the location specified when the file was saved.

The bitmap picture of a map can be too large to be displayed in the view window. This can also happen if the Map Scale factor is increased too much. In this case an error message is displayed recommending decreasing the Map Scale factor. The Map Scale factor is saved with the result file.

Th information on the actual Limit Values is also saved with the result file. This means that if a Multi Street result file was created with one Country setting and next retrieved within a session with another Country setting, the Limit Values displayed will correspond to the settings valid for the original Country setting, i.e. the settings that were active when the file was saved.

14.7 User defined output files

The results of Multi Streets calculations can also be saved to user defined file. The procedure is similar to assigning user defined output files for statistical results (Section 11.2).

The user defined output files for Multi Streets calculation results are defined in the box "Statistics and other". Hourly Output Files cannot be created when in the Multi Streets Mode (*Fig. 14.14*).

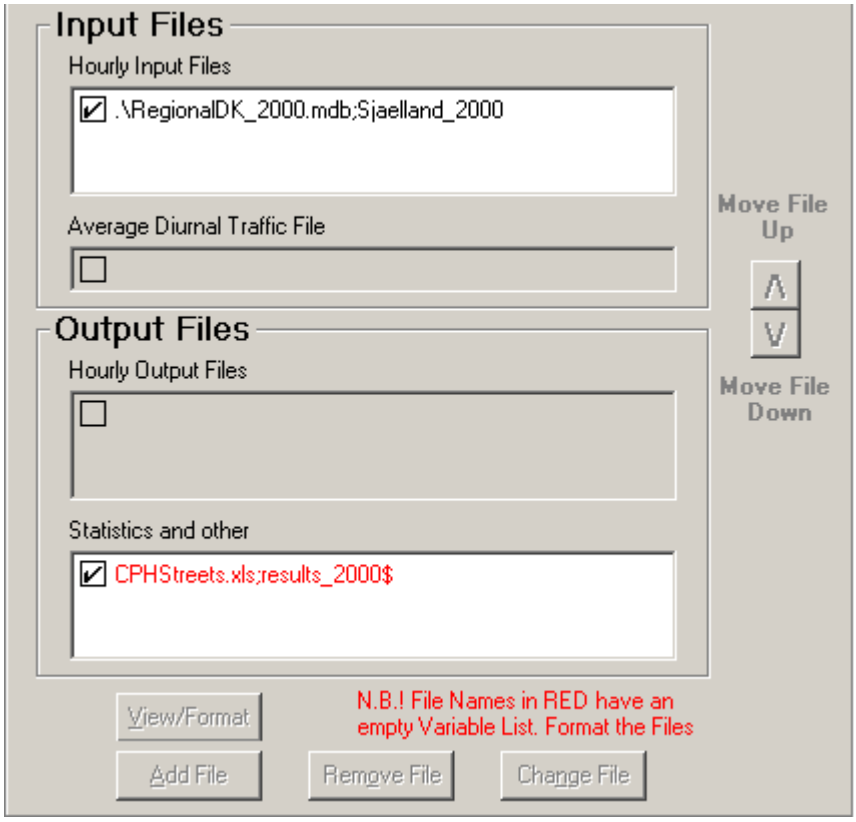


Fig. 14.14 The user defined output files for Multi Streets calculation results are defined in the box "Statistics and other". Hourly Output Files cannot be created when in the Multi Streets Mode.

The list of variables must be defined for the output file. This list should be provided in the "Format File" window (*Fig. 14.15*).

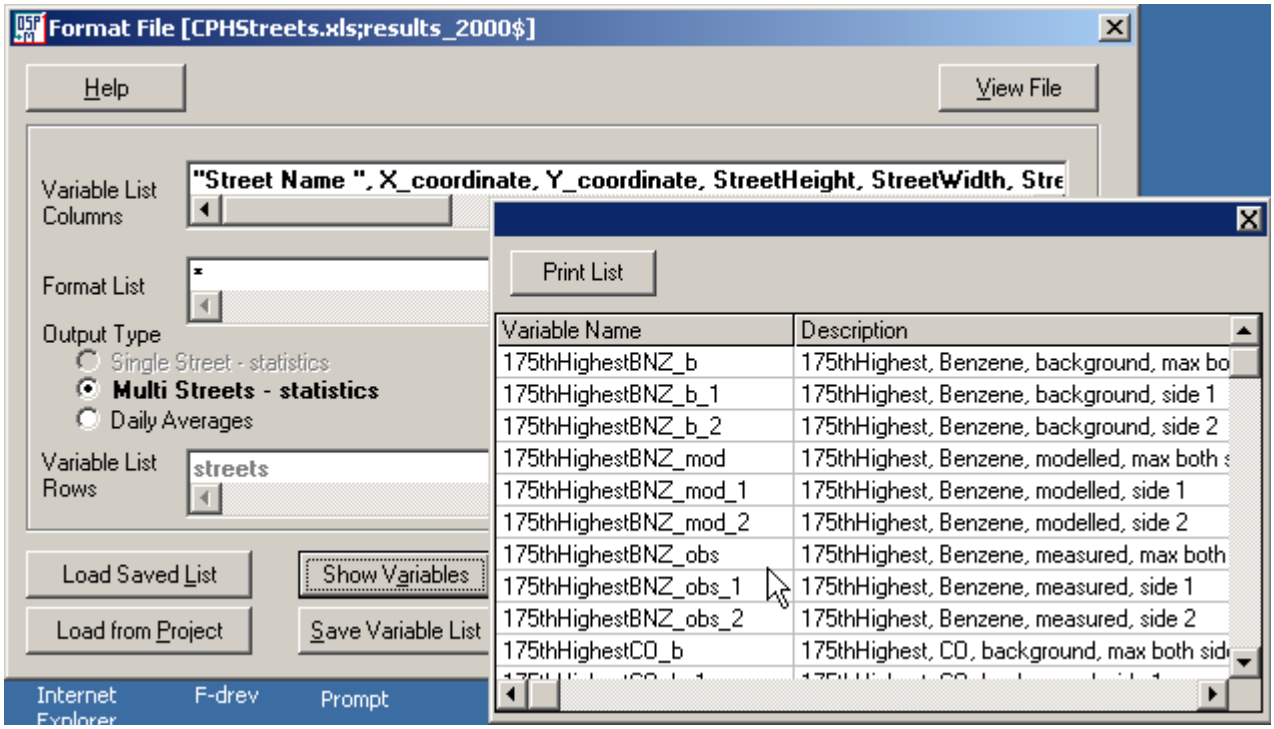


Fig. 14.15. The variable list for user defined Multi Streets calculation results files can contain all the street's data and the statistical results of the calculated concentrations.

The option button – "Multi Streets – statistics", is automatically selected when the "Format File" window is opened in the Multi Streets Mode. The first column in the output file will always contain the names of the streets in the Streets Collection. It is natural to name this column with something like "Street Name", or similar. The variable list for user defined Multi Streets calculation results files can contain all the street's data and all the statistical results of the calculated concentrations. Each single record in the file will contain results for one street only.

15 List of input and output variables

The user has a choice of many variables when formatting an input- or output file. These opportunities will be described in the following.

The selection of variables is depending on the type of input- or output files. The type of a file is determined by in which of the 3 following File Lists the file is located:

- Hourly input files
- Hourly output files
- Statistics and others

The type of output files, which can be produced, depends additionally on the two modes of the WinOSPM operation:

- Single street mode
- Multi street mode

Under Statistics and others it is possible to output results which are not generated for each calculation hour. These output types are as follows:

- statistical parameters, e.g. averages, percentiles etc
- daily averages
- results from Multi Streets calculations

Almost all input variables can also be written to an hourly output file. Hourly output files may additionally include such variables as: modelled concentration levels, emission data, traffic data and several variables related to turbulence conditions in the street.

Variables for hourly input and output files are described together while Statistics and others are dealt with separately.

15.1 Hourly input and output variables

The nomenclature to describe pollutants is subdivided into three groups: concentrations, emission input and flags for special modelling procedures.

Concentrations

The general nomenclature for concentrations is:

cPOL_type_side

where ”c” is concentration, ”POL” is pollutant, ”type” is different pollution regimes and ”side” is side 1 or 2 of the street.

POL can be any of the pollutants included in the OSPM calculations, as e.g.: BNZ (benzene), CO, NO, NO2, NOX, O3 and PM10. The currently included pollutants are specified in the Pollutants List –

Pollutants.lst. The list of pollutants depends on the current Country setting.

"type" can take on the values:

_b urban background

_r rural backgroun

_str street (street contribution only)

_obs observed (measured)

_mod modelled

_cor corrected (modelled concentrations are corrected using monitor data, special option).

"side" can be:

_1 side 1 of the street

_2 side 2 of the street.

For example, cBZN_mod_1 is modelled benzene concentrations at side 1 of the street.

The "_str" type is combined either with the "_obs" or the "_mod" type. For example, cBNZ_str_obs_1 is the street contribution to the measured benzene concentrations at side 1 of the street.

Emission input/output

The nomenclature for emission variables is:

QPOL

where "Q" is total emission for all vehicle categories and "POL" is the pollutant. For example, QBZN is the total benzene emission for all vehicle categories.

or QPOLVehicle

where "Q" is the emission for the specific vehicle category, "POL" is the pollutant. "Vehicle" may be one of the vehicle categories included in OSPM calculations, such as e.g.: Buses, Pas_Car (passenger cars), Trucks_1 (< 32t), Trucks_2 (> 32t) and Vans. The actual list of vehicle categories depends on actually selected Vehicle List. For example, QBZNTrucks_1 means benzene emissions from trucks < 32t.

Traffic input/output

The nomenclature for traffic variables is:

NVehicle

where "N" is the traffic flow (vehicles/hour) for the specified vehicle category. Beside vehicle specific traffic flow, aggregated traffic variables can also be provided in input or output files.

Ntotal total number of vehicles

Nlight total number of light duty vehicles

Nheavy total number of heavy duty vehicles

Flags (special option)

It is possible to output a flag for special calculations when modelled concentrations are adjusted taking into account monitoring data for the specific hour. The nomenclature is:

FlagPOL_side

"Flag" indicates a marking. "side" is:

_1 side 1 of the street

_2 side 2 of the street.

Variable names

A number of other variables is also available which are listed alphabetically below:

Coldstart	Cold starts share in percent
Cloudcover	Cloud cover
DailyTraffic	Average Daily Traffic
Date	Date
DateTime	Date and time
day	Day
DayCase	Day type for the diurnal variation of traffic e.g. Saturdays in July
DayOfWeek	Day of week (Monday =1, Sunday = 7)
Delta_Fi	Fluctuations in wind direction
ExceptionNo	Number of wind sectors with exceptions from the general building height.
GlobalRad	Global radiation. A parameter needed for modelling of NO_2
H_mix	Mixing height
hour	Hour
InpOut	Indoor/outdoor (only available in route mode)
minute	Minute
month	Month
NetRad	Net radiation
PersonId	Person identification (only available in route mode)
R_hum	Relative humidity
RecHeight	Receptor height
s_w_Roof	Total turbulence at roof level
s_w_TPT	Traffic generated turbulence in the street
SegmentId	Route segment identification (only available in route mode)
SegmentLength	Length of route segment (only available in route mode)
SegTimeIn	Start time on route segment (only available in route mode)
SegTimeOut	End time on route segment (only available in route mode)
Speed_heavy	Travel speed for heavy traffic (trucks and buses)
Speed_light	Travel speed for passenger cars and vans
SpeedPerson	Travel speed for person (only available in route mode)
StreetHeight	Average building height
StreetLength_1	Length1 (see explanation in chapter on Street configuration)
StreetLength_2	Length2 (see explanation in chapter on Street configuration)
StreetOrientation	Street orientation with respect to North
StreetSide	Side 1 or side 2. Same as receptor 1 or receptor 2 (see explanation in chapter on Street configuration)
StreetWidth	Street width from facade to facade

Temperature	Temperature
TimeInSeg	Residence time on route segment (only available in route mode)
TimeInSegInp	Residence time on route segment in input file (only available in route mode)
TrafficFile	Traffic file that describes the diurnal variation of traffic
TranspMode	Transport type (only available in route mode)
TranspStay	Type of stay (only available in route mode)
TravelSpeed	Travel speed
TurSegmentNo	Number identification of the sub segment on the route (only available in route mode)
u_mast	Wind speed over roof level
u_roof	Wind speed at roof level
Wind_dir	Wind direction
Year	Year.

15.2 Statistical variables

Output files with values based on statistics of the calculated or measured concentrations are constructed as tables with column and row headings. Therefore, the variables, which have to be specified for files with statistical output refer either to a column or to a row heading. A combination of the column and the row-heading variable produces the final statistical variable.

Statistical variables

The nomenclature for statistical variables is:

statPOL_type_side

”stat” is the statistical parameter, such as the annual average, a percentile of hourly or daily averages, a percentile of running 8 hours averages. Percentiles can refer either to a certain fraction of the observations (measured or modelled values) or to the nth-highest value. The actual definition of percentiles calculated by the program is given in the Percentiles Definition List (PercDef.lst), which depends on the actual Country setting.

Additionally, the “stat” parameter can also refer to the number of observations (either measurements or model calculations), that were processed to provide the specific statistical value.

“POL” is one of the pollutants included in the calculations.

”type” can be:

_b	urban background
_obs	observed (measured)
_mod	modelled

The “type” parameter can also be “Background”, “Measured”, or “Modelled” but only when not in combination with the “POL” parameter.

”side” is:

_1	side 1 of the street

_2 side 2 of the street.

For example, 175thHighestBNZ _mod_1 is the 175th highest value of the modelled benzene concentrations at side 1 of the street, while avNOX_obs_2 is the annual average of measured NOX concentrations at side 2 of the street.

There is a large number of combinations of the column and row variables that will result in the desired statistical variable. The rule is that one of the 4 parameters ("stat", "POL", "type" and "side") must be present either in the column or in the row variable name, but not in the both. Exception is here the "side" parameter, which if missing will result in that the outputted statistical value will refer to the highest value of both sides of the street.

For example, a combination of the column variables and row variables like this:

column: "text", BNZ_mod, BNZ_obs, BNZ_b

row: Average_1, Average_2, nHours_1, nHours_2

will result in the following output table:

text	BNZ_mod	BNZ_obs	BNZ_b
Average_1	avBNZ_mod_1	avBNZ_obs_1	avBNZ_b_1
Average_2	avBNZ_mod_2	avBNZ_obs_2	avBNZ_b_2
nHours_1	nHoursBNZ_mod_1	nHoursBNZ_obs_1	nHoursBNZ_b_1
nHours_2	nHoursBNZ_mod_2	nHoursBNZ_obs_2	nHoursBNZ_b_2

A combination of the column variables and row variables like this:

column: "text", Modelled, Measured, Background

row: 18thHighestNO2, MaxRun8CO, avBNZ

will result in the following output table:

text	Modelled	Measured	Background
18thHighestNO2	18thHighestNO2_mod	18thHighestNO2_obs	18thHighestNO2_b
MaxRun8CO	MaxRun8CO_mod	MaxRun8CO_obs	MaxRun8CO_b
avBNZ	avBNZ_mod	avBNZ_obs	avBNZ_b

The phrase "text" can be any text, as it only appears as a column heading for the row headings. The shaded regions refer to the resulting statistical variables, and in the output files they are replaced by the actual values. In the second example the "side" parameter is missing and therefore the values represent the highest values calculated for both sides of the street.

15.3 Daily averages

The files with daily averages are constructed in a similar way as the files with statistical output. The output variables must be specified as a combination of a column and a row variable. However, the syntax is much simpler, compared with the statistics files. The only row

variable is "DailyAv". The nomenclature for the column variables is following:

POL_type_side

"POL" is one of the pollutants included in the calculations.

"type" can be:

_b	urban background
_obs	observed (measured)
_mod	modelled

"side" is:

_1	side 1 of the street
_2	side 2 of the street.

The resulting file will contain in the first column the Date variable and in the following columns the values of the daily averages according to the specifications given by the column variables. As in the case of the statistical variables, omitting the "side" parameter will result in output of the highest daily average concentrations for both sides of the street.

Additional variables that can be specified for the files with daily averages are:

DayCase	A number corresponding to the Day type for the diurnal variation of traffic
DayOfWeek	Day of week (Monday =1, Sunday = 7)
StreetName	Street name (for use in the Multi Streets mode)
X_coordinate	X co-ordinate of the middle of the street next to the receptor point (for use in the Multi Streets mode)
Y_coordinate	Y co-ordinate of the middle of the street next to the receptor point (for use in the Multi Streets mode)

15.4 Multi Streets

When running in the multi streets mode, the output files can only contain statistical (percentiles, averages, etc.) results of the OSPM calculations. All statistical values can be defined for the output files. The multi streets output files can also contain additional variables related to the street geometry and traffic data.

The multi streets output files are constructed as a table, i.e. with column and row headings. However, the only row heading that can be specified is the phrase –"streets".

The nomenclature for the column variables is following:

statPOL_type_side

"stat" is the statistical parameter, such as the annual average, a percentile of hourly or daily averages, a percentile of running 8 hours averages. Percentiles can refer either to a certain fraction of the observed (calculated) values or to the nth-highest value. The actual definition of percentiles calculated by the program is given in the Percentiles Definition List (PercDef.lst), which depends on the actual Country setting.

Additionally, the "stat" parameter can also refer to the number of observations (model calculations only), that were processed to provide the specific statistical value.

"POL" is one of the pollutants included in the calculations.

"type" can be:

_b "urban background"

_mod "modelled"

"side" is:

_1 side 1 of the street

_2 side 2 of the street.

The resulting file will contain in the first column the name of the street and in the following columns the values of the statistical variables according to the specifications given by the column variables. As in the case of the other statistical variables, omitting the "side" parameter will result in output of the highest value for both sides of the street.

Other Multi Streets output variables

Additional variables that can be specified for the multi streets output files are:

X_coordinate	X co-ordinate of the middle of the street next to the receptor point
Y_coordinate	Y co-ordinate of the middle of the street next to the receptor point
StreetHeight	Average building height
StreetWidth	Street width from facade to facade
StreetLength_1	Length1 (see explanation in chapter on Street configuration)
StreetLength_2	Length2 (see explanation in chapter on Street configuration)
StreetOrientation	Street orientation with respect to North
TrafficFile	Traffic file name
DailyTraffic	Average Daily Traffic (veh/day)
TravelSpeed	Travel Speed (km/h)

Output from Multi Streets calculations can also be provided in form of daily averages. When using output files with daily averages in the Multi Streets mode, the StreetName variable should (preferable) be

added to the list of output variables. The user can also add the “X-coordinate” and the “Y_coordinate” variable to an output file with the daily averages.

Appendix A. Pre-defined traffic data: Traffic list files

Pre-defined traffic data are files with information on the relative distribution of vehicle types (such as e.g. passenger cars, vans, trucks and buses) and the fraction of the daily total for each of the vehicle types. If required, several "Day cases" can be defined, representing different days of the week and months of the year - e.g. a case for Fridays in July. In order to use such pre-defined data for a particular street, the user must specify the Average Daily Traffic (ADT) and the travel speed for this street. The pre-defined traffic data will normally be provided for some typical street types with specific traffic conditions, such as e.g. main streets in the city centre, streets in residential areas, etc.

The Country setting determines which pre-defined traffic files are available in the list box shown in the "New Project" window (*Fig. A.1*). This mechanism is governed by a "Traffic list file", named StrTrf.lst, for the relevant country.

The details of StrTrf.lst are explained below.

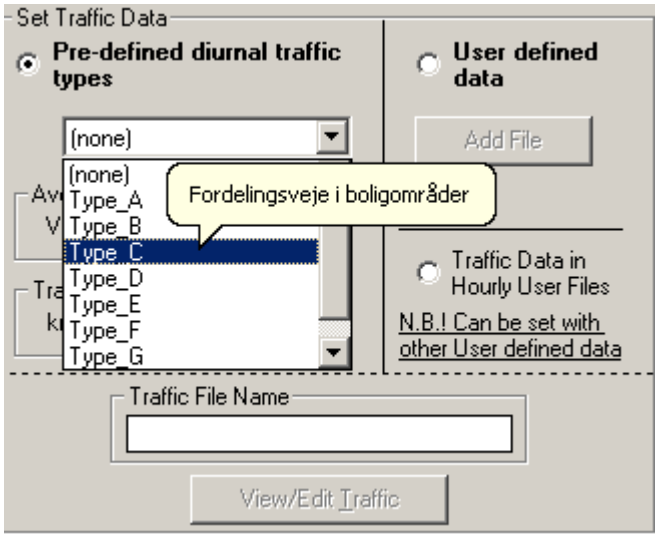


Fig. A.1 Dialog box displaying available Traffic files. The box is based on information in StrTrf.lst.

StrTrf.lst is a text file (ASCII) and can be edited by any text editor. The location (path) of the StrTrf.lst file is given by:

[AppPath]\Lists\National\[CountryCode]\StrTrf.lst

where [AppPath] is the path of WinOSPM on the local drive as specified during installation of the software. [CountryCode] is the Country Code corresponding to the actual Country setting.

One StrTrf.lst file must reside in each of the [AppPath]\Lists\National\[CountryCode] folders. If the file is

missing, an error message is displayed when the "New Project" window is opened.

An example of a StrTrf.lst file with a list of pre-defined traffic files for Danish cities is given in *Listing A.1*

Listing A.1 Traffic List file StrTrf.lst for Danish cities.

```
Name,     FileName,       HelpText
"Type_A", "Type_A.trf",   "Gennemfartsvej i middelstore eller mindre byer"
"Type_B", "Type_B.trf",   "Gennemfartsveje i storby"
"Type_C", "Type_C.trf",   "Fordelingsveje i boligområder"
"Type_D", "Type_D.trf",   "Trafikveje med blandet bolig og erhverv"
"Type_E", "Type_E.trf",   "Hovedgade i centrumområde - store byer"
"Type_F", "Type_F.trf",   "Indfaldsveje til store byer"
"Type_G", "Type_G.trf",   "Trafikveje i store og mellemstore byer uden for centrumområdet"
"Type_H", "Type_H.trf",   "Centrumgader i mellemstore byer"
```

In the column labelled “Name”, the names of the predefined street types as they will appear in the “Pre-defined diurnal traffic types” drop-down list box in the New Project window, are specified.

In the column labelled “FileName”, the names of the files with the pre-defined traffic data are specified. The location (path) of these files is given by:

[AppPath]\Data\Traffic\National\[CountryCode]\[FileName]

where [FileName] is the name of one of the files listed in the StrTrf.lst file.

In the column labelled “HelpText”, text lines with short description of the respective street types, are provided. All the “HelpText” must be on a single line. In the New Project window this text will appear as a Help Text, when the mouse pointer is hovered over one of the items in the drop-down list box with the pre-defined street type names.

The quotation marks and the comma separators are mandatory.

A StrTrf.lst file must at least contain the first line with the column headings. If the column headings line is the only text line in the file, the drop-down list box with the pre-defined street type names in the New Project window will be inactive (greyed) and selection of the pre-defined traffic types disabled.

Appendix B. Traffic Data Files

Traffic data files are text files (ASCII) and can be edited by any text editor. However, a Traffic Data Editor and Visualisation tool is available from WinOSPM. It is recommended that this tool is used for editing the traffic data.

The pre-defined traffic data files are always of the so-called "Default Type". User-defined traffic data will typically not be of "Default" type, but they may well be.

Distinction between files of "Default" type and other files

The "Default" type of traffic data are files with information on the relative distribution of vehicle types (such as e.g. passenger cars, vans, trucks and buses) over time, indicated as the fraction of the daily total. These are files also have the characteristics that the user is required to supply information on the Average Daily Traffic (vehicles per day as an average over the year) and travel speed.

The alternative to "Default Type" are files which contain *absolute numbers* for the distribution of vehicle types over time.

Format of "Default" type files

A listing of such a "Default Type" traffic data file is given in *Listing B.1*, using the "Type_A" file from *Listing A.1* as an example.

The first line in the file contains the indicator of the traffic data file type. It is the phrase "Default Type" (the quotation marks are mandatory), which indicates that the file is a file with traffic data given as *fraction of daily total*, and not as number of vehicles per hour. The presence of the word "Default" is used by the WinOSPM program to recognise this type of traffic data. Next, in the same line, follow the names of vehicle types for which the traffic data are provided. These names must correspond exactly to the names used in the Vehicle List Files, however, the text is not case sensitive.

The second line starts with the name of the street type, and this text is for information only. Next follow numeric values indicating the fraction of the total annual average diurnal traffic (ADT) that is assigned to the particular vehicle type. In the shown example (*Listing B.1*), the number of vehicles of type PAS_Car constitute 0.8008 of the total traffic in the street, while Vans are assigned fraction of 0.1204, etc. The sum of all these fractions must be 1.

The third line starts with the indicator of the day type (Day Case) for which the following traffic data are specified. The Day Case is specified using logical expressions combining days of the week and/or months of the year. The first group (the quotation marks and the semicolon separator are mandatory) refers to the days-of-the-week selection, while the second, to the months-of-the-year selection. In the shown example (*Listing B.1*), the text "<5" means that the following traffic data are used for all days of the week, which have the week day number less than 5. Using the convention that Monday is 1 and Sunday is 7, this means that the traffic data concern, in this case, weekdays Monday to Thursday. The second group, referring to

the months of the year, is in this example translated as "all months of the year but not July". Any sensible (mathematically correct) combination of equality (=), inequality (<, >, <=, >=) and logical operators (such as "AND", "OR") can be used to specify the Day Case. For example, a text in the second group, which could be like "<=5 OR >10", would be translated as: "January to April or November to December". The text string specifying the weekdays selection may not be empty. To specify that the traffic data refer to all days of the week, write simply "<=7" (including the quotation marks). Writing ">=1", will have the same effect. However, the text concerning the months selection can be empty (two quotation marks are still required). If this text is empty, the traffic data are assumed to be valid for all months of the year.

The numeric values following the Day Case specification indicate the ratio with respect to the annual average daily traffic. In the shown example (*Listing B.1*), the average daily traffic on Monday to Thursday and all months but not July, and of vehicle type PAS_Car, is 1.0323 of the Average Daily Traffic. The corresponding value for Vans is 1.0382, etc.

The subsequent block of lines starts with a heading line indicating hour of the day (from 1 to 24), the vehicle types, the traffic speed of "short" and "long" vehicles and Cold Start percentage (see the sections "Vehicle Speed" and "Cold Start" for further explanation of these parameters).

The numeric values in the columns with the vehicle type heading specify the fraction of the total daily traffic that is attributed to the particular vehicle type for the hour of the day, that is specified in the column "Hour" within each day case. The values in each column with the vehicle type heading must sum-up to 1.

The numeric values in the columns with the traffic speed headings are weights applied to the daily average traffic speed that is attributed to the particular hour of the day for respectively "short" and "long" vehicles (see the section "Vehicle Speed" for further explanation of these parameters). The sum of the values in each of the two columns should be 24.

The numeric values in the column under the heading "Cold_start" specify the fraction (in %) of all the vehicles that for the particular hour of the day are under the "cold-start" conditions (see the section "Cold Start" for further explanation of this parameter).

The alternative to files of "Default" type will be described in the following. Typically, *User provided traffic data* will not be of the "Default Type" but will contain traffic data specified as number of vehicles per hour, and not as a fraction of the daily total. Also the traffic speed will be given in terms of speed in km/hour and not as a weight. The user would not need to specify the Average Daily Traffic, neither to specify the travel speed. The precise structure of such traffic data file is explained using an example given in *Listing B.2*.

Listing B.1 The beginning of a traffic file of "Default" type. This file contains traffic data given as *fraction of daily total*

"Default Type"	PAS_Car	Vans	Truck_1	Truck_2	Buses			
"Type_A"	0.8008	0.1204	0.0466	0.0113	0.0209			
"<5";"<>7"	1.0323	1.0382	1.1324	1.2827	1.0972			
Hour	PAS_Car	Vans	Truck_1	Truck_2	Buses	V_short	V_long	Cold_start
1	0.00575	0.00340	0.00267	0.01216	0.00741	1.07	0.91	7
2	0.00232	0.00192	0.00309	0.00612	0.00249	1.12	1.00	7
3	0.00144	0.00124	0.00588	0.00376	0.00279	1.15	1.09	7
4	0.00131	0.00158	0.00455	0.00131	0.00127	1.08	1.03	7
5	0.00274	0.00354	0.00704	0.02625	0.00261	1.06	1.01	7
6	0.01036	0.01498	0.01443	0.02141	0.01597	1.05	1.05	7
7	0.03864	0.06453	0.04398	0.05072	0.03537	0.98	0.99	7
8	0.07197	0.07643	0.07338	0.07588	0.06421	0.93	0.93	8
9	0.06516	0.06502	0.08305	0.07741	0.07861	0.96	0.92	5
10	0.05253	0.07142	0.08021	0.08348	0.06896	0.95	0.93	7
11	0.05123	0.07191	0.08743	0.07860	0.05574	0.95	0.93	7
12	0.05568	0.07634	0.09581	0.06457	0.06150	0.95	0.92	7
13	0.05725	0.07504	0.08853	0.07302	0.05407	0.96	0.93	7
14	0.06039	0.06897	0.10347	0.08606	0.05553	0.95	0.92	7
15	0.07073	0.07253	0.08336	0.08006	0.07900	0.94	0.91	7
16	0.08419	0.08132	0.06724	0.07035	0.09273	0.93	0.90	5
17	0.09530	0.06594	0.06131	0.05348	0.08265	0.94	0.92	9
18	0.07620	0.04393	0.03956	0.04650	0.08483	0.97	0.93	7
19	0.05655	0.03614	0.01903	0.03196	0.05374	0.98	0.96	7
20	0.03921	0.02817	0.01257	0.01274	0.03244	0.99	0.96	7
21	0.02803	0.02420	0.00968	0.01257	0.02464	0.99	0.99	7
22	0.02984	0.01980	0.00726	0.00925	0.02230	1.00	0.95	7
23	0.02778	0.01930	0.00440	0.00937	0.01436	1.00	0.88	7
24	0.01540	0.01234	0.00207	0.01297	0.00678	1.05	0.88	7
"=5";"<>7"	1.1530	1.1590	1.2613	1.3679	1.2470			
Hour	PAS_Car	Vans	Truck_1	Truck_2	Buses	V_short	V_long	Cold_start
1	0.00644	0.00381	0.00284	0.00567	0.00773	1.12	0.92	7
2	0.00331	0.00274	0.00219	0.00000	0.00173	1.12	1.01	7
3	0.00183	0.00158	0.00685	0.00839	0.00319	1.13	1.04	7
4	0.00150	0.00180	0.00635	0.00252	0.00174	1.05	1.09	7
5	0.00288	0.00373	0.00526	0.01242	0.00191	1.10	1.01	7
6	0.00975	0.01410	0.01634	0.02200	0.01772	1.05	1.06	7

Format of a traffic data file which is not of "Default" type

The first line in the file contains the indicator of the traffic data file type. It is essential that the text within the quotation marks does not contain the phrase "Default" (the quotation marks are mandatory). The absence of the word "Default" is used by the WinOSPM program to recognise this type of traffic data. Next, in the same line, follow the names of vehicle types for which the traffic data are provided. These names must correspond exactly to the names used in the Vehicle List Files, however, the text is not case sensitive. In the shown example (*Listing B.2*), an additional feature (which actually can also be used for the "Default Type" traffic data files) is the concept of a "composed vehicle type". The text string within the second pair of quotation marks (the quotation marks are mandatory in this case) contains the phrase - "Trucks; 0.8 Truck_1; 0.2 Truck_2". The vehicle type that it is referred to in this text string is called "Trucks". However, the emission factors, as specified in the actual Vehicle List File, are not provided for this vehicle type but separately for types "Truck_1" and Truck_2" only. In order to make it possible to calculate emissions from the vehicle type "Trucks", the traffic data must contain the information on the sub-division of the "composed" vehicle type "Trucks" between the basic vehicle types "Truck_1" and "Truck_2". This sub-division is specified in the phrase: "Trucks; 0.8 Truck_1; 0.2 Truck_2" by the two sub-strings - "0.8 Truck_1" and "0.2 Truck_2" (the semicolon separating the two strings is mandatory). In this particular example, the values 0.8 and 0.2 indicate that the vehicle type Truck_1 constitutes 0.8 of the vehicle type Trucks, while the vehicle type Truck_2 constitutes 0.2 of the vehicle type Trucks. This rule of "composition" can be used to combine several basic vehicle types into one vehicle type. An example of such traffic data

file, where the traffic data are provided only for two “composed” vehicle types - “Light” and “Heavy”, is shown in *Listing B.3*.

The second line of the file shown in *Listing B.2* contains only text with identification of the street for which the traffic data are provided. This text is used for information only.

The third line contains only the specification of the Day Case. The rules are the same as in the case of the “Default Type” traffic files (*Listing B.2*). The only difference is that the block with the specification of the moths of the year can be omitted totally, i.e. even quotation marks are not required if this block is omitted.

The remaining part of the file has the same structure as a “Default Type” file. The only difference is that the traffic data are provided as number of vehicles per hour and the speed as the actual speed in km/hour.

Listing B.2 The beginning of a traffic file which is not of "Default" type. This file contains absolute numbers.

```
"Traffic Data"   PAS_Car   Vans   "Trucks;  0.8  Truck_1;  0.2  Truck_2" Buses
Jagtvej; 1994
"<6";"<>7"
  Hour   PAS_Car     Vans   Trucks    Buses  V_short   V_long Cold_start
    1    262.0     14.0      4.0      6.0     50.0     45.0       0.0
    2    139.0      7.0      4.0      0.0     50.0     45.0       0.0
    3     93.0      4.0      2.0      0.0     50.0     45.0       0.0
    4     78.0      3.0      3.0      0.0     50.0     45.0       0.0
    5     95.0      4.0      5.0      1.0     40.0     35.0       0.0
    6    227.0     10.0     12.0     11.0     40.0     35.0       0.0
    7    726.0     95.0     49.0     13.0     40.0     35.0      10.0
    8   1426.0    194.0     77.0     18.0     30.0     30.0      10.0
    9   1520.0    191.0     90.0     18.0     30.0     30.0      10.0
   10   1257.0    194.0     79.0     26.0     40.0     35.0       5.0
   11   1250.0    188.0     90.0     20.0     40.0     35.0       5.0
   12   1261.0    194.0     86.0     18.0     40.0     35.0       5.0
   13   1371.0    128.0     72.0     28.0     40.0     35.0       5.0
   14   1363.0    183.0     64.0     29.0     40.0     35.0       5.0
   15   1487.0    178.0     56.0     26.0     40.0     35.0       5.0
   16   1593.0    166.0     39.0     24.0     40.0     35.0       5.0
   17   1646.0    127.0     34.0     15.0     40.0     35.0       5.0
   18   1529.0    110.0     23.0     14.0     40.0     35.0       5.0
   19   1427.0     76.0     14.0     17.0     40.0     35.0       5.0
   20   1061.0     71.0     10.0     15.0     40.0     35.0       5.0
   21    795.0     47.0      9.0      9.0     40.0     35.0       5.0
   22    784.0     42.0      6.0     10.0     50.0     45.0       5.0
   23    858.0     43.0      2.0     13.0     50.0     45.0       0.0
   24    629.0     23.0      1.0     11.0     50.0     45.0       0.0
"=6";"<>7"
  Hour   PAS_Car     Vans   Trucks    Buses  V_short   V_long Cold_start
    1    615.0     31.0      2.0      8.0     50.0     45.0       0.0
    2    459.0     23.0      0.0      3.0     50.0     45.0       0.0
    3    337.0     17.0      0.0      0.0     50.0     45.0       0.0
    4    257.0     10.0      0.0      2.0     50.0     45.0       0.0
    5    221.0     11.0      1.0      1.0     50.0     45.0       0.0
    6    186.0      9.0      5.0      4.0     50.0     45.0       0.0
```

Listing B.3 An example of a traffic file where the concept of the "Composed" vehicle type is used.

```
"Traffic Data"   "Light; 0.82 PAS_Car;  0.18 Vans"  "Heavy;  0.8 Truck_1; 0.15 Truck_2; 0.05 Buses"
Jagtvej 3
"<6";"<>7"
  Hour  Light       Heavy    V_short   V_long Cold_start
    1    262.0        4.0       50.0     45.0       0.0
    2    139.0        4.0       50.0     45.0       0.0
    3     93.0        2.0       50.0     45.0       0.0
    4     78.0        3.0       50.0     45.0       0.0
    5     95.0        5.0       40.0     35.0       0.0
    6    227.0       12.0       40.0     35.0       0.0
    7    726.0       49.0       40.0     35.0      10.0
    8   1426.0       77.0       30.0     30.0      10.0
    9   1520.0       90.0       30.0     30.0      10.0
   10   1257.0       79.0       40.0     35.0       5.0
   11   1250.0       90.0       40.0     35.0       5.0
   12   1261.0       86.0       40.0     35.0       5.0
.
.
.
```

Appendix C. File Location and Naming Convention

File Location

Location of data files and other program files used by WinOSPM follows some pre-defined rules.

The directory structure for location of the data and program files is shown in *Fig. C.1*.

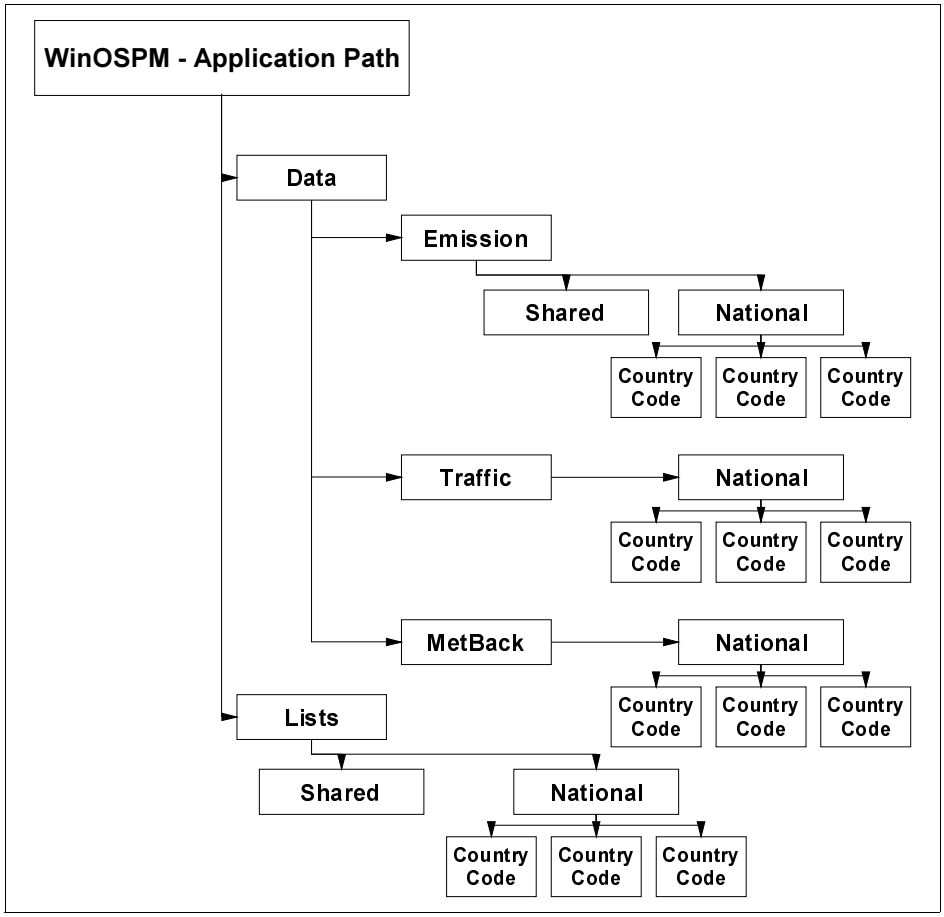


Fig. C.1 Flow diagram illustrating the file directory structure in WinOSPM.

WinOSPM Application Path

WinOSPM Application Path is the name of the directory where the WinOSPM program is installed. In the following, we will refer to this directory as **AppPath**.

Data

Data is the name of the sub-directory where all the pre-defined data files are located. In the following we will refer to this sub-directory as **Data**. The **Data** sub-directory has three sub-directories: Emission, Traffic and MetBack.

Emission

The Emission sub-directory, to which we will in the following refer as **Emission**, is furthermore divided into two sub-directories: Shared and National.

Shared

All pre-defined files with expressions for vehicle emission factors, expressions for cold start correction and mileage correction are, as default, located in the **Shared** sub-directory. These files are not country specific.

National

The National sub-directory consists of several (at least one) Country Code folders to which we will refer as **CountryCode** folders.

Country Code

Country specific data on fuel composition are located in the **CountryCode** folder.

Traffic

The Traffic sub-directory, to which we will in the following refer as **Traffic**, has only one sub-directory - **National**. This sub-directory contains traffic related files, and all traffic related files are country specific.

National

The National sub-directory consists of several (at least one) Country Code folders to which we will refer as **CountryCode** folders.

Country Code

Predefined (default) traffic files are located in the **CountryCode** folder. This folder will normally also contain files with the national fleet share data (Excel files) and mileage data (Excel files). If available, the Access Database file providing data on the national vehicle fleet, will normally be located in this folder.

MetBack

The sub-directory **MetBack** has only one sub-directory – **National**. This sub-directory contains input files that are related to meteorology and background concentrations. All such files are country specific.

National

The National sub-directory consists of several (at least one) Country Code folders to which we will refer as **CountryCode** folders.

Country Code

Files with predefined meteorology and background concentrations data (either urban or regional) will, as default, be located in the **CountryCode** folder. This folder may also contain files with data on urban emissions for selected pollutants.

Lists

Lists is the name of the sub-directory where different list files are located. These files may contain some data but they are mainly providing references to other data files. In the following we will refer

to this sub-directory as **Lists**. The **Lists** sub-directory has two sub-directories: **Shared** and, **National**.

Shared

A number of text files with definition of names of the input- and output variables is, located in the **Shared** sub-directory. These files are not country specific and they should never be modified by the user.

National

The National sub-directory consists of several (at least one) Country Code folders to which we will refer as **CountryCode** folders.

Country Code

This **CountryCode** folder must always contain the Scenario List File (Scenarios.lst). Several other country specific list files, such as e.g. a file with definition of limit values (LimValDef.lst) and a list of pre-defined traffic files, must also be located in this folder. List files with references to data files on the national fleet composition and fuel quality will, as default, be located in this folder.

Naming Convention

WinOSPM is using a naming convention that makes it possible to specify location of input and output files as well as some of the data and list files without explicitly specify the directory path. This naming convention is based on pre-defined directory path names.

SharedEmissionPath

SharedEmissionPath refers to the directory:

AppPath\Data\Emission\Shared

CountryEmissionPath

CountryEmissionPath refers to the directory:

AppPath\Data\Emission\National\CountryCode

SharedListPath

SharedListPath refers to the directory:

AppPath\Lists\Shared

CountryListPath

CountryListPath refers to the directory:

AppPath\Lists\National\CountryCode

CountryTrafficPath

CountryTrafficPath refers to the directory:

AppPath\Data\Traffic\National\CountryCode

CountryMetBackPath

CountryMetBackPath refers to the directory:

AppPath\Data\MetBack\National\CountryCode

In the following all the mentioned directory names will also be referred to as **Default Directories**.

For all user defined hourly output files as well as statistics and daily averages output files, the following rules apply:

- If the file name is given without specification of the directory path, the file location is assumed to be the **Working Directory**, i.e. the directory that was specified when creating a new project or the directory where the project file (.osp) is located.

For input files the following rules apply:

- If the name of an hourly input file is given without specification of the directory path, the file location is assumed to be the **Working Directory**, i.e. the directory that was specified when creating a new project or the directory where the project file (.osp) is located.

- If the name of an hourly input file is preceded with ".\", the file location is assumed to be **CountryMetBackPath**.

- If the name of a traffic file with diurnal traffic data is given without specification of the directory path, the file location is assumed to be the **Working Directory**, i.e. the directory that was specified when creating a new project or the directory where the project file (.osp) is located.

- If the name of a traffic file with diurnal traffic data is preceded with ".\", the file location is assumed to be **CountryTrafficPath**.

For list files, such as Vehicle List File (.vlf) and Fuel List File (.flf), the following rules apply:

- If the name of a list file is given without specification of the directory path, the file location is assumed to be the **Working Directory**, i.e. the directory that was specified when creating a new project or the directory where the project file (.osp) is located.

- If the name of a list file is preceded with ".\", the file location is assumed to be **CountryListPath**.

For files with data on the National fleet composition and mileage, the following rules apply:

- If the name of the file (Excel file) is given without specification of the directory path, the file location is assumed to be the **Working Directory**, i.e. the directory that was specified when creating a new project or the directory where the project file (.osp) is located.

- If the name of the file is preceded with ".\", the file location is assumed to be **CountryTrafficPath**.

For files with data on fuel composition, the following rules apply:

- If the name of the file (Excel file) is given without specification of the directory path, the file location is assumed to be the **Working Directory**, i.e. the directory that was specified when creating a new project or the directory where the project file (.osp) is located.

- If the name of the file is preceded with ".\", the file location is assumed to be **CountryEmissionPath**.

For files with expressions for vehicle emission factors, cold start correction and mileage correction, the following rules apply:

- If the name of the file is given without specification of the directory path, the file location is assumed to be the **Working Directory**, i.e. the directory that was specified when creating a new project or the directory where the project file (.osp) is located.

- If the name of the file is preceded with ".\", the file location is assumed to be **SharedEmissionPath**.

Using the ".\" path name convention it is possible to specify a file location that refers to a sub-directory of **Default Directory**.

Example: If a name of a file containing expressions for vehicle emission factors is given as:

.\XX\VehEmiFact.emi

the full path of such a file is assumed to be:

SharedEmissionPath\XX\VehEmiFact.emi