

RAIMI Tools–AMP User's Manual: Air Modeling Pre-Processor



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Date Revised	Manual Version	Software Version
September 2003	First Edition	AMP Version 1.0

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Introduction 1

This chapter gives you a brief overview of the Air Model Pre-processor (**AMP**) program and shows you how to navigate through AMP, giving you a quick start in analyzing the data you need.

In this chapter, you will learn to:

- Understand AMP
- Navigate AMP

Understanding AMP

U.S. Environmental Protection Agency (U.S. EPA) Region 6 developed AMP under the Regional Air Impact Modeling Initiative (RAIMI) to meet the functional need of preparing data and input files for use in the air dispersion model, ISCST3. Other related RAIMI Tools allow for completion of the air modeling:

- ISCBatch executes multiple ISCST3 air modeling runs in a single batch run.
- AIR2GIS consolidates the large plot files generated by each ISCST3 run into a single file for each source to input into the Risk-MAP Node Array Index Table.

AMP performs three key functions for air modeling within the RAIMI environment:

- Implements site parameter quantification (surface roughness, urban/rural land use) for each emission source in accordance with RAIMI methods.
- Prepares source-specific meteorological files using U.S. EPA Meteorological Processor for Regulatory Models (MPRM).
- Auto-generates air model input files for multiple sources for all four potential contaminant phases to include source-centered universal grid node array with extracted terrain elevations.

The three core capabilities of AMP provide the air modeler with a tool to prepare source-specific meteorological and ISCST3 air model input files to allow for completing the air modeling on numerous sources (greater than 100) within a regional or county-wide study area.

As each source has unique surrounding land use, available land use data analyzed using geographic information system (GIS) tools provides for accurate, repeatable determination of appropriate site parameters that influence the air dispersion and subsequent disposition of emitted contaminants downwind from a release source. These parameters may then be integrated with AMP into the MPRM input files for execution of source-specific meteorological data for a five-year period to satisfy RAIMI requirements.

Finally, the location of each source is combined with surrounding terrain data from U.S. Geological Survey (USGS) digital elevation model (DEM) digital files to build a universal grid node array aligned with the USGS longitude/latitude specifications for DEM files to complete the creation of the required ISCST3 air model input files for volatile vapor, particle, particle-bound and mercury vapor phase air modeling.

Who Should Use This Manual

This manual is intended for air modelers experienced in concentration, dry and wet deposition and removal processes, including terrain elevations. Users should also be familiar with:

- Processing data through Stage 2 of MPRM
- LULC shapefiles and DEM terrain elevation data
- Sources and formats of surface and upper air met data
- Creating an ArcView shapefile of the source inventory data

Navigating AMP

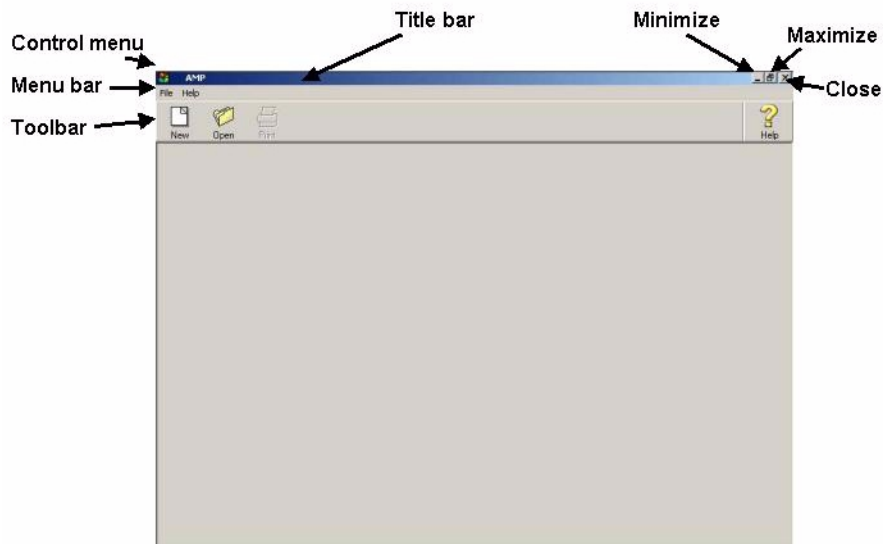
In this section, you will learn how to navigate AMP's main components:

- The main window
- The menu bar
- The toolbar buttons

The Main Window

AMP's window components follow the standard Windows features. For more information on standard Windows commands, see your MicroSoft Windows documentation.

The following figure highlights the components of the AMP main window.



The following table lists the components of the AMP window.

Window Component	Description
Control Menu box	Displays the options: Move, Size, Minimize, Maximize, and Close
Title Bar	Displays the program name (AMP) and the full path and name of the project file currently in use.
Minimize button	Minimizes the AMP window.
Maximize/Restore button	Maximizes the AMP window to occupy the entire screen or restores its pre-maximized size and position.
Close button	Closes AMP.
Menu bar	Displays menu names. To open a menu, move the mouse over the menu name and press the left mouse button. A drop-down menu appears displaying a list of related commands.
Toolbar buttons	Series of shortcut buttons that provides fast selection of some of the menu commands.

The Menu Bar

To access a menu, click on one of the menu bar options.

Note: AMP only displays the File and Help menu bar components initially. You must open a file before AMP displays all the menu bar components.

The following table lists descriptions of each menu bar command option.




Menu Bar Component	Description
File	Allows you to open and save files.
Site Data	Allows you to quantify site parameters and create air model input files.
MPRM	Allows you to create meteorological data files.

Note: The following features are not supported in this version of AMP:

- Export
- View
- Import
- Help

Toolbar Buttons

The toolbar buttons are shortcuts to some of the menu items in the drop-down menus. The following table explains the function of each toolbar button, as well as the equivalent menu command.

Button	Menu Command	Description
 New	File New	Displays the dialog box in which you specify the name and location of the file you wish to create.
 Open	File Open	Displays the dialog box in which you specify the name and location of the file you wish to open.
 Print	File Print	Prints the active project file.

Installing AMP 2

This chapter guides you through the basic steps for installing AMP.

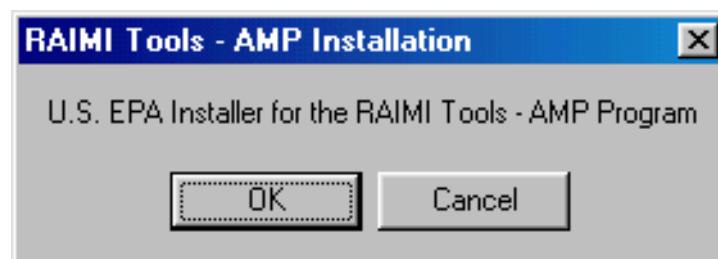
Note: AMP has a 32 character limitation for the entire file pathway, including the name of the met files. Because of this limitation, EPA recommends that you create a directory in the root directory of the computer/network drive where you want to run AMP and limit the size of the project file names to 8.3 characters.

Installing AMP

Perform the following steps to install AMP.

Step 1 Unzip the AMP.zip file.

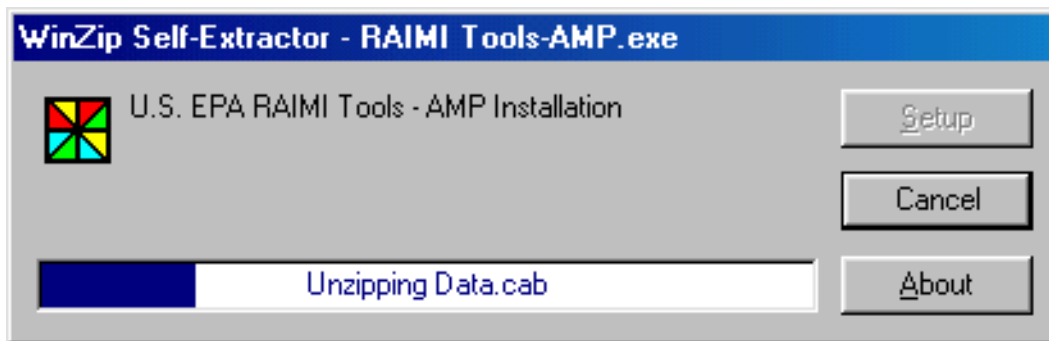
Step 2 Double-click on the RAIMI Tools-AMP.exe file. The installation program sets up the Windows Installer on your system. Click OK to start the AMP installation.



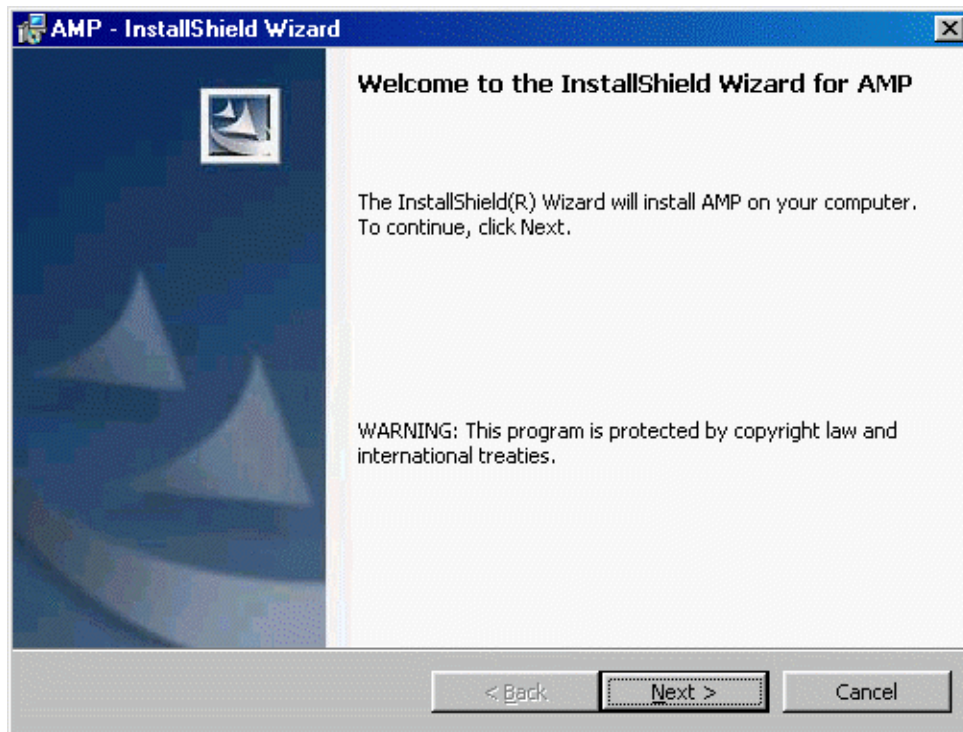
Step 3 The WinZip Self-Extractor for AMP starts. Click Setup to set up AMP on your system.



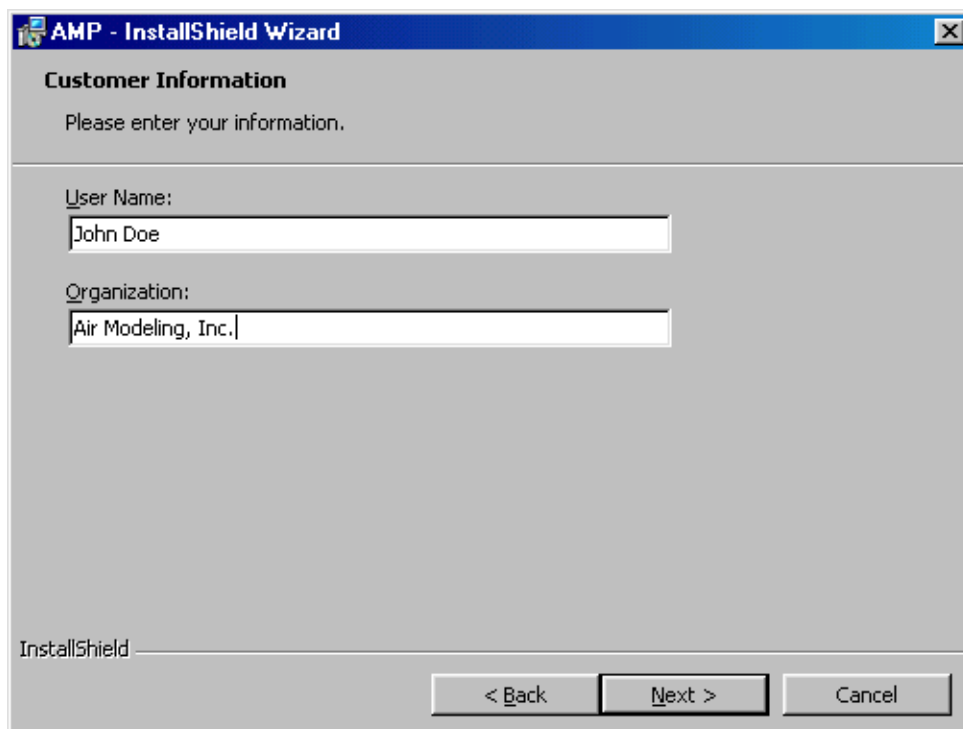
Step 4 The AMP self extractor displays the progress on the screen.



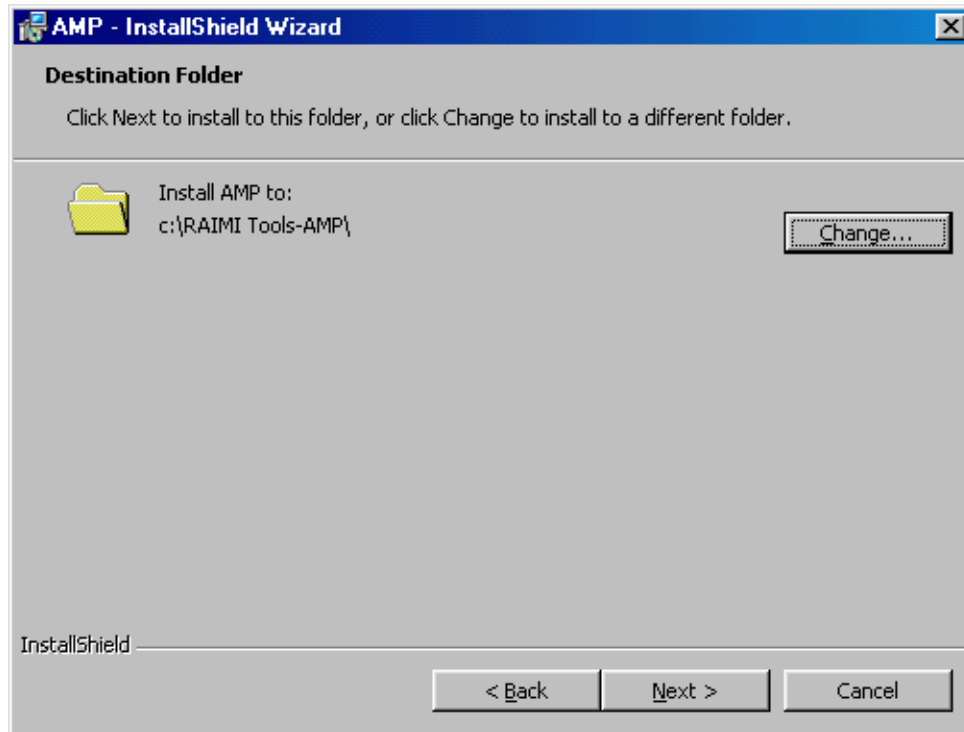
- Step 5 Once the self extractor unzips the installation files, the InstallShield Wizard for AMP begins. Click Next to continue the installation, or click Cancel to cancel the installation.



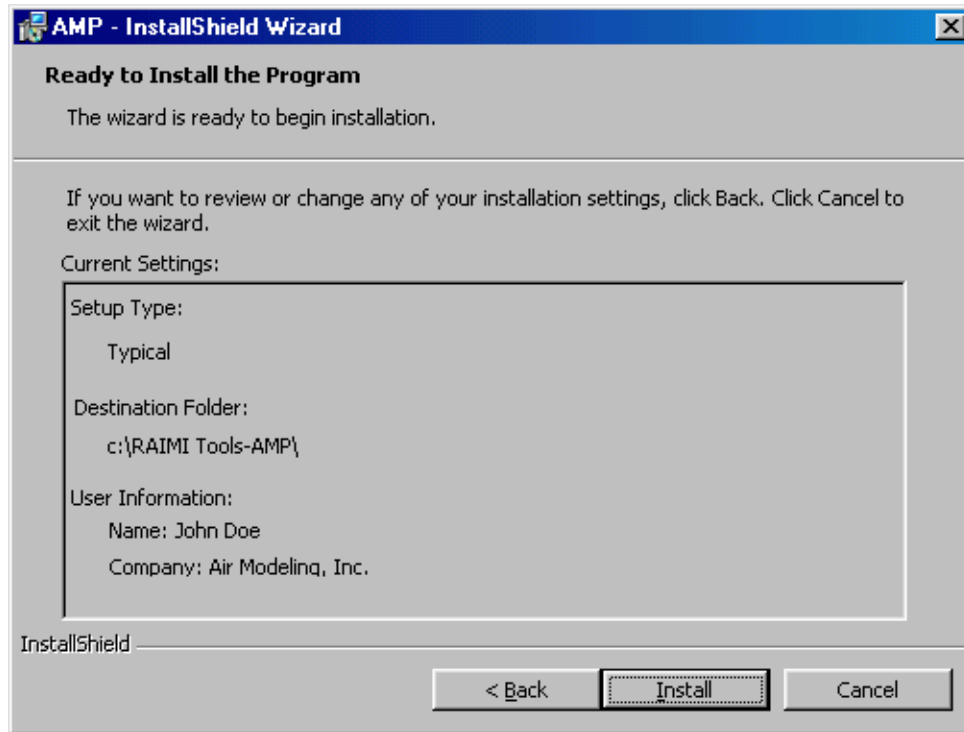
- Step 6 Enter your user name and organization and click Next.



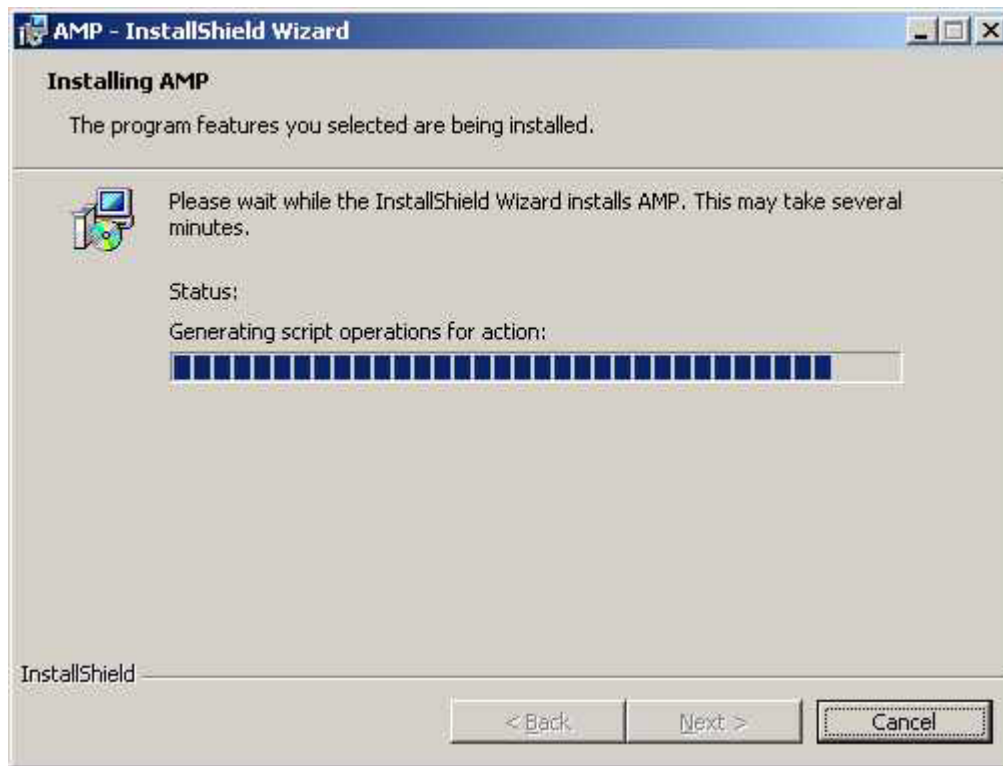
- Step 7 Select the destination folder (C:\RAIMI Tools-AMP\) where you will install AMP. The default folder is AMP. Click Change to change to a different folder. Once you select the correct folder, click Next.



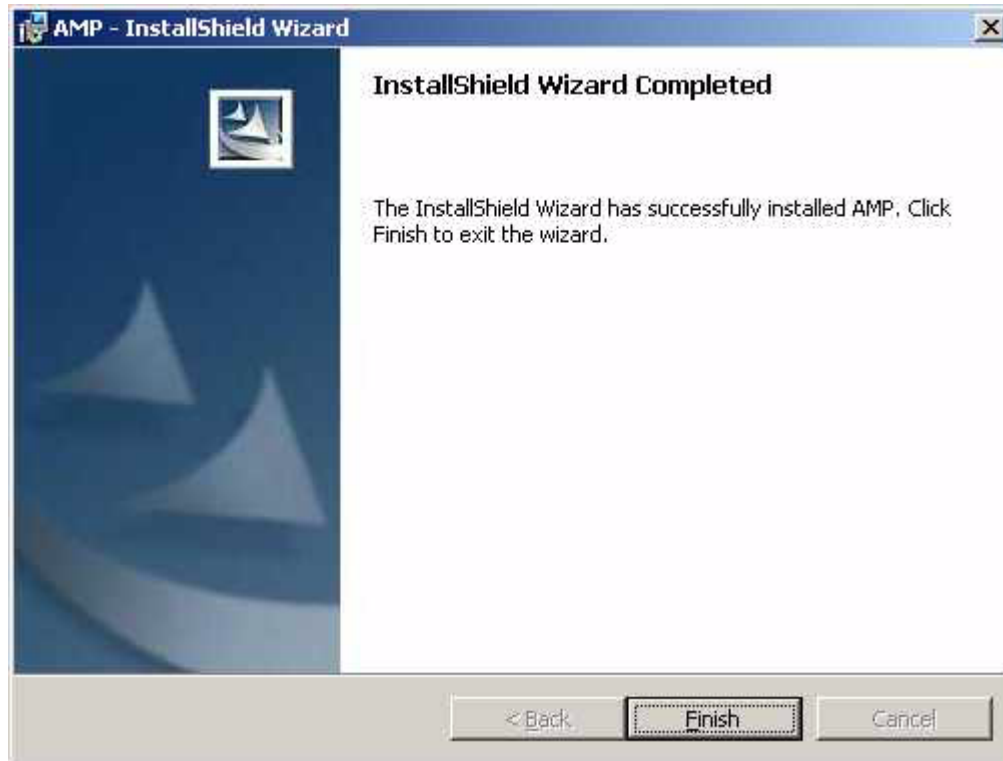
- Step 8 Confirm the summary information is correct and click Install. If any information is not correct, click Back to correct the information and continue the installation.



Step 9 The installation begins and displays a status indicator similar to the following.



- Step 10 Once the InstallShield Wizard copies all the files to your computer, click Finish to complete the installation.



Starting AMP 3

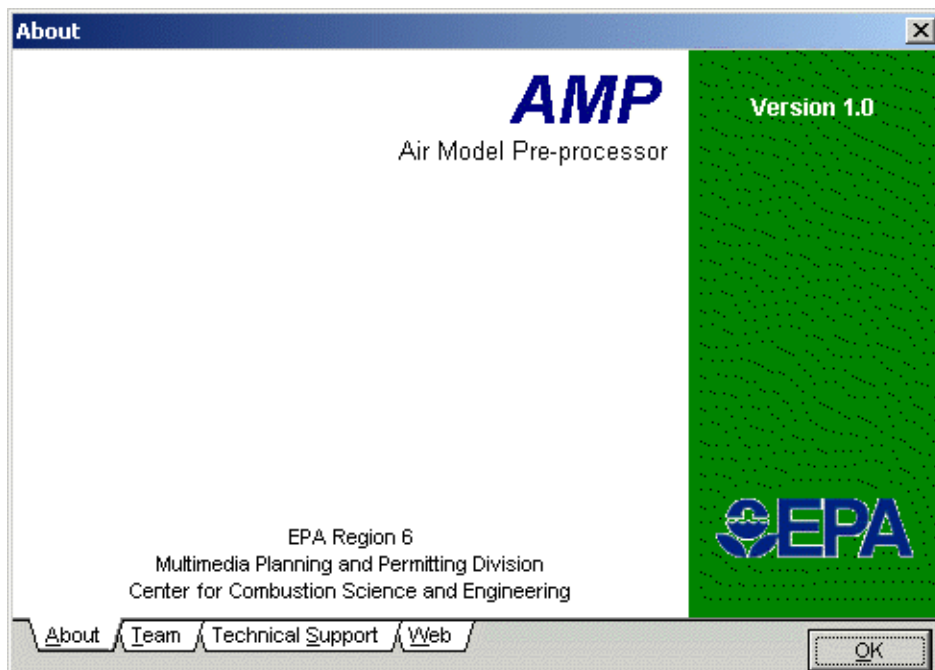
This chapter guides you through the basic steps for starting AMP. In this chapter, you will learn to:

- Start AMP
- Open a project file

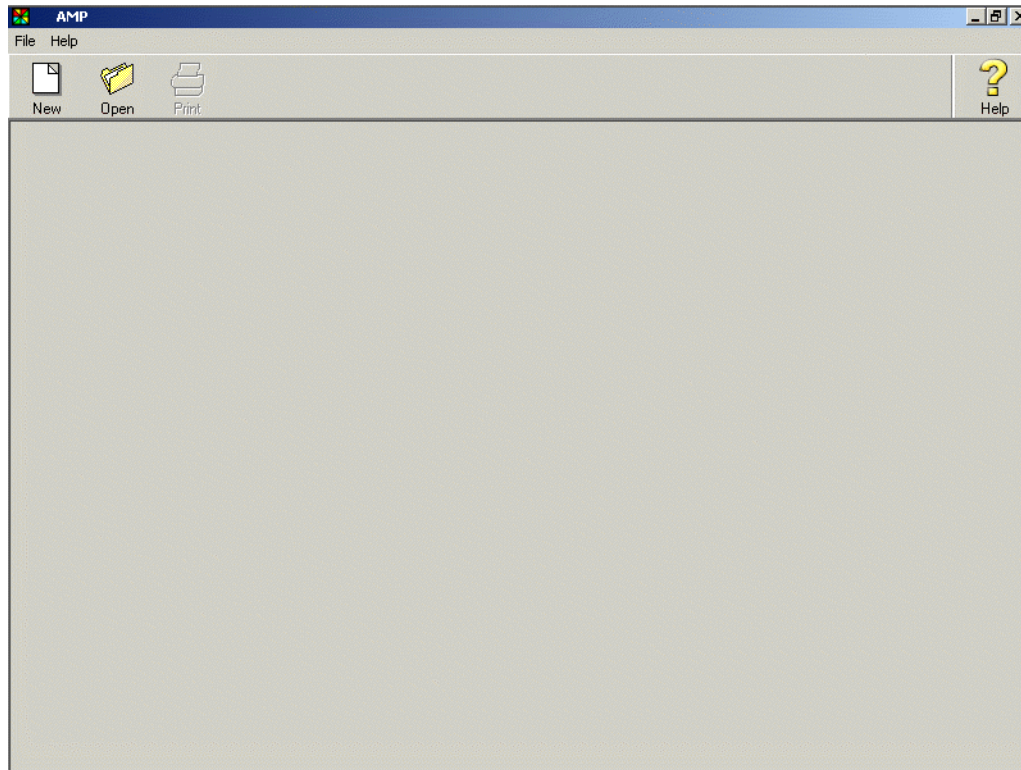
Starting AMP

Perform the following steps to start AMP.

- Step 1 Double-click on the **AMP** icon, if you have created a shortcut on the desktop, or, from the Windows **Start** menu, choose: Programs > RAIMI Tools-AMP. The **About** window appears.



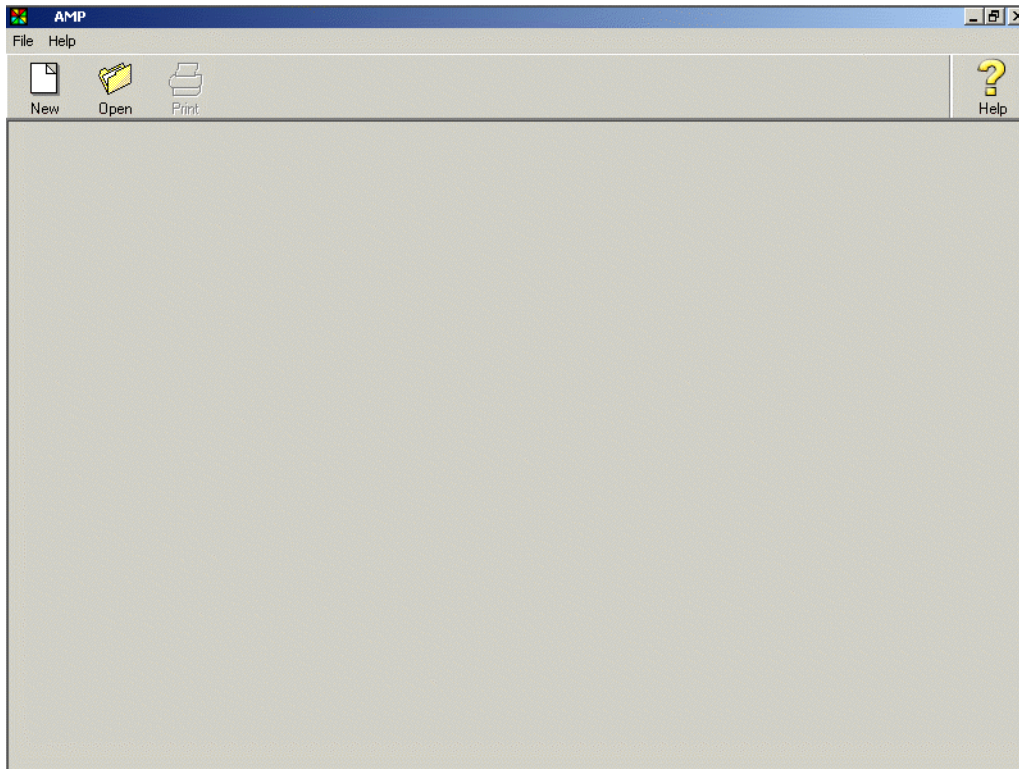
Step 2 Click **OK**. The **AMP** interface main window appears.



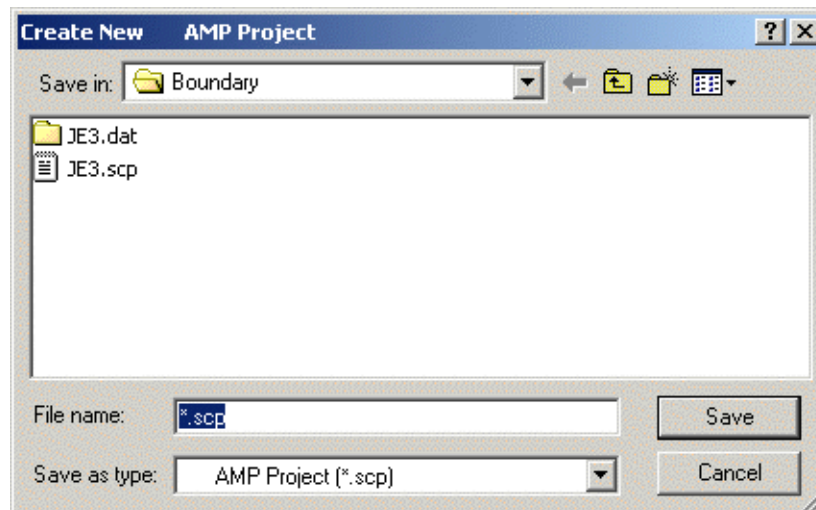
Creating a New Screen File

To create a new screen file, perform the following steps.

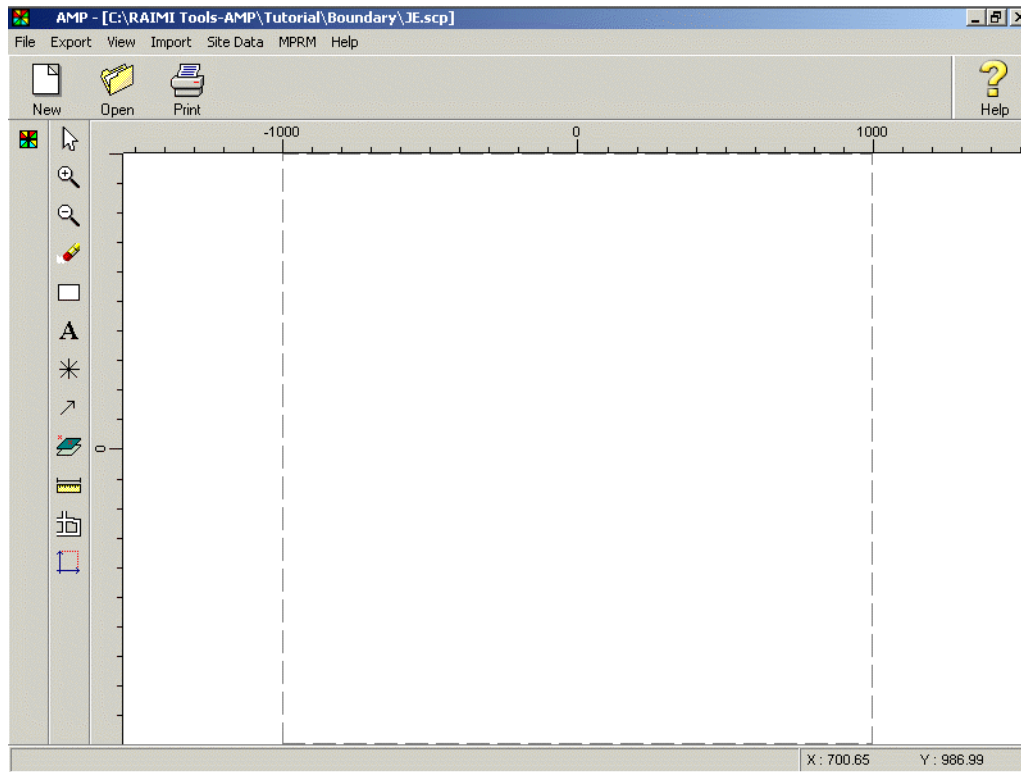
Step 1 Start AMP and click the New button.



Step 2 The Create New AMP Project window appears. Enter the file name and click Save. For the sample scenario, the file name is JE.scp.



Step 3 AMP returns you to the main window. The remaining toolbar buttons, which were shaded out before, are now active.



Implementing Site Parameter Quantification

4

The U.S. EPA has identified a refined methodology for determining site-specific surface roughness and urban/rural classification for use in completing the meteorological data processing. The recommended RAIMI method uses the U.S. EPA MPRM, which allows for directional (12 30-degree sectors) and seasonal variations in land use. The result is the input of 48 surface roughness values into MPRM. This method is implemented in the refined air models by U.S. EPA (ISCST3, AERMOD, CALPUFF).

The air model also requires source-specific specification of the surrounding land use as urban or rural for model selection of corresponding air dispersion coefficients. AMP generates these values to allow for timely, practical implementation of the revised RAIMI methods using the latest U.S. EPA meteorological pre-processor and air modeling methods.

In this chapter, you will learn to:

- Define site data
- Implement site parameter quantification

Defining Site Data

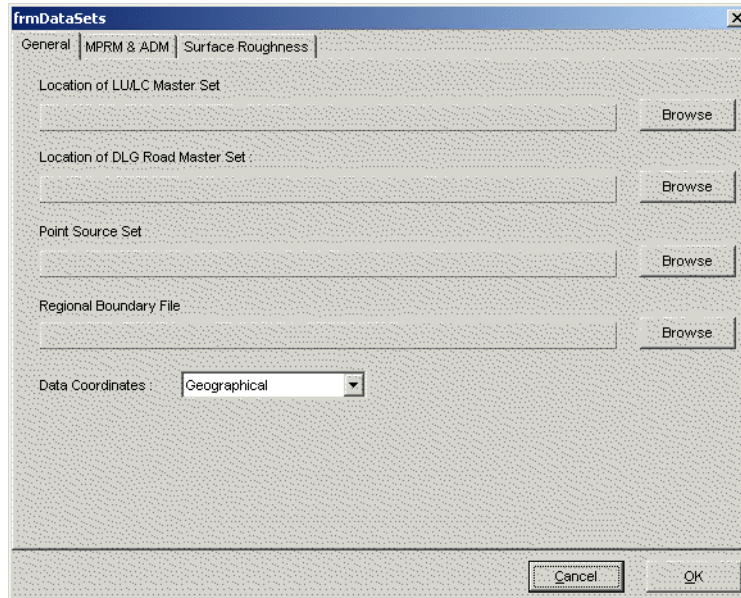
To define site data, perform the following steps.

Step 1 From the Site Data menu, select Define Datasets.



General Tab

On the General Tab, you will define where AMP can find the datasets it needs to execute.



Step 1 Click Browse to select the location of these files:

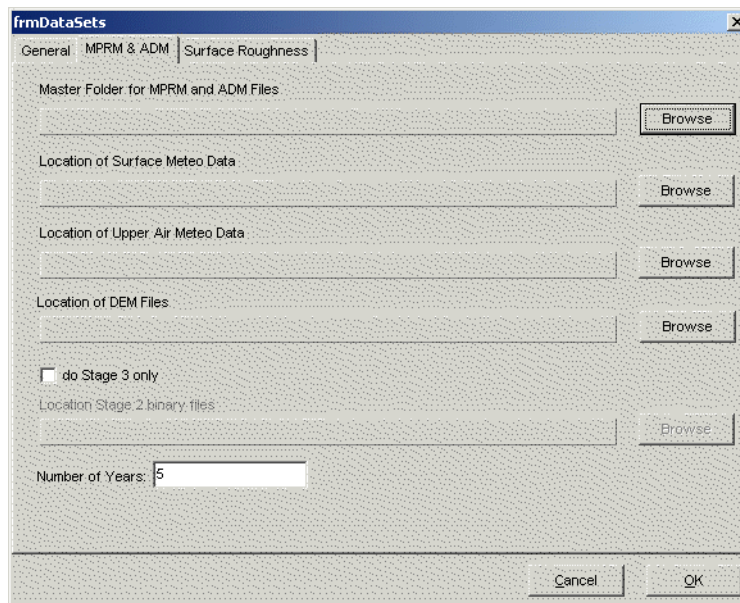
Field	Description
LU/LC Master Set	Defines the location of the land use/land cover files.
DLG Road Master Set	Not supported.
Point Source Set	Defines the location of the point source dataset.
Regional Boundary File	Defines the location of the regional boundary file.

Note: Do not specify a location for the DLG Road Master Set, as this is not supported in this release of AMP.

Step 2 Select Geographical in the Data Coordinates drop-down pick list.

MPRM & ADM Tab

On the MPRM and ADM Tab, you will define where AMP can find the MPRM and ADM datasets it needs to execute.



Step 1 Click Browse to select the location of these files:

Field	Description
Master Folder for MPRM and ADM Files	Defines the location for all the files AMP generates.
Surface Meteo Data	Not supported.
Upper Air Meteo Data	Not supported.
DEM Files	Defines the location of the DEM files. These files include the map of terrain, including elevations and elevations of grid nodes. You must download these shape files and Stage 2 bin files prior to running AMP.

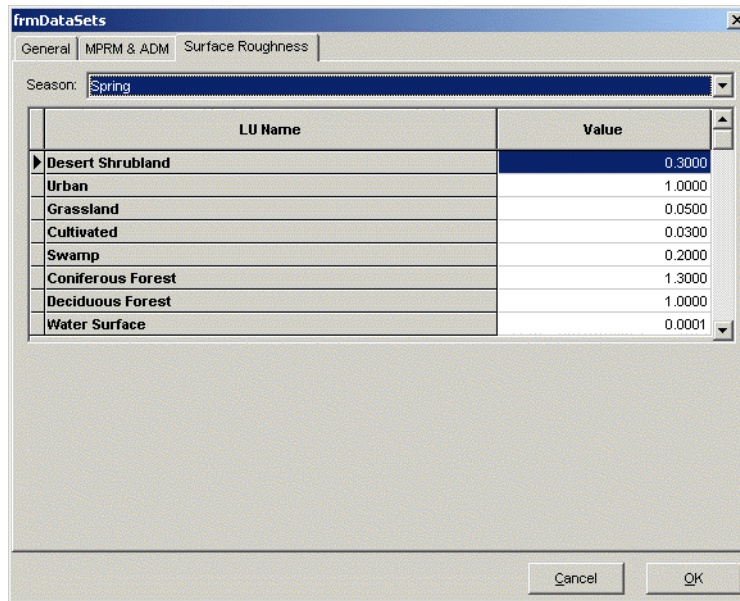
Step 2 Check the Do Stage 3 Only checkbox.

Step 3 Click browse to specify the Location of Stage 2 binary files.

Step 4 Specify the number of years in the Number of Years field. AMP defaults to five years. You can change this value, but it must match the number of years of Stage 2 met files that you generated.

Surface Roughness Tab

On the Surface Roughness Tab, you will define the values for the various LU names for each season.



LU Name	Value
Desert Shrubland	0.3000
Urban	1.0000
Grassland	0.0500
Cultivated	0.0300
Swamp	0.2000
Coniferous Forest	1.3000
Deciduous Forest	1.0000
Water Surface	0.0001

- Step 1 Select the appropriate Season.
- Step 2 AMP implements the recommended seasonal values in the U.S EPA *Meteorological Processor for Regulatory Models User's Guide (MPRM) User's Guide*. However, depending on the geographical area, you may wish to substitute other representative values. You may edit any LU value prior to execution. For example, in Region 6, you might use summer values for fall and fall values for winter.
- Step 3 Click OK to keep all the changes.

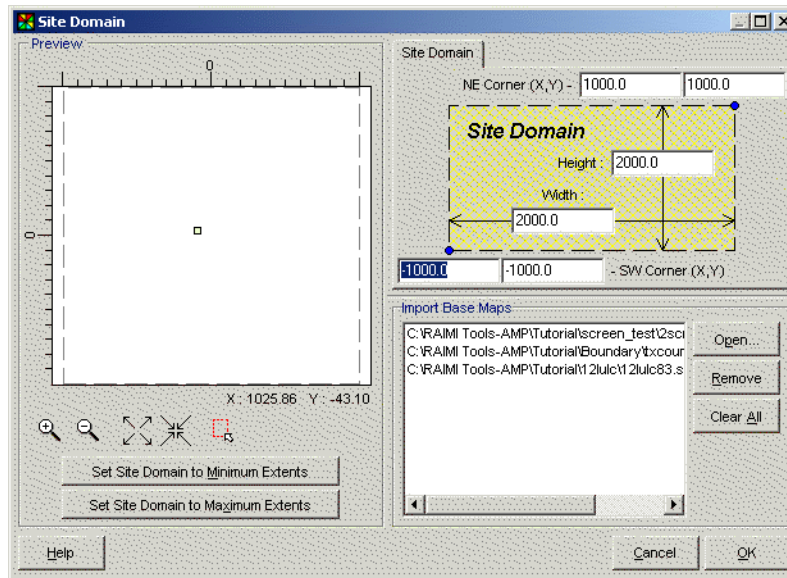
Setting Site Domain

To set the site domain, perform the following steps.

- Step 1 Click the Site Domain button.

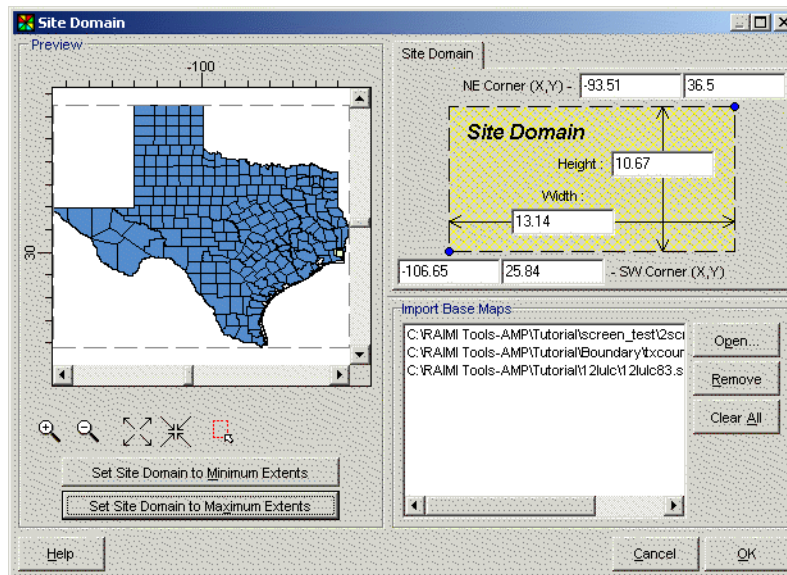


Step 2 The Site Domain window appears.



Step 3 Click on the Set Site Domain to Maximum Extents.

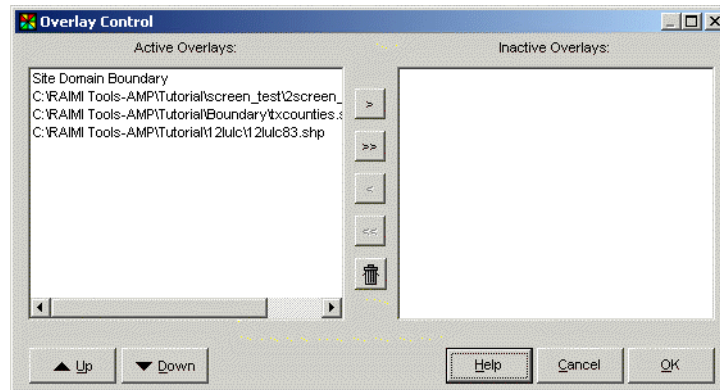
Step 4 Click OK. The boundary of your boundary file appears on the AMP screen.



Step 5 Click the Overlay Control button.




Step 6 The list of Active Overlays appears.



Step 7 Select the appropriate source inventory shape file and click the up arrow button until it is the first in the list.

Step 8 Move the LULC shape file just below the source inventory shape file by clicking the up arrow button. Click OK.

Step 9 Zoom in using the Zoom button  to see the squares representing the sources. For the scenario example, each square is one of 20 sources AMP will model.

Processing Site Parameters 5

In this chapter, you will learn to process site parameters with AMP.

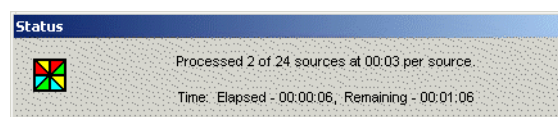
Processing Site Parameters

To process site parameters, perform the following steps.

Step 1 From the Site Data menu, select Process Site Parameters.



Step 2 AMP begins processing the site parameters, including multiple lines for fugitive sources that might exist, and shows the progress.



Note: The shape file has more than one line per source when running fugitive sources that have been subdivided. This accounts for AMP showing more than the number of sources in its progress message.

Step 3 If the status indicator box disappears without displaying an error message, AMP processed the site parameters successfully.

- Step 4 To confirm that AMP generated the files, select View Site Parameters from the Site Data menu. A screen similar to the following appears.

The screenshot shows a dialog box titled "LulcDataView" with three main sections: Sources, Sectors, and Parameters. Each section contains a table of data.

Sources :				
#	Unique Name	Coordinate X	Coordinate Y	Dispersion Coefficient
1	JE0F011	-93.9456	29.9896	Rural
2	JE1102C	-93.9468	29.9834	Rural
3	JE1104E	-93.9477	29.9776	Rural
4	JE1102E	-93.9483	29.9946	Rural
5	JE0F00M	-93.9466	29.9856	Rural
6	JE11047	-93.9468	29.9811	Rural
7	JE11025	-93.9497	29.9787	Rural
8	JE1102A	-93.9497	29.9740	Rural
9	JE4D028	-94.0288	30.0116	Urban
10	JE1104C	-93.9491	29.9814	Rural
11	JE0F01w	-93.9444	29.9841	Rural
12	JE1104I	-93.9494	29.9777	Rural

Sectors :		
#	Start Angle [Degrees]	End Angle [Degrees]
1	15.0	45.0
2	45.0	75.0
3	75.0	105.0
4	105.0	135.0
5	135.0	165.0
6	165.0	195.0
7	195.0	225.0
8	225.0	255.0
9	255.0	285.0
10	285.0	315.0
11	315.0	345.0
12	345.0	15.0

Parameters :			
Season	Albedo	Bowen Ratio	Surface Roughness
Winter	0.30	1.50	0.20
Spring	0.12	0.25	0.32
Summer	0.14	0.41	0.32
Fall	0.16	0.41	0.32

A "Close" button is located at the bottom right of the dialog box.

- Step 5 Confirm by source and season.

Generating ISCST3 Air Model Input Files 6

AMP automatically generates the ISCST3 air model input files. In this chapter, you will learn to:

- Create ISCST3 input files

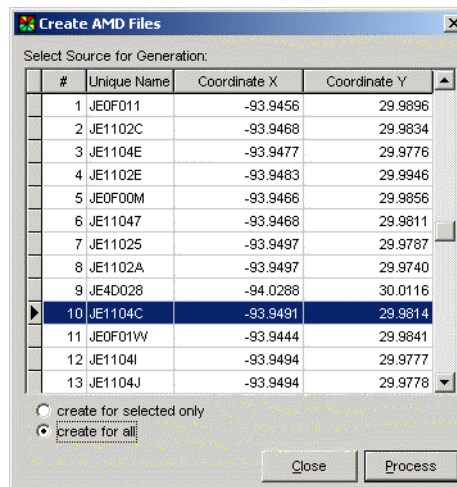
Creating ISCST3 Input Files

To create the ISCST3 files, you must select the appropriate Air Dispersion Model (ADM) files. To select the ADM files, perform the following steps.

Step 1 From the Site Data menu, select Create ADM Files.



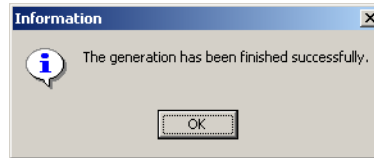
Step 2 The Create ADM Files window appears.



Step 3 Check the Create for All radio button.

Step 4 Click Process.

Step 5 Once AMP autogenerates the universal grid node array and ADM files, it will display the following message: "The generation has been finished successfully." AMP created the appropriate ISCST3 input files.



Step 6 Click OK.

Step 7 Click Close.

Step 8 AMP created a folder under the project folder with the files for each source for the four phases:

Phase	Extension	Pathway
vapor	.VIN	direct
particle	.PIN	indirect
particle-bound	.BIN	indirect
mercury vapor	.HIN	indirect

Generating Meteorological Data Files 7

AMP pre-processes the five years of meteorological data required for air modeling to support RAIMI applications applying the 48 surface roughness values determined for each source.

Note: Be sure to execute MPRM Stage 1 stand-alone prior to using AMP to ensure quality and replace missing data for the surface and upper-air meteorological data. Also, execute MPRM Stage 2 to combine these surface and upper air data.

AMP completes MPRM Stage 3 applying the source-specific site parameters.

In this chapter, you will learn to:

- Generate meteorological data files
- Verify output

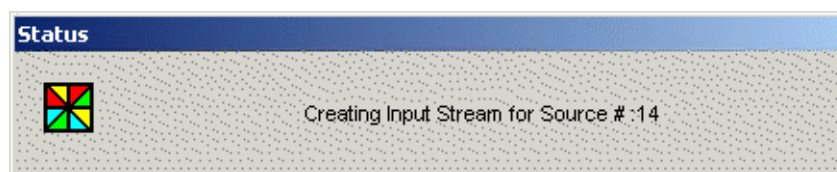
Generating Meteorological Data Files

To generate meteorological data files, perform the following step.

Step 1 From the MPRM menu, select Run Batch.



Step 2 AMP begins executing Stage 3 for each year for each source. In the example scenario, AMP creates five years of met data, merging the data into a single five-year met file for each source. As AMP executes, it displays a status indicator similar to the following.



Step 3 When AMP completes processing, the status message disappears.

Step 4 Close the AMP project.

Verifying Output

To verify that AMP generated the files, perform the following steps.

Step 1 From Windows Explorer, navigate to your working project folder. For the example scenario, the folder name is JE. You will see two folders, JE and Stage 2. Stage 2 is the folder you created to store the Stage 2 binary (.mrg) files and the Stage 2 station identifier (.ma_) files.

Step 2 Open the JE folder. AMP generated the files that have P in the eighth character position. Review the list of files to ensure you have the appropriate number of source files for the following file type:

File Type	Extension	Pathway
site-specific met data	.MET	direct/indirect

Note: If errors occur, see the U.S. EPA *Meteorological Processor for Regulatory Models User's Guide (MPRM) User's Guide* to debug the met data.

Working with AMP Outside Texas 8

U.S. EPA Region 6 initially designed AMP for use in Texas. To run AMP outside Texas, you must perform the following steps:

- Step 1 Name the sources to be air modeled using a number as the first or second character.
- Step 2 Name the met files from Stage 2 as sequential numbers (1,2,3,4,5) rather than by met station name.
- Step 3 Edit the met program template file (MPRMSiteCharTemplate) for the time zone and anemometer height. The following represents the MPRMSiteCharTemplate file.

```

JB STA
JB OUT DISK <#proj_rp3>
JB ERR DISK <#proj_er3>
JB FIN

OS STA
OS LOC <#site_name> <#site_lon> <#site_lat> 0
OS SFC SETUP <#Period> <#num_sectors>
<#sector_geometry>
<#sector_values>
OS FIN

MP STA
MP MET DISK <#proj_mrg> 6
MP MMP DISK <#proj_met> ISCGASW
MP VBL STAB NWSWXX <#anemh>
MP FIN

```

- Step 4 To change time zone from Central Time Zone (UTC-6 hours), to Pacific Time Zone (UTC-8 hours), change the line in the unedited MPRMSiteCharTemplate file from:

```

MP MET DISK <#proj_mrg> 6

to:

MP MET DISK <#proj_mrg> 8

```

- Step 5 To specify the anemometer height in meters (e.g. '10.0' meters), change the line in the unedited MPRMSiteCharTemplate file from:

```
MP VBL STAB NWSWXX <#anemh>
```

to:

```
MP VBL STAB NWSWXX 10.0
```

- Step 6 The following represents the edited MPRMSiteCharTemplate file for use in Pacific Time Zone with a 10.0-meter anemometer height:

```
JB STA
```

```
JB OUT DISK <#proj_rp3>
```

```
JB ERR DISK <#proj_er3>
```

```
JB FIN
```

```
OS STA
```

```
OS LOC <#site_name> <#site_lon> <#site_lat> 0
```

```
OS SFC SETUP <#Period> <#num_sectors>
```

```
<#sector_geometry>
```

```
<#sector_values>
```

```
OS FIN
```

```
MP STA
```

```
MP MET DISK <#proj_mrg> 8
```

```
MP MMP DISK <#proj_met> ISCGASW
```

```
MP VBL STAB NWSWXX 10.0
```

```
MP FIN
```

References 9

U.S. Environmental Protection Agency Office of Air Quality Planning and Standards Emissions, Monitoring, and Analysis Division, *Meteorological Processor for Regulatory Models User's Guide (MPRM) User's Guide*. Research Triangle Park, NC, August 1996.

