



User Tutorial

for the Caltrans

Pavement Management System

(PaveM)

AgileAssets® Pavement Analyst



AgileAssets Inc.

AgileAssets Pavement Analyst

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Table of Contents

1	Introduction.....	1
1.1	What's in this Tutorial	1
1.2	Conventions Used in this Tutorial.....	1
1.3	How to Seek Help	1
2	Getting Started	2
2.1	Logging on to the System.....	2
2.2	Left Gutter Icons.....	4
2.3	Displaying a Window.....	5
2.3.1	Displaying a Window by "Point & Click".....	5
2.3.2	Displaying a Window via Quick Links	6
2.4	Locating Records within a Window Using the Scroll Bars and Navigation Toolbar.....	7
2.5	Selecting What Data Is Displayed	8
2.5.1	Setting a Filter	9
2.5.2	Specifying Sort Order	11
2.6	Attaching a File to a Record.....	13
2.7	Location Referencing System	14
2.7.1	Working in Different Reference Systems.....	16
3	Database Configuration Overview.....	17
3.1	Database Menu Structure	18
3.2	Analysis Menu Structure	25
3.3	Setup Menu Structure	27
3.4	Viewing and Working with Data.....	28
3.4.1	Grid and Form Data Views	28
3.4.2	Graph View	29
3.4.3	Pavement Structure Graph.....	30
3.4.4	Using the Road View.....	31
3.4.5	Working with GIS Data Explorer.....	34
3.4.6	Exporting Data	43

3.4.7	Show Data on Google Map/ Bing Map	44
3.4.8	Viewing APCS Data using Hyperlink to Fugro's iVision Software	46
4	Updating Pavement Management Sections.....	49
4.1	Overview	49
4.2	How to Run Finest Partition/Aggregation	50
5	Recording “Pavement” Work.....	53
5.1	Overview	53
5.1.1	The Contracts and Layers Data Windows.....	53
5.2	Entering Data for a Completed Project.....	54
5.3	Adding a New Layer to an Existing Project	55
6	Updating Models And Analysis Parameters	56
6.1	Overview	56
6.2	Updating Unit Costs	56
6.3	Updating Decision Trees	56
6.3.1	Updating an Existing Decision Tree	57
6.3.2	Creating a New Decision Tree	60
6.4	Updating Treatments.....	64
6.4.1	The Treatments Window	64
6.4.2	Creating a treatment and its improvements in treatments window	66
6.5	Updating Performance Models.....	67
6.5.1	Types of Models Supported by AgileAssets Pavement Analyst	68
6.5.2	Performance Modeling Set-up.....	69
6.5.3	Specifying Performance Models.....	72
7	Updating Master Work Programs	75
7.1	Overview	75
7.2	Entering and Updating MWP Projects.....	75
7.2.1	Entering Project Data in MWP window.....	75
7.2.2	Example of Checking for Section Overlaps	76
7.2.3	Creating Projects from Scenario Result Line Items	78

7.3	Deleting Completed Projects from the MWP	81
7.4	Updating Project Status in Master Work Program.....	82
8	Conducting Statewide Network Analysis	83
8.1	Overview	83
8.2	Creating a Network Master File.....	83
8.3	Conducting Optimization Analysis.....	86
8.3.1	Optimization Analysis Window Description	86
8.3.2	Configuring Constraints for Optimization Analysis	90
8.3.3	Defining and Running a Multi-Constraint Optimization Analysis.....	93
8.3.4	Defining and Running a Multi-Year Multi-Constraint Optimization Analysis	104
8.4	Creating a Work Program from Scenario Results	107
8.5	Non Optimization Treatment Recommendations.....	109
8.5.1	Current Treatment Needs of a Section.....	110
8.5.2	Developing and Assigning Rehabilitation Strategies to Road Sections	112
9	Reporting.....	116
9.1	Overview	116
9.2	Report Source Data	116
9.3	Report Types.....	117
9.4	Reports Management Window	119
9.4.1	Reports Pane	119
9.4.2	Right-click Commands for Folders	119
9.5	Displaying Existing Reports.....	121
9.5.1	Right-click Commands for Individual Tabular, Graph, and GIS Reports and GIS Maps.....	121
9.5.2	. Right-click Commands for Jasper Reports	122
9.5.3	How to Display a Report.....	123
9.6	How to Create a Report	125
9.6.1	How to Create a New Standard Report	125
9.6.2	How to Create a New Graph Report.....	130
9.6.3	How to Create a New GIS Report	135

Exporting Data	141
9.7 Dashboard.....	143
9.8 Report Sharing.....	145
9.8.1 Share Report Window	145
9.8.2 How to Create a Share Group.....	145
9.8.3 How to Share a Report.....	147
9.8.4 How to Stop Sharing a Report.....	147
9.8.5 How to Make a Report Public.....	148
9.8.6 How to Make a Report Private	149
9.8.7 PaveM Reports/Views Lists.....	149

1 INTRODUCTION

1.1 What's in this Tutorial

This tutorial is intended for users of the Agile Pavement Analyst (Caltrans PaveM) system. This chapter provides an introduction to the system and covers conventions used within the set of tutorials.

1.2 Conventions Used in this Tutorial

To assist you in differentiating types of information or actions required of you, this tutorial uses the following typographical conventions:

- > The greater-than sign separates menu levels (for example, File > Open).
- CAPITALS Upper case text indicates the names of keys on the keyboard (for example, SHIFT or CTRL or ALT+F4).
- + When used between keyboard keys, the plus sign indicates keys that must be pressed simultaneously to perform a command (for example, ALT+F4).
- Bold Commands are shown in a heavy bold font (for example, Retrieve).
- Tahoma The Tahoma font is used for text that appears in a window and statements that are to be typed in exactly as shown.
- Title Caps Title Capitalization often indicates a specific data element type (for example, Treatment, Performance Index, Work Code).

1.3 How to Seek Help

Every effort is made to ensure that you can successfully use the PaveM system to efficiently perform the tasks of your job. Yet, at times, questions may arise about particular features or how to perform certain tasks. One source of assistance that is provided to help you is the comprehensive Help menu system found within the PaveM. This system contains information on all features of the system and provides instructions on using many features of the system. To access the Help system, click the  icon on the far left side of your browser window.

2 GETTING STARTED

2.1 Logging on to the System

To launch and log on to the PaveM system, you need the following information:

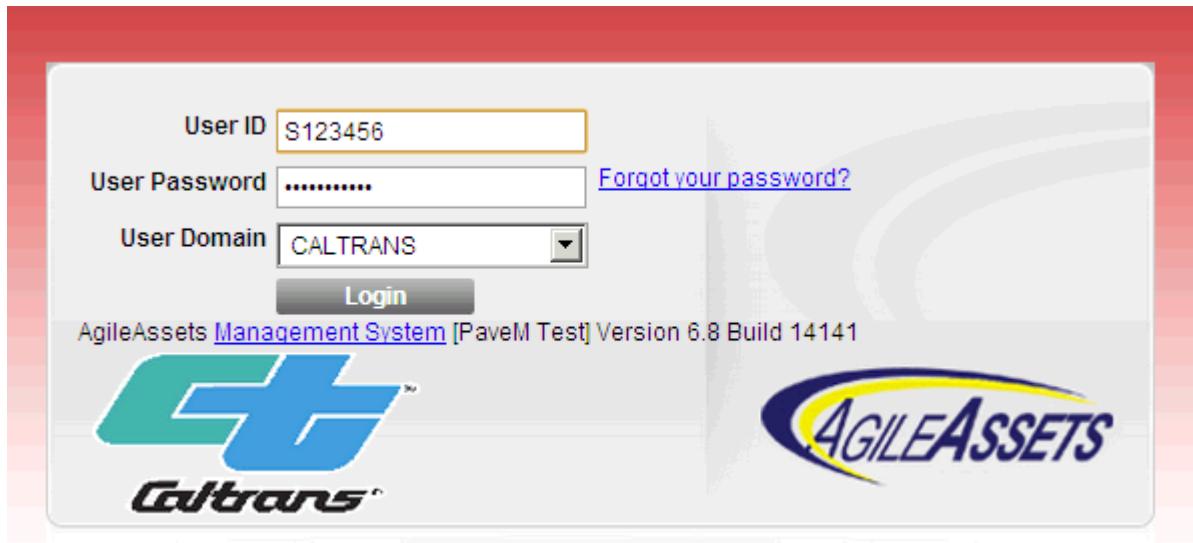
- ❖ The URL (web address) to access the system.
- ❖ Your user ID.
- ❖ Your user password.
- ❖ The administrative unit to which you are assigned.

Once you have this information, follow these steps to log on to the system:

1. Launch your Internet browser.
2. In the address window of the browser window, type the URL for where the system resides and press Enter. (Note that if this is the first time you are accessing the system, you should save this URL as a "favorite" to facilitate return visits.)



3. After the Enter key is pressed, the browser window will show the log on window for the system. An example of this window is shown below.

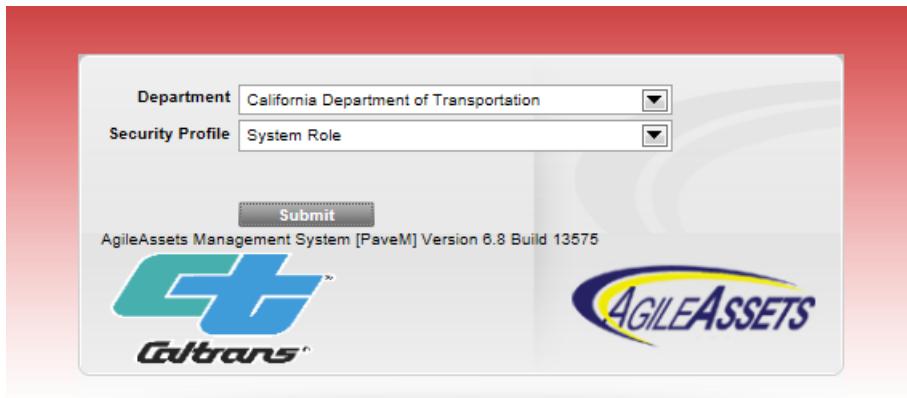


The screenshot shows a login interface for the AgileAssets Management System. At the top, there are fields for 'User ID' (containing 'S123456'), 'User Password' (redacted), and 'User Domain' (set to 'CALTRANS'). To the right of the password field is a link 'Forgot your password?'. Below these fields is a large 'Login' button. At the bottom of the form, it says 'AgileAssets Management System [PaveM Test] Version 6.8 Build 14141'. On the right side of the form, there are two logos: the Caltrans logo (a stylized 'C' and 'T') and the AgileAssets logo (the word 'AGILEASSETS' in blue and yellow).

4. In the User ID field, type your user ID. (If you have previously logged onto the system using this machine, the system will remember your user ID and so you will only need to enter your password.)
5. Press the Tab key to move the cursor to the User Password field and type your password.

6. Click Login. The system checks the information you entered and, if recognized, logs you on to the system. If you are assigned to only one administrative unit, the system automatically selects this unit and displays the home window of the system. The log-on process is now complete.

On the other hand, if you are assigned to more than one administrative unit, the system displays a window to select your administrative unit. An example of this window is shown below.



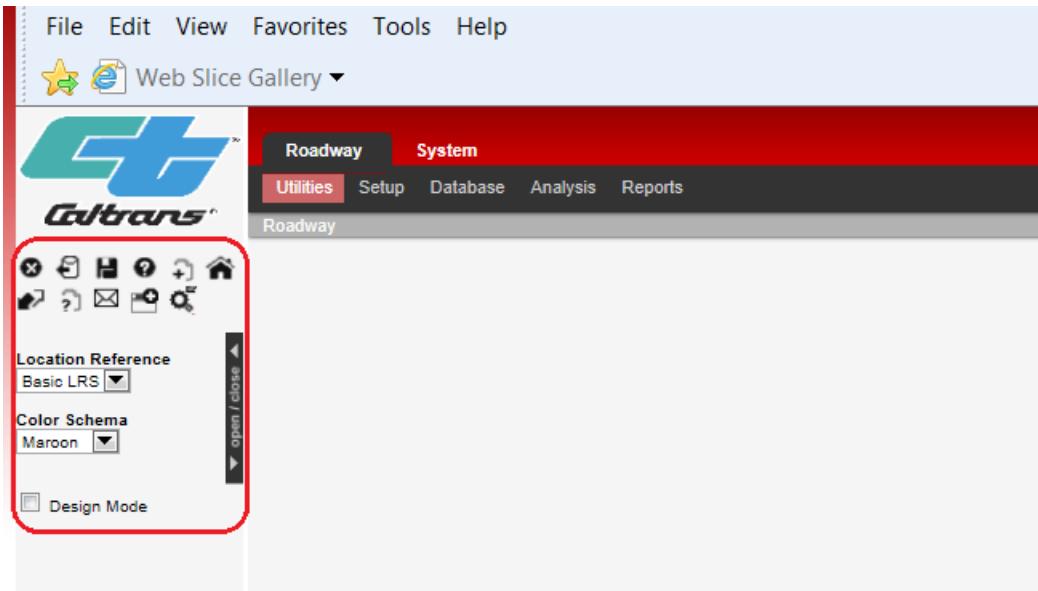
Note: You are only allowed a specific number of attempts to log on within a certain time period. (The System Administrator sets the number of attempts and time period.) After the last unsuccessful attempt, you will be locked out of the system. You must contact the System Administrator to be allowed to log on to the system.

7. Click the down arrow to display the administrative units, locate and then click the desired unit. (Note that if you have previously logged onto the system, the system will "remember" the unit you last used and so you may skip this step.)

Note: The selection of an administrative unit is important. At various points in the system, the phrase "use current" appears. The current unit is the unit you selected when you logged on. You may change the administrative unit at any time while logged on by clicking the  icon. This displays the selection dialog box for administrative unit. You may then select a different administrative unit from those provided in the drop-down list.

8. Click Submit. You are now fully logged onto the system, and the system displays the home window of the application. This window shows your "dashboard". The dashboard is where up to four reports may be displayed for quick review. See the section on reports for more information about placing particular reports on the dashboard.

2.2 Left Gutter Icons



The left gutter, which may be viewed or hidden by clicking the black bar 'open/close' at the right edge, provides the icons shown in the table below. The gutter also provides a Color Schema field with a drop-down list of colors. You may select a color from the list to change the appearance of the window and what color indicates the selected record. A Design Mode field is also provided for users with the appropriate security profile.

The following icons are found in the left gutter:

-  Exit – This icon closes the application.
-  Retrieve – This icon retrieves the latest data for the displayed window from the database. Note that this will overwrite any new, unsaved data (meaning that the unsaved data will be lost).
-  Save – This icon stores the new data in the window in the database.
-  Help – This icon displays Help information for the displayed window.
-  Add Quick Link – This icon adds a link to the displayed window in the left gutter as well as the Quick Links group selected in the Manage Window Links window. The Manage Window Links window is displayed by clicking the  icon in the left gutter of the browser window. This window allows you to configure Quick Link groups as well as what is displayed when you hover over a Quick Link hyperlink in the left gutter. By selecting a particular Quick Link group, you select what Quick Links are shown in the left gutter. You also may determine whether the Quick Links are for you alone or are shared amongst all members of your agency. More is explained further in this section.

Note: The default Quick Link group is called Quick Links. Each user has a similarly-named group. This group is intended for private use only and should not be made public.

After selecting this icon, the application displays a new window with two tabs: Link Groups and Links. The Link Groups tab shows the different groups into which the Quick Links are

divided. For the link group selected in the Link Groups tab, the Links tab shows the target windows of the links in the Link Groups tab. The text in the Comments column is what is displayed when you hover the cursor over the Quick Link.

-  Remove Quick Link – This icon appears beside each entry in the Quick Links list, and is used to remove an entry from the list as well as the Manage Window Links window.
-  Home – This icon displays the Home window for the selected module. (The Home window is typically a blank tab.)
-  Administrative Unit Selection – This icon displays the window for selecting an administrative unit and a security profile. This allows you to select a different administrative unit and/or security profile without logging off and then logging back on.
-  Manage Window Links – This icon displays a new window in which you may configure Quick Link groups (which in turn determine what Quick Links are shown in the left gutter) as well as text that is displayed when you hover the cursor over a Quick Link hyperlink.
-  Data Selection – When the dashboard for a module is displayed and data selection for the module is allowed, this icon is available if implemented (not all applications provide this icon). When clicked, it displays a window with a set of columns that are determined at project implementation. You may then select what data will be displayed for one of these columns.
-  Create New Session – This icon allows you to start a new, independent session without ending the current session. After clicking the icon, the system displays a new tab in your browser that shows the dashboard of the current module. You may then alternate between the tabs to see and modify different windows in the same application.
-  Reset User Window Settings – This icon resets any customized window settings for the current window to their default settings.

2.3 Displaying a Window

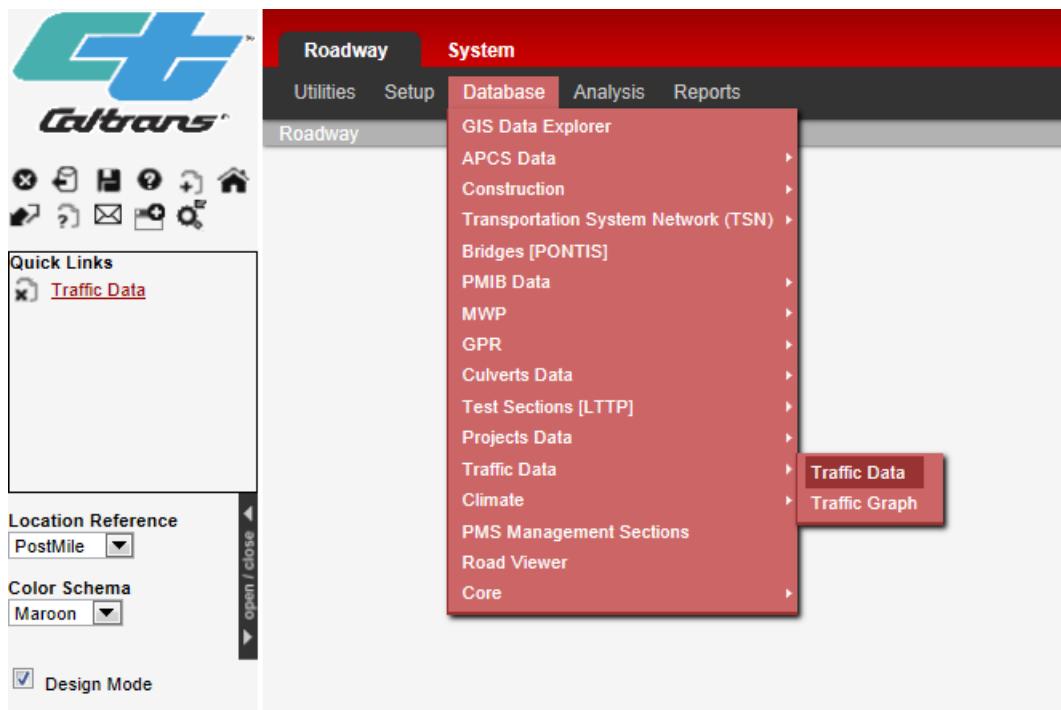
PaveM provides two ways to display a window: "point & click" commands and Quick links (which is a special, customizable form of hyperlinks).

2.3.1 ***Displaying a Window by “Point & Click”***

You display a window by selecting a series of commands from menus. For example, to display the Performance Models window, perform the following steps:

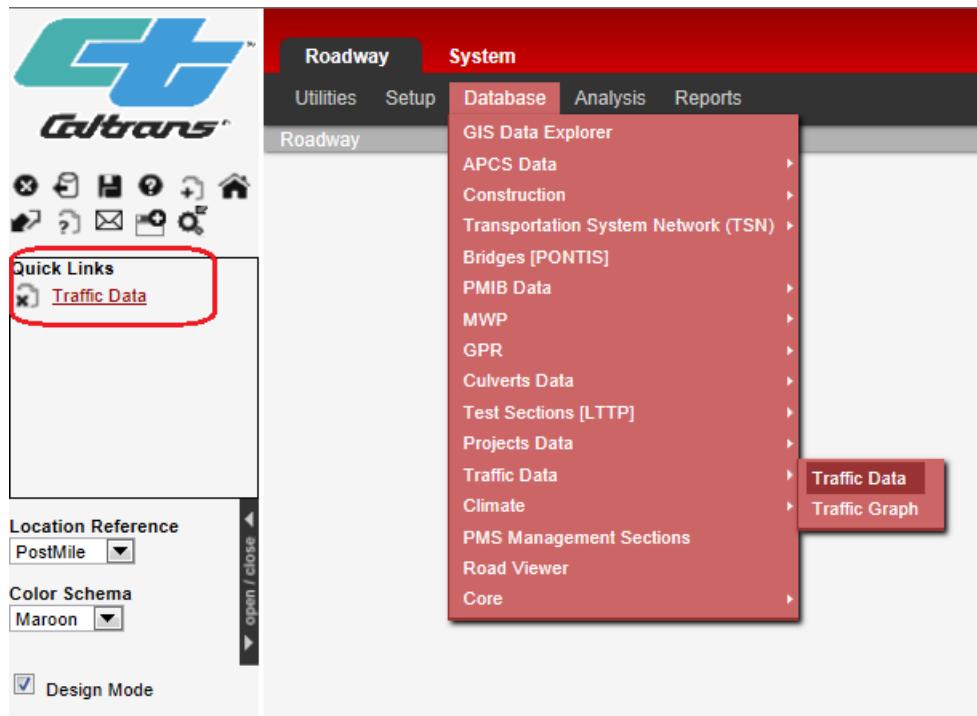
1. Since the default active module is Roadway, you don't need to select a module.
2. Click the menu item Database. This displays the submenus of the Database menu.
3. Click the menu item Traffic Data (Roadway > Database > Traffic Data > Traffic Data). The Traffic Data window is displayed.

Graphically, this series of steps is shown below.



2.3.2 Displaying a Window via Quick Links

1. Quick Links provide a handy way to quickly navigate to frequently used windows from a module's main menu. These are essentially customizable hyperlinks that remove the necessity of "pointing & clicking" to get to a window within a module. (You cannot establish a Quick Link to a window in a different module.)
2. For example, say you would like to move quickly to the Traffic Datasheet window within the Roadway module. Ordinarily, you would need to perform a similar series of steps shown in the previous section (Roadway > Database > Traffic Data). This involves several "points & clicks." You could shorten this navigational path considerably by establishing a Quick Link to the Traffic Data window as described below:
3. Display the Traffic Datasheet window (Roadway > Database > Traffic Data > Traffic Data).
4. Click (shown on the far left of the browser window). A Traffic Datasheet hyperlink appears on the left side of the browser window. Now, whenever you select the Roadway module, you may simply click this hyperlink to directly display the Traffic Datasheet window rather than "point click" through the series of menus.
5. Note that this icon appears next to the Traffic Data hyperlink. This icon will remove the Quick link to the Traffic Datasheet window.
6. Graphically, these steps are illustrated below.

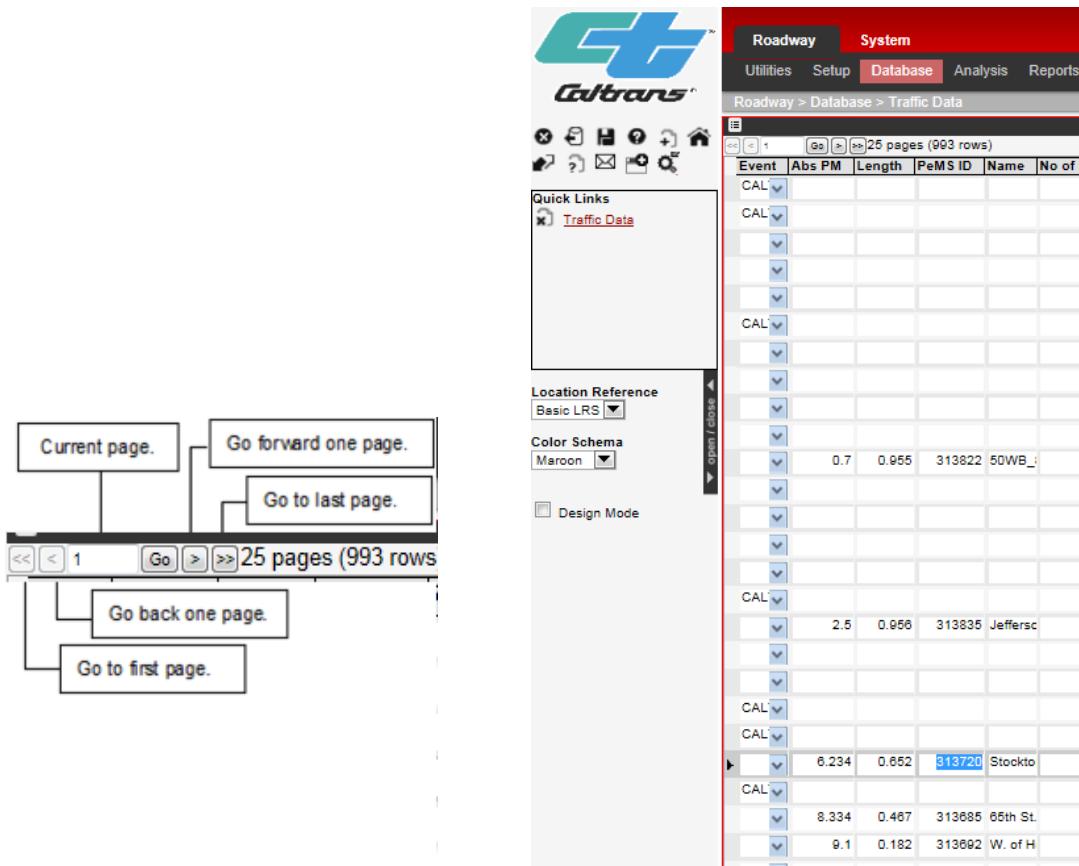


2.4 Locating Records within a Window Using the Scroll Bars and Navigation Toolbar

Once a window is displayed, scroll bars are available to move what is viewable either vertically or horizontally. Be observant as to which scroll bars you select to use — two sets are provided (depending on the size of your browser window):

- ❖ One set is for the browser window, and these move the viewable portion of the entire browser window. They do not affect what is viewable within the system. (These will be absent if the browser window is large enough to entirely contain the displays of the system.)
- ❖ The second set applies to windows (and panes, which are subdivisions of a window) within the system. These change what is viewable in the system.

In addition to scroll bars, tables also provide a navigation toolbar. The tables that are displayed in the system are often quite large. In these large tables, the number of records (rows) is greater than what may be displayed at one time in a window or pane. So the table is divided into multiple pages of records. A navigation toolbar similar to the following appears at the top of every table to inform you of the number of pages and rows in the table and to allow you to navigate to different pages:



You may click the buttons as indicated to navigate to different pages in the table. You may also double-click the displayed page number, type a new page number, and then click Go (or press Enter on the keyboard) to display that particular page. (If you enter a non-existent page number, the current page remains displayed.)

Note that the vertical scroll bar that appears along the side of a window that shows a table cannot be used to move from page to page. The scroll bar only allows you to change what is viewable for the page that is displayed in the window or pane.

2.5 Selecting What Data Is Displayed

The PaveM application typically contains a very large amount of data. By restricting the data that is displayed to just those data elements with which you work (for example, only particular road sections) or you wish to see displayed (for example, only particular years), you realize the following benefits:

- ❖ The amount of time it takes to display the information is reduced.
 - ❖ Your ability to locate particular records within the data is facilitated.

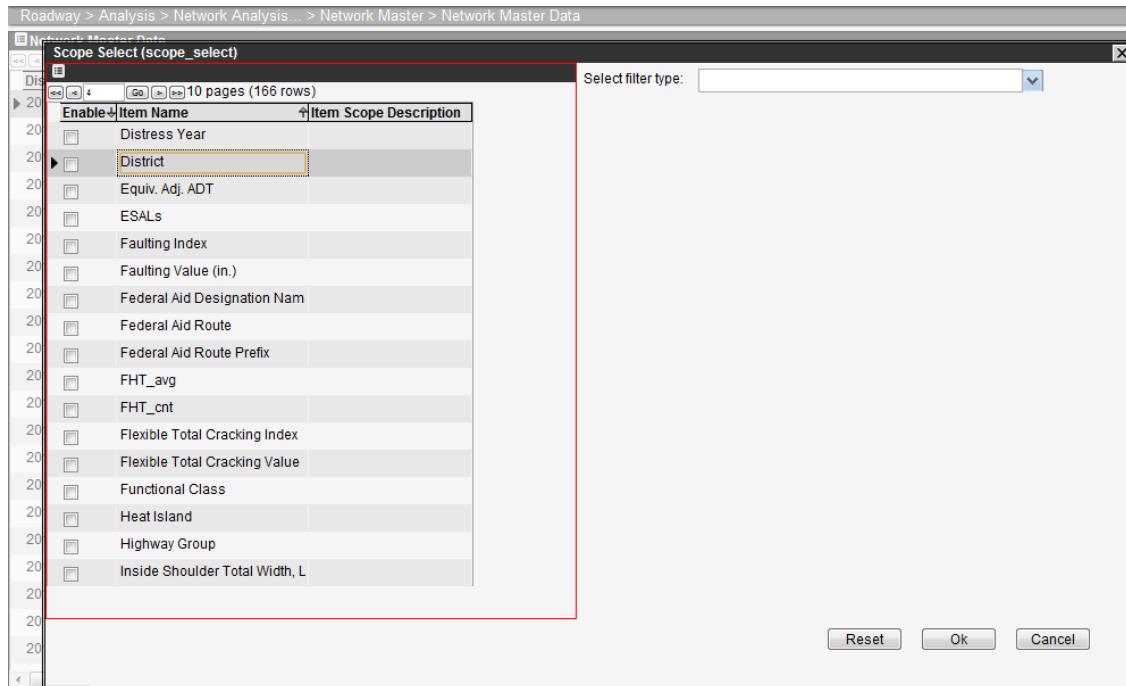
2.5.1 Setting a Filter

Every window possesses several columns. A filter can be applied on any columns present in this window (per pane). The filter preset will act in all windows of the Pavement Manager system containing the column. To set (or modify) a filter in a window, follow these steps:

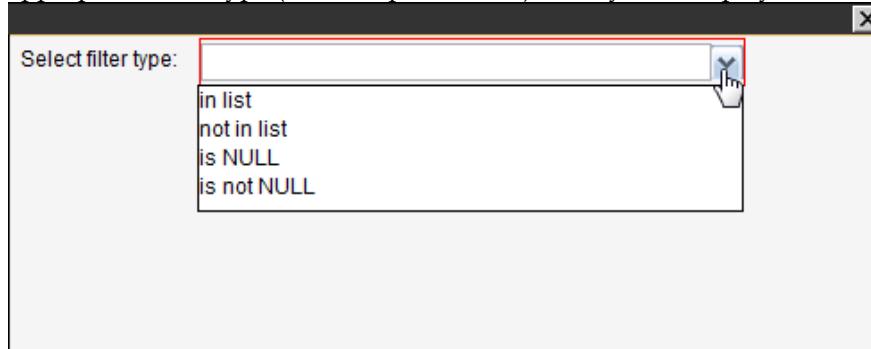
1. In the application, at any time, you can right-click and then click Filter in the appropriate pane (window) you wish to set a filter on. The system opens the Filter window. An example of this window is shown below (Roadway > Network Analysis > Network Master > Network Master Data, then right-click and click Filter).

Distress Year	County From	Route From	Route Suffix (From)	Post Mile Prefix Fr	PostMile Begin
2011	YOL	080			9.508
2011	SAC	080			16.618
2011	YOL	080			10.641
2011	SAC	050			19.5
2011	BUT	099			8.219
2011	SAC	051			7.902
2011	SAC	051			1.476
2011	SAC	005			20.036
2011	SAC	005			23.309
2011	NEV	080			2.489
2011	COL	020			0

2. In the left pane, click the row for the variable you wish to use (for example District). Note: You only have to highlight the field on the left pane. You will not be able to check the box. Once you've made your selection from the right pane, the box will automatically become checked in the left pane.



- In the right pane, click the down arrow in the Select Filter Type field and then click the appropriate filter type (for example "in list"). The system displays the filtered values.



- Select the desired values for the variable by clicking the Select check box. Note: To select multiple values, hold down the CTRL key while clicking the Select check box.

Enable	Item Name	Item Scope Description
<input type="checkbox"/>	Distress Year	
<input checked="" type="checkbox"/>	District	6
<input type="checkbox"/>	Equiv. Adj. ADT	
<input type="checkbox"/>	ESALs	
<input type="checkbox"/>	Faulting Index	
<input type="checkbox"/>	Faulting Value (in.)	
<input type="checkbox"/>	Federal Aid Designation Nam	
<input type="checkbox"/>	Federal Aid Route	
<input type="checkbox"/>	Federal Aid Route Prefix	
<input type="checkbox"/>	FHT_avg	
<input type="checkbox"/>	FHT_cnt	
<input type="checkbox"/>	Flexible Total Cracking Index	
<input type="checkbox"/>	Flexible Total Cracking Value	
<input type="checkbox"/>	Functional Class	
<input type="checkbox"/>	Heat Island	
<input type="checkbox"/>	Highway Group	
<input type="checkbox"/>	Inside Shoulder Total Width, L	

Select filter type: in list

Select	Item Name
<input checked="" type="checkbox"/>	District 01
<input checked="" type="checkbox"/>	District 02
<input checked="" type="checkbox"/>	District 03
<input checked="" type="checkbox"/>	District 04
<input checked="" type="checkbox"/>	District 05
<input checked="" type="checkbox"/>	District 06
<input type="checkbox"/>	District 07
<input type="checkbox"/>	District 08
<input type="checkbox"/>	District 09
<input type="checkbox"/>	District 10
<input type="checkbox"/>	District 11
<input type="checkbox"/>	District 12

- When you have selected all desired values, return to step 2 to select another variable or click OK to close the Data Selection window. This filters the data the selected requirements.
- If you want to reset the filter, again right click and click **Filter** in the appropriate pane. The system opens the Filter window (dialogue box). Click on **Reset** which is present on to the right side bottom of the dialogue box. This clears the selection in the Filter pane. Now click **OK**. This clears the filter.

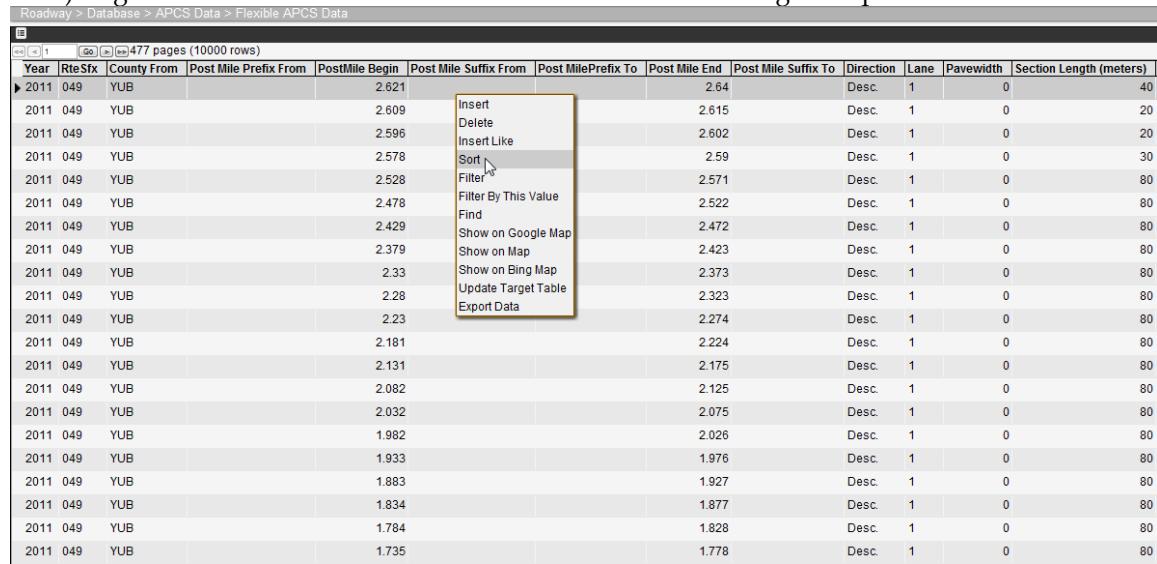


Note: Any filter set in a specific window will be remaining active in all other windows containing the same column. When a filter has been established, a small icon is visible indicating that a filter is active on this window. An example is shown below.

2.5.2 Specifying Sort Order

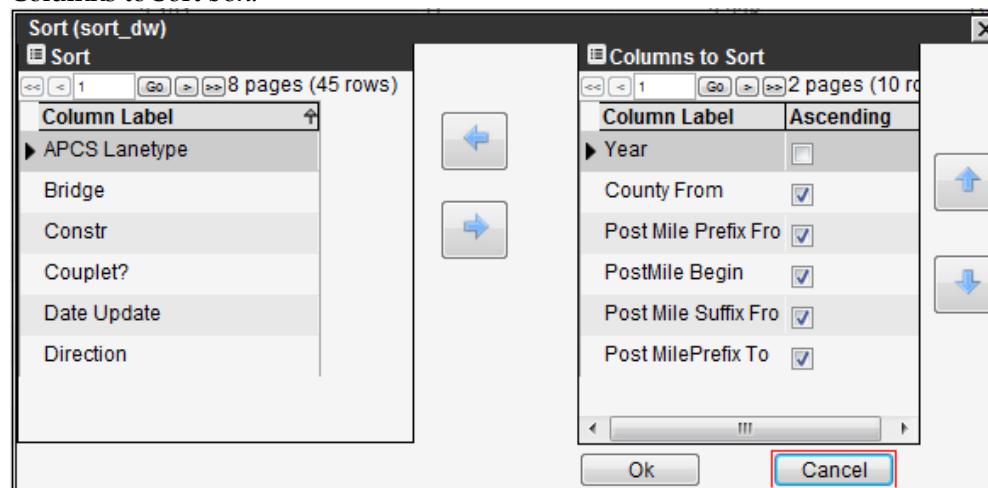
To specify the sort order, follow these steps:

- Display the Flexible APCS Data window (Roadway > Database > APSCS Data > Flexible APSCS Data). Right-click the window and then click Sort. The Sort dialog box opens.



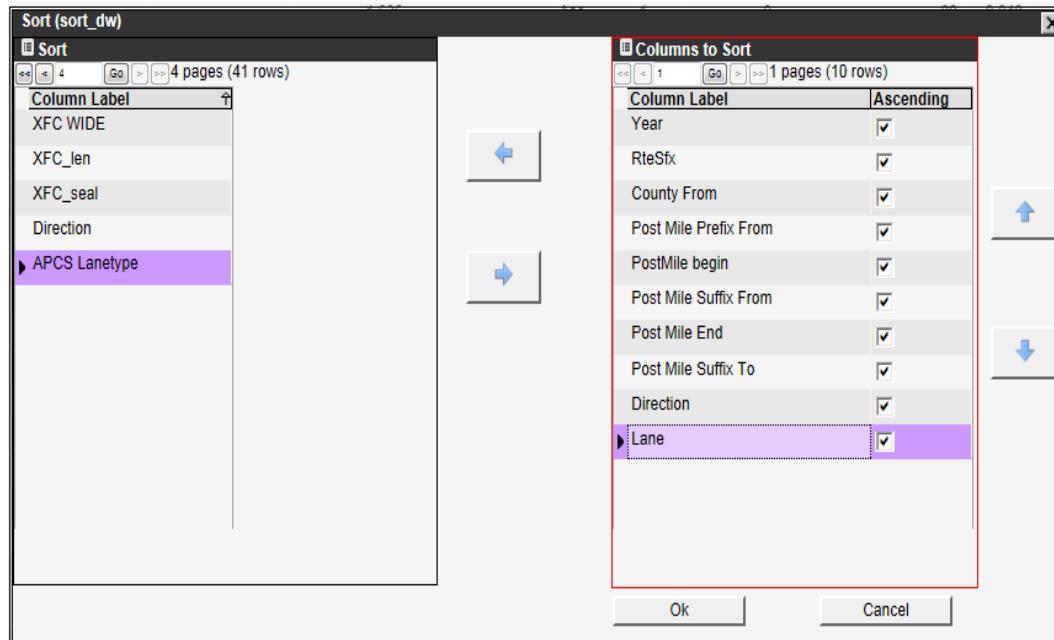
Year	RteSfx	County From	Post Mile Prefix From	PostMile Begin	Post Mile Suffix From	PostMilePrefix To	Post Mile End	Post Mile Suffix To	Direction	Lane	Pavewidth	Section Length (meters)
2011	049	YUB		2.621			2.64		Desc.	1	0	40
2011	049	YUB		2.609			2.615		Desc.	1	0	20
2011	049	YUB		2.596			2.602		Desc.	1	0	20
2011	049	YUB		2.578			2.59		Desc.	1	0	30
2011	049	YUB		2.528			2.571		Desc.	1	0	80
2011	049	YUB		2.478			2.522		Desc.	1	0	80
2011	049	YUB		2.429			2.472		Desc.	1	0	80
2011	049	YUB		2.379			2.423		Desc.	1	0	80
2011	049	YUB		2.33			2.373		Desc.	1	0	80
2011	049	YUB		2.28			2.323		Desc.	1	0	80
2011	049	YUB		2.23			2.274		Desc.	1	0	80
2011	049	YUB		2.181			2.224		Desc.	1	0	80
2011	049	YUB		2.131			2.175		Desc.	1	0	80
2011	049	YUB		2.082			2.125		Desc.	1	0	80
2011	049	YUB		2.032			2.075		Desc.	1	0	80
2011	049	YUB		1.982			2.026		Desc.	1	0	80
2011	049	YUB		1.933			1.976		Desc.	1	0	80
2011	049	YUB		1.883			1.927		Desc.	1	0	80
2011	049	YUB		1.834			1.877		Desc.	1	0	80
2011	049	YUB		1.784			1.828		Desc.	1	0	80
2011	049	YUB		1.735			1.778		Desc.	1	0	80

- When you first open the Sort dialog box for the Flexible APSCS Data window, there are 10 columns in the Columns to Sort right side pane (Year and Location related columns starting with County From.) For this example, click the blue left arrow to remove all sort columns from the Columns to Sort box.



- Select the 'Year' column from the Sort box to the left and click the blue forward arrow button. Year column is added to the right side pane of the dialogue box. Again select 'RteSfx' column from the Sort box to the left and then click the blue forward arrow button. 'RteSfx' column is added to the right side pane of the dialog box. Repeat the same step for the 'County from', 'Post

Mile Prefix From ', 'Post Mile Begin,' , 'Post Mile Suffix from', 'Post Mile Prefix To', 'Post Mile End', 'Post Mile Suffix To', 'Direction' and 'Lane' columns. Selected columns are added to the right pane of the dialog box. Click OK on the dialog box. The dialog box closes. The data is sorted by year and then by location.



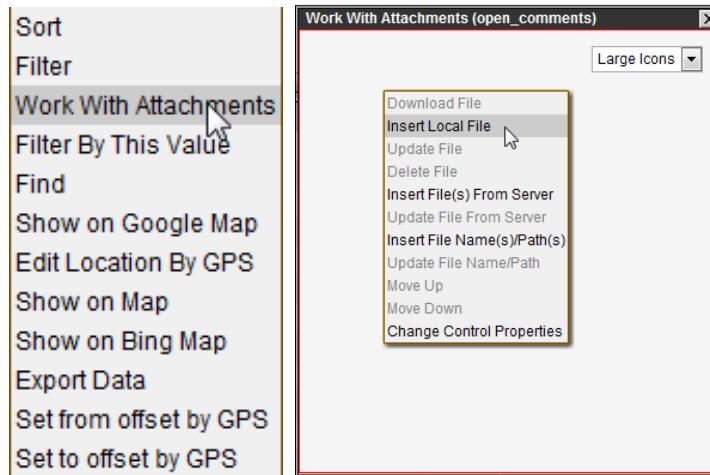
Year	RteSfx	County From	Post Mile Prefix From	PostMile begin	Post Mile Suffix From	Post MilePrefix To	Post Mile End
2011	099	SAC			0.716		0.75
2011	099	SAC			0.727		0.77
2011	099	SAC			0.754		0.79
2011	099	SAC			0.759		0.80
2011	099	SAC			0.765		0.80
2011	099	SAC			0.777		0.82
2011	099	SAC			0.804		0.84
2011	099	SAC			0.809		0.85
2011	099	SAC			0.814		0.85
2011	099	SAC					0.87
2011	099	SAC			0.853		0.89
2011	099	SAC			0.859		0.90
2011	099	SAC			0.864		0.90
2011	099	SAC			0.877		0.91
2011	099	SAC			0.903		0.94
2011	099	SAC			0.909		0.95
2011	099	SAC			0.914		0.94

2.6 Attaching a File to a Record

The Pavement Manager includes the capability to attach a file (picture, movie, AutoCAD drawing, etc.) to any record in the system. For example, a photograph may be attached to a distress rating record; or project documentation could be attached to a work plan item.

To attach a file to a specific record, follow these steps:

1. Click on the record for which you want to attach a file. The system highlights the record. On the record, right-click then click Work with Attachments.... A pop-up window opens.



2. Right-click in the dialog box and Click on Insert Local File. Another smaller pop-up window opens. An example of this window is shown below.



3. Click the Browse... button. Another pop-up window opens where you will point at the file you want to upload. This window is a typical MS Windows window.
4. Once you have selected a specific file in a specific location, then click Open. The window closes and the path to this file is inserted in the previous pop-up window.
5. Click the Upload button. The system uploads the selected file and attaches it to the desired record. An example of this window is shown below.
6. Once the upload is completed, your file is attached. Repeat steps 2 to 5 as many times as you need. You can attach multiple files to the same record.
7. Once all the files have been attached, you can close the Work with Attachments window by clicking on the following icon  in the top right corner.

8. Once files have been attached to the record, the cell corresponding to the Attachment Column will be colored in red, indicating a file is attached to the record, as shown below.

2.7 Location Referencing System

The location referencing system is an essential component of the relational database structure for pavement management. It allows the system to locate data on the pavement network and relate the data in different parts of the system to each other via a common reference scheme.

One of the challenges in configuring the PaveM database design is to maintain consistent use of referencing systems and limits in various data sources such as: pavement inventory, traffic, condition surveys, and construction activities, etc. The PaveM application configured for Caltrans uses two related reference systems: Basic LRS and PostMile.

The Basic linear referencing system is by Base Route identifier and a Statewide odometer (hereafter abbreviated ODM) measure along the base route. To properly handle the display of divided and undivided highways all the base routes will be divided into two directions indicated by an "L" and "R" appended to the route name. Where the route is undivided the L or left side will be configured to be subordinate to the "R" or right side. The California Post Mile Linear referencing system includes County, Route Number, Route Suffix, Post Mile Prefix and Suffix Identifiers and Begin and End Post Mile values. In all cases events stored within the system will have the same values of the County, Route Number, Route Suffix, Post Mile Prefix, and Post Mile Suffix codes for the full length of all data events. For more information please refer to Caltrans LRS Document.

Note: When entering data into the pavement management system it is recommended that the PostMile referencing system be used.

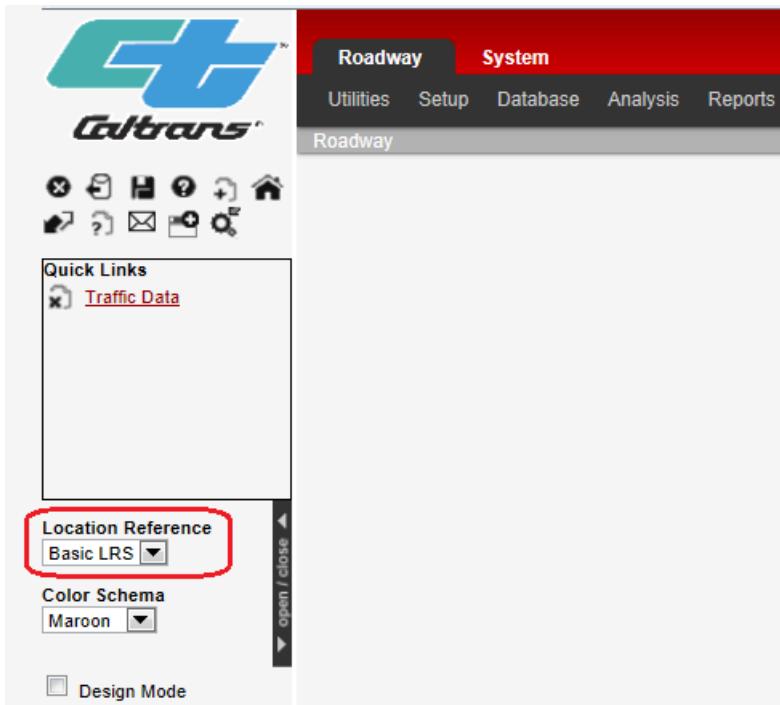
Table 1 Agile Pavement Analyst Location Reference System Columns

Column Name	Reference Systems Utilized	Definition
Route ID	Basic LRM	This Contains a unique identifier for each route and measure of the start distance and length along the route for each event recorded in the database. California Route Number and Route Suffix with L or R Designation (e.g. 275L or 168SL).
State ODO Beg	Basic LRM	The location from the beginning of the route to the data beginning point measured from the start of the route in the state. (OFFSET_FROM in SETUP_LOC_IDENT Table)
State ODO End	Basic LRM	The location from the beginning of the route to the data ending point measured from the start of the route in the state. (OFFSET_TO in SETUP_LOC_IDENT Table)
Route From / Route To	Post Mile	The location from the beginning of the route to the data beginning point measured from the start of the route in the county indicated in the county column. (CA_ROUTE_FROM, CA_ROUTE_TO) Note: CA_ROUTE_TO is never displayed; it is always the same as CA_ROUTE_FROM and is filled automatically during data entry.
County From	Post Mile	The location from the beginning of the route to the data ending point measured from the start of the route in the county indicated in the county column.
Post Mile Prefix From/To	Post Mile	(CA_PM_PREFIX_FROM, CA_PM_PREFIX_TO)
Route Suffix (From/To)	Post Mile	(CA_RTE_SUFFIX_FROM, CA_RTE_SUFFIX_TO) Note: CA_RTE_SUFFIX_TO is never displayed; it is always the same as CA_RTE_SUFFIX_TFROM and is filled automatically during data entry.
PostMile Begin Value	Post Mile	The county that contains the begin mile point for the data (CA_POSTMILE_BEG)
PostMile End Value	Post Mile	The county that contains the end mile point for the data (CA_POSTMILE_END)

Note: The RteSfx column (CA_ROUTE_AND_SUFFIX) is a calculated column found in some windows that concatenated Route Number (CA_ROUTE_FROM) and Post Mile Suffix (CA_RTE_SUFFIX_FROM). This column can be added to any window for display purposes only.

2.7.1 Working in Different Reference Systems

The pavement management system allows you to operate using one of the two reference systems at any time. To switch your referencing system return to the dashboard screen by clicking the Home Icon on the toolbar () and then change the selection in the location reference drop down box at the left side of the screen. The figure below shows the Basic LRS referencing system chosen.



3 DATABASE CONFIGURATION OVERVIEW

The AgileAssets Pavemen Analyst application configured for Caltrans contains numerous data windows with Caltrans data. This section provides an overview of the database and its contents and organization. The following figure represents the major flow of data within the system. Initially, the condition data is collected by the data collection contractor. That data is imported into the required tables within the PaveM system. A representative sample of those tables is listed in the **Agile Assets System** box. Initially Data from the Pavement Management Sections and Aggregation rules from other tables are combined to create the sections located within the network master file. The network master file contains the base network description used for all analysis and work plan development within the system. The analysis procedures assist the user in creating work plans and the work plans in turn may be used as an input into further analysis. Once the analysis process is complete, completed work plan projects are entered into the Construction History windows along with any other work performed but not planned within the system.

At the beginning of the next year, new management sections are created by performing a finest partition of the newly entered construction history records with the previous year's Pavement Management Sections. These sections are used to create Network Master File and further analysis.

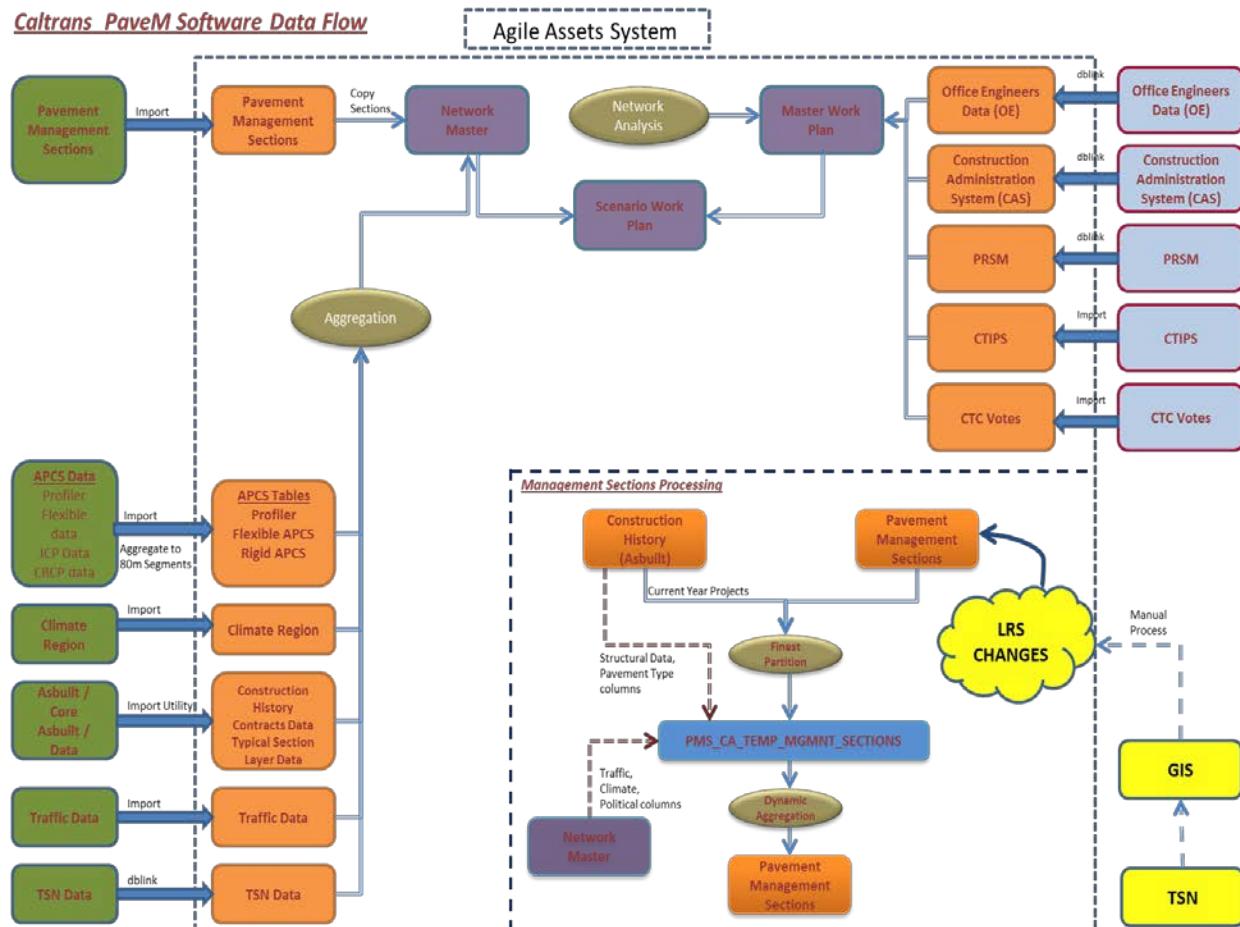


Figure 2. Caltrans PaveM Software Data Flow

3.1 Database Menu Structure

The major data sets for Caltrans like Inventory data, Condition data, Construction History data and Traffic data etc., are accessed via the Database menu in the application. The following table describes each of the Database menu items.

Menu Structure	Sub Menu	Description
Roadway > Database >	GIS Data Explorer	Data on a map where defined themes can be displayed.
	Flexible APICS Data	Distress Data for Automated Pavement Condition Survey (APCS) Distress Data for Flexible Pavement s. Data segment length is 0.05 mile (262 ft or 80 m). Please refer to APICS Manual for distress details.
	Flexible APICS Graph	Graph window showing Flexible APICS data for a selected location
	JPCP APICS Data	Distress Data for Automated Pavement Condition Survey (APCS) Distress Data for Rigid (JPC) Pavement s. Data segment length is 18 slabs (262 ft or 80 m or 0.05 mile). Please refer to APICS Manual for distress details.
	JPCP APICS Graph	Graph window showing APICS JPCP data for a selected location
	Profiler Data	“Sensor Data” (since it is derived from the laser sensors), and includes International Roughness Index (IRI), Mean Profile Depth (MPD), rut depth and faulting values. Please refer to APICS Manual for distress details.
	Profiler Data Graph	Graph window showing profiler data for a selected location
	CRCP APICS Data	Continuously Reinforced Concrete Pavement (CRCP) data. Please refer to APICS Manual for distress details.
	CRCP APICS Graph	Graph window showing CRCP data for a selected location

Menu Structure	Sub Menu	Description
Roadway > Database > Construction >	Construction History	Construction History data including Contract name, work code, location and material layer information
	Construction History as Designed.	As Designed Data for Construction
	Contracts and Route Table	Route information for the contracts
	Pavement Structure (Profile/Cross Section)	Pavement Structure Information, with graphical display for selected location
Roadway > Database > Transportation System Network (TSN)>	TASAS Highways (TSN) Data	Displays TSN data which defines inventory and attributes that reside upon the State highways and provide the inventory location. It also stores traffic volume counts being taken by the state and provides analysis functionality
	TASAS Highways (TSN) Graph	Graph window showing TSN data for a selected location

Menu Structure	Sub Menu	Description
Roadway > Database >	Bridges [PONTIS]	<p>Bridge Inventory Data from Pontis</p> <ul style="list-style-type: none"> ▪ District ▪ Route ▪ County ▪ Facility Carried ▪ Location ▪ Last Insp ▪ Year Built ▪ Year Reconstructed ▪ Length (m) ▪ Deck Area (m²) ▪ Latitude (Deg Min Sec) ▪ Longitude (Deg Min Sec) ▪ Br No ▪ Bridge Name <p>PaveM will update annually.</p>
Roadway > Database > PMIB Data > MSL	MSL Data	The MSL (Maintenance Service Level) data contains MSL assignments by location for all state routes.
	MSL Graph	Graph window showing MSL data for a selected location
Roadway > Database > PMIB Data > RT1A	RT1A Data	<p>Combined Distress and IRI data from the existing Pavement Management Database (aka PMIB). The table name is RT1A data. This data is available for historical condition information only and it will not be used for analysis.</p> <p>On an annual basis, Caltrans performs condition assessments to determine pavement condition based on "ride quality" and "visual survey." The entire state highway system has historically been surveyed annually until 2007, when changes in methodology basically doubled the survey time.</p>
	RT1A Graph	Graph window showing RT1A data for a selected location

Menu Structure	Sub Menu	Description
Roadway > Database > PMIB Data > IRI	IRI Data	IRI data (0.1 mile interval) from the existing Pavement Management Database (aka PMIB). Caltrans' current pavement management system has been collecting condition and IRI data and storing it in Pavement Management Information Branch (PMIB) system.
	IRI Graph	Graph window showing IRI data for a selected location
Roadway > Database > MWP	Award Dollars (MWP)	Amount Awarded (dollars) data for the EA projects
	Project Field Review (MWP)	Project Field Review data
	CA Funds Request (MWP)	Funds request data with approval details
	Authorized Final Cost (MWP)	Authorized final cost for the EA projects
Roadway > Database > GPR	GPR data	The Ground Penetrating Radar (GPR) Data consists of GPR survey information for every lane mile on every highway route in California and as well as pavement layer material types and pavement layer thickness to a depth of 5 feet. It also contains recorded geo-referencing information obtained by using the Global Positioning System (GPS). Both GPR and GPS survey information were recorded at 10 meter or 100 meter intervals depending on the route. Additionally, non-pavement fixed assets (NPFA) such as connectors, ramps, lane adds and lane drops are included.
	GPR Graph	Graph window showing GPR data for a selected location

Menu Structure	Sub Menu	Description
Roadway > Database > Culverts	Culvert System Inventory (Main)	Displays Basic Inventory and Condition Information of the Culvert assets. Culverts are a very important component in managing the performance of a highway network. Location information and conditions of culverts are especially useful for design and maintenance engineers.
	Culvert System Status	Culvert System Status (Status table is required for inventory tables in PaveM)
	Culvert System Class Code	Culvert System Classcodes (Classcodes are required for Inventory tables in PaveM)
	Culvert System Inventory	Culvert System Inventory
	Culvert Status	Culvert Status (Inventory status table is required for inventory tables in PaveM)
	Culvert Class Code	Culvert Class Code (Classcodes are required for Inventory tables in PaveM)
	Culvert Inventory	Culvert Inventory
	End Treatment Assessment	End Treatment Assessment data
	GIS Precision	GIS details of the culvert data collection including latitude, longitude, and elevation.
	Culvert Inspection	Culvert Inspection data
Roadway >	End Treatment Assessment	End Treatment Assessment data
	Research Projects	Research projects data identifying test section details for each project

Menu Structure	Sub Menu	Description
Database > Test Sections (LTTP)	Test Sections	<p>Test section Details data</p> <p>PaveM users will be able to add New Test Sections, Delete existing Test Sections and Modify Test Sections (e.g., change limits, etc). PaveM will also be able to identify sections via queries, flag sections being reviewed, flag sections during optimization and eliminate sections during optimization.</p> <p>The test sections will be identified when optimizations have been made and identified in the lists for pavement maintenance/rehabilitation. Test sections can be removed from the optimization process when negotiated with the Districts.</p>
Roadway > Database > Projects Data> CAS Data	CAS Contract Items	Displays records on the construction phase of Caltrans Construction. The district is responsible for updating and maintaining the information regarding the contract until it has been completed.
	CAS Contracts	CAS Contracts data with the corresponding Contract Items
Roadway > Database > Projects Data	CTC Votes Data	California Transportation Commission (CTC) Votes Data
	CTIPS Data	California Transportation Improvement Program System (CTIPS) data
	OE Data	Office Engineer Data (OE database) displays pre-contract award, project schedule and project cost data. Many Divisions and Districts use this database to monitor the milestones and schedule for projects from the PS&E phase through contract approval. It is also the primary source of milestone data after PS&E submittal.
Roadway > Database > Projects Data> PRSM Project Information	PRSM Project Information Data	Displays Project Information Data. PRSM is the new project management system and integrates planned project data with several of the Department's other systems, including Staff Central. It is being rolled out to the districts.
	PRSM Project Information Graph	Graph window showing PRSM data for a selected location
Roadway > Database >	Road Viewer	Linear Diagram for selected features for a chosen route.

Menu Structure	Sub Menu	Description
Roadway > Database > Traffic Data	Traffic Data	ADT, ADTT, ADTT, axle truck percentages, ESALs, hourly traffic volumes in the entire state highway network. Please refer to Traffic Data Compilation documentation for Calculation and Consolidation Details.
	Traffic Graph	Graph window showing Traffic data for a selected location
Roadway > Database >	HPMS Couplets	List of Couplets Routes in the Highway Network. HPMS requires the states to submit data for both directions data submittal on Couplets. This is information is used only for HPMS reporting.
Roadway > Database > Core	Core Data	Core information comes from a number of sources, mostly by email submissions from Contractors, GPR Project, Research Projects. The initial core data that is imported into the PaveM system is being provided by GPR Contract and DRI/UCPRC research. The New cores will be entered manually. It is also expected that eventually core data information will be collected in a format that can be direct imported into the PaveM system's core data table.
	Core Data Form	Core data in Caltrans defined form
Roadway > Database > Climate	Climate Region Archived	Archived Climate Data
	Climate Regions	<p>Caltrans Climate Region data.</p> <p>The Caltrans climate zone map is based on regions with uniform climatic influence on pavement performance. The information is maintained by Caltrans DRI, with review by the Pavement Program (PP). DRI (typically via a contractor) uses climatic data collected from a variety of sources to select representative weather stations and compile climate inputs file for pavement design and summary data for the climate zones. This summary data is attached to the GIS based map of the zones that is saved in PaveM. The most current data will be used in PaveM.</p> <p>PaveM will take the geographic coordinate at the center of each management section and use this to locate the climate zone (based on GIS polygon intersection). This will be used to provide the climate zone as a field in the Network Master table.</p>

Menu Structure	Sub Menu	Description
Roadway > Database >	PMS Management Sections	Management sections created by Caltrans defined business rules (Finest partition of existing management sections combined with current year construction projects and then dynamically aggregated with data like Traffic, Climate, Political regions
Roadway > Database >	Road Viewer	The Road View window can be used to graph several types of data at once.
Roadway > Database > Core	Core Data	Caltrans HMA specifications require pavement core data obtained from HMA construction projects is to be collected. This window will contain the core data submitted information submitted to the Pavement Program Office.
	Core Data Form	Specially Designed form view of the core data in order to enter and view

3.2 Analysis Menu Structure

The following table summarizes each option included under the Analysis menu.

Menu Structure	Sub Menu	Description
Roadway > Analysis > Network Analysis... >	Approved Master Work Program	This is a list of all the approved master work plan data.
	Detailed Optimization Results	Detailed scenario results can be viewed in this window.
	Optimization Analysis	This window is used to run optimization analysis.
	Section Current Needs	This window lists the current treatment recommendations for the defined sets of decision trees for each section within the network master file.

Menu Structure	Sub Menu	Description
Roadway > Analysis > Network Analysis... > Network Master >	Setup Constraint Partitions	This window contains the constraints that may be subdivided to allow a more finely tuned optimization.
	Setup Multiyear Project Data	This window is used to define the types of funding streams utilized when developing the Multi-Year analysis section strategies.
	Master Work Plan	This is the master work plan data window.
	Section Strategies	This window issued to review and create the assigned strategies for each network master pavement section.
	Scenario Analysis Work Plan Group	
Roadway > Analysis > Performance Analysis... >	Network Master Data	This is the Network Master Data window. It is the starting point of all scenario analysis.
	Network Master Graph	This windows you to graph network master information along the road.
Roadway > Analysis > Performance Analysis... >	Performance Models	This window is used to assign performance models to each branch of the performance model tree structure and edit some attributes of each defined performance index (Use in RSL, Thresholds and Condition state definitions)
Roadway > Analysis > Performance Analysis... >	Section Performance	This window allows for the development and assignment of section based performance models.
Roadway > Analysis > Performance Analysis... > Performance Master >	Performance Master Data	This is the Performance Master data window. It contains historical condition information utilized for analyzing pavement performance models.

3.3 Setup Menu Structure

The Setup Table menu structure contains many tables that list the drop-down values that are used in the windows that are in the Database and Analysis menus. These setup tables are contained in the following Setup menus:

- Roadway > Setup > Construction Setup >
- Roadway > Setup > Database Setup... >
- Roadway > Setup > Network Analysis... >
- Roadway > Setup > Performance Setup... >
- Roadway > Setup > Lookup Tables >

3.4 Viewing and Working with Data

3.4.1 Grid and Form Data Views

Data in the system can be viewed in two ways: a grid view and a form view. The grid view allows you to see multiple records in the window (one record per row); the form view displays all of the data for a single record. The following example illustrates how to switch between the grid and the form data views.

1. Go to APCS Data window (Roadway > Database > APCS Data > Flexible APCS data). This window shows the APCS data for Flexible pavement type in a grid style view.
2. Select any section which you want to see in grid view and double click on icon which is located at the top left hand side of the window. This is next to the Filter button (if filtered).

Year	RteSfx	Route ID	Direction	Lane	State ODO Beg	State ODOM End	Pavewidth	Section Length (meters)	Length
2011	104	104R	Asc.	1	0.002	0.033	0	60	0.036
2011	104	104R	Asc.	1	0.039	0.082	0	80	0.048
2011	104	104R	Asc.	1	0.088	0.131	0	80	0.048
2011	104	104R	Asc.	1	0.137	0.18	0	80	0.048
2011	104	104R	Asc.	1	0.186	0.229	0	80	0.048
2011	104	104R	Asc.	1	0.235	0.278	0	80	0.048
2011	104	104R	Asc.	1	0.284	0.327	0	80	0.048
2011	104	104R	Asc.	1	0.333	0.376	0	80	0.048
2011	104	104R	Asc.	1	0.382	0.425	0	80	0.048
2011	104	104R	Asc.	1	0.431	0.474	0	80	0.048
2011	104	104R	Asc.	1	0.48	0.523	0	80	0.048
2011	104	104R	Asc.	1	0.529	0.572	0	80	0.048

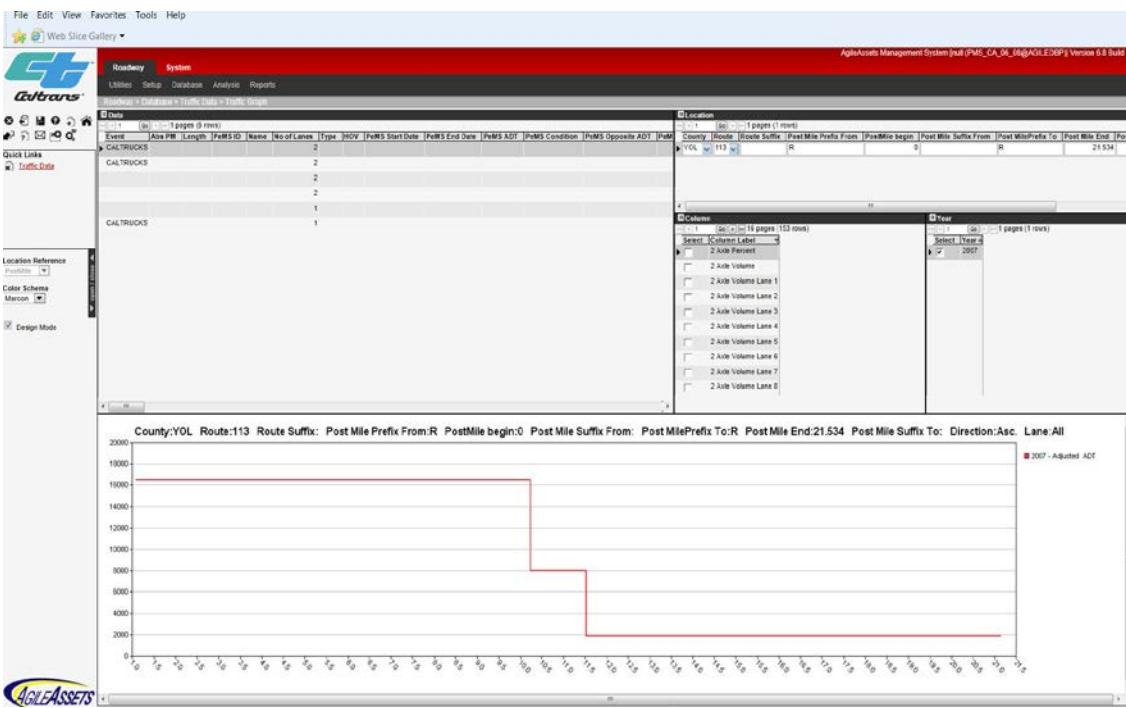
3. Then for the selected section the view changes to the form view. Double click again to revert back to grid view.

Year	RteSfx	Route ID	Direction	Lane	State ODO Beg	State ODOM End	Pavewidth	Section Length (meters)	Length
2011	104	104R	Asc.	1	0.002	0.033	0	60	0.036

3.4.2 Graph View

The Graph View is also known as the graph-down-the-road view. It shows data from a section data table (such as Traffic Data) along a particular road section.

1. The Graph View is present for all the condition data windows. It shows data from a section data table along a particular road section. When you display this window, the selections you last made will still be in effect, and you only need to click the  icon to display data in the Data pane. You may then click the Show Graph button to display the graph in the lower portion of the window.
2. For example let's view the Windshield condition data table. Go to Traffic Graph window (Roadway > Database > Traffic Data > Traffic Graph).
3. In the 'Location' pane window perform the following:
 - Select 'YOL' from the drop down of County From column
 - Select '113' from the drop down of Route From column
 - Enter 'R' in Post Mile Prefix From column
 - Enter 'R' in Post Mile Prefix To column
 - Select 'Asc' from the drop down of Direction column
 - Select '2' from the drop down of Lane column
 - Right-click and click 'RESET MILE POINTS TO ENTIRE ROUTE'. This makes sure that entire route is selected. PostMile Begin and PostMile End columns automatically fill with mile points.
4. Check the box for 'Adjusted ADT' in the list from the Column pane and check the box for 2007 in the Year pane. Click the Retrieve button .
5. Then the data is displayed for the selected section in the 'Data' pane and the graph is generated in the bottom pane.

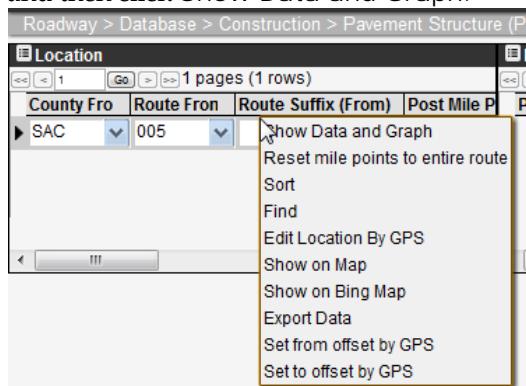


- The same kind of procedure is used to generate the graphs for all the graph windows.

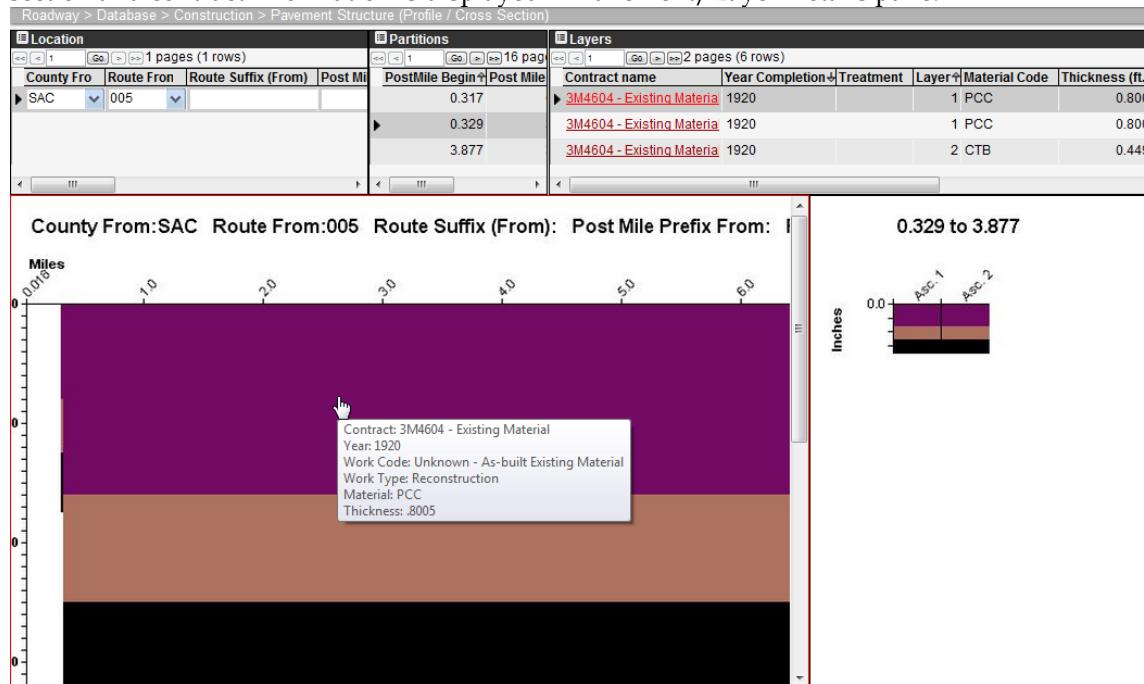
3.4.3 Pavement Structure Graph

The Pavement Structure Graph window shows changes in the construction history along a route or portion of a route that is selected. This window helps in reviewing the entire construction history for the roadway across multiple contracts. An example on how to do a pavement structure graph is described below.

- Go to Pavement Structure (Profile / Cross Section) (Pavement Structure Graph Roadway > Database > Construction > Pavement Structure (Profile / Cross Section))
- In the 'Route' pane window select county 'SAC', route '005' from the drop down of Route column, enter 'Asc' from Direction column, '1' from Lane column, select 'All layers' from the drop down of 'Layers Year/s' column and right-click and click 'RESET MILE POINTS TO ENTIRE ROUTE'. This makes sure that entire route is selected. In the Location pane, right -click and then click Show Data and Graph.

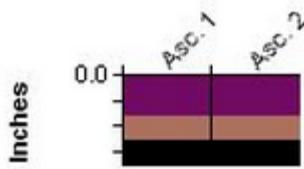


3. The graph is generated for the selected section of road. The number of contracts for the selected section and contract information is displayed in Pavement/Layer Details pane.



4. Click on any point along the length of the section of the road. Cross-sectional view of the road at the point is displayed on the right hand side.

0.329 to 3.877



3.4.4 Using the Road View

The Road View window (Roadway > Database > Road Viewer) always uses the base linear referencing system regardless of what is selected in the Location Reference field on the left side of the browser window. It is used to graph several types of data at once. In the window, you select which columns are to be graphed. You then use the Show Linear Diagram command (found by right-clicking in the Linear Diagram pane) to display a new window (the Linear Diagram window) that shows graphs of the selected columns. The steps below show how this window can be used:

1. Go to Road View Window (Roadway > Database > Road Viewer)

The screenshot shows the 'Roadway' tab selected in the top navigation bar. The main area is divided into three panes:

- Select Route for Linear Diagram Roadview:** A table listing routes with columns: Route Name, Length, State ODO B, and State ODOM. The route '80R' is highlighted.
- Select Start and End Mile Points:** A table with columns: Route ID, Direction, Lane, State ODO Beg, and State ODOM End. The row for route '80R' has 'Both' in Direction, 'All' in Lane, '55' in State ODO Beg, and '105' in State ODOM End.
- Select Parameters to Display and Right Click 'Show Linear Diagram':** A list of tables with their descriptions and selection checkboxes. The 'Master Work Plan' table is checked.

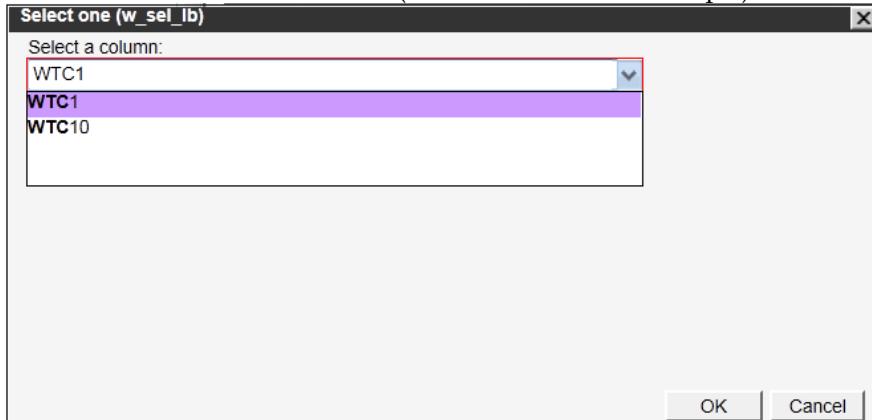
2. In the Select Route for Linear Diagram Roadview pane there is a list of all routes in the road network. Highlight the route, which will be graphed in the Linear Diagram window (e.g. '80R') then in the Select Start and End Mile Points pane enter Lane and the boundary of the route that you would like to graph in the State ODO Beg and State ODO End fields. (55 and 105 respectively in this example).

This is a detailed view of the 'Select Start and End Mile Points' pane. It shows a table with the following data:

Route ID	Direction	Lane	State ODO Beg	State ODOM End
80R	Both	All	55	105

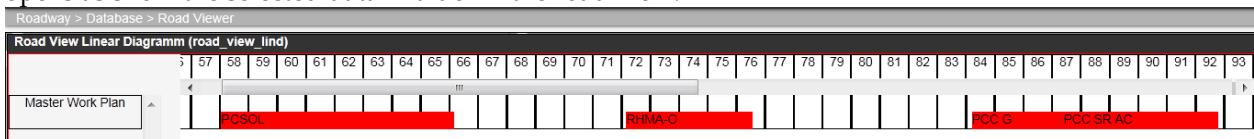
3. In the 'Select Parameters to Display...' pane select the data that will be graphed in the Linear Diagram window. It shows one row for each table with data that can be graphed. You can choose multiple datasets to be displayed if desired. (Select Master Work Plan {PMS_MASTER_WP} in this example).

4. Right-click on the record in the data window and click Set Description Column. The selection pop-up window opens as shown below. Select the value you would like to use as the description in the Linear Diagram window and click OK, the Description column will be filled with the Column ID of the selected value. (Select WTC1 in this example).

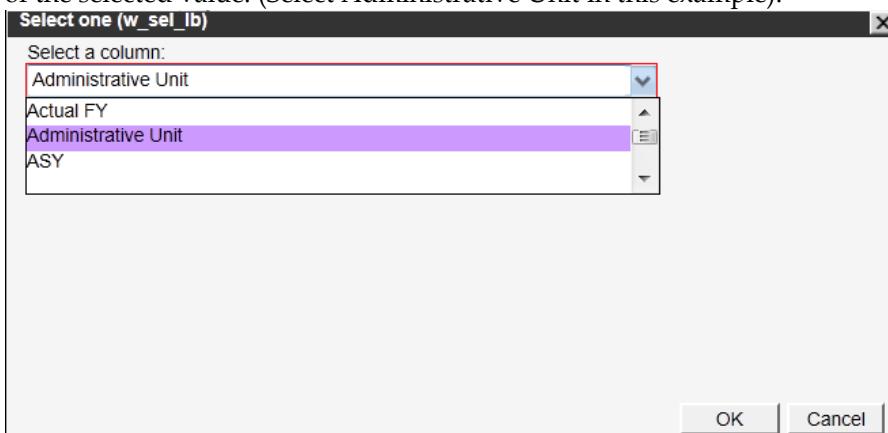


Select	Linear Diagram	Table Name	ID Column	Description Column	Expansion Column	Coloring Column
<input checked="" type="checkbox"/>	Master Work Plan	PMS_MASTER_WP	Location ID#	CA_WTC1		

5. Right-click the data window and click Show Linear Diagram. The Linear Diagram window opens as show the selected data in a down the road view.

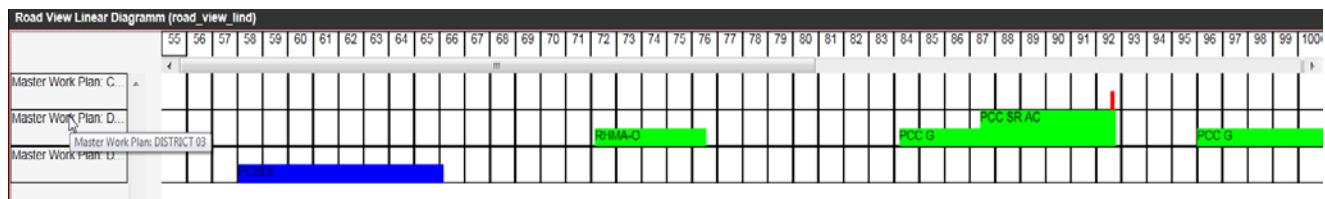


6. Close the Linear Diagram window by clicking the button in the upper right.
 7. Right-click on the record in the data window and click Expand By.... The selection pop-up window opens as shown below. Select the value you would like to use as the description in the Linear Diagram window and click OK, the Description column will be filled with the Column ID of the selected value. (Select Administrative Unit in this example).



Select	Linear Diagram	Table Name	ID Column	Description Column	Expansion Column	Coloring Column
<input checked="" type="checkbox"/>	Master Work Plan	PMS_MASTER_WP	Location ID#	CA_WTC1	Administrative Unit	

8. Right-click the data window and click Show Linear Diagram. The Linear Diagram window opens as show the selected data in a down the road view.



9. Close the Linear Diagram window by clicking the  button in the upper right.

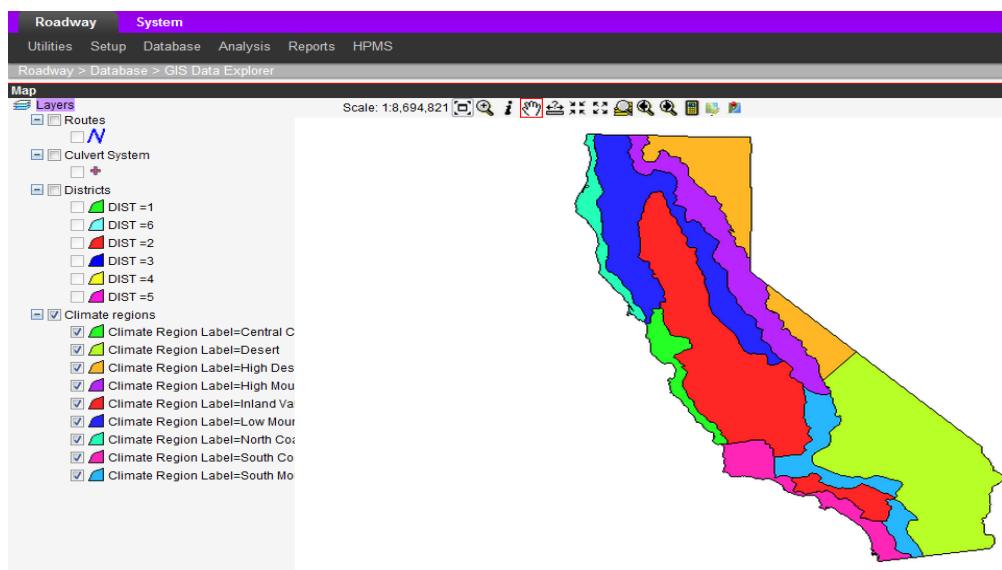
Below is a description of some other commands not mentioned above in the Road Viewer window that are used to format the diagram:

- **Edit Scope** – This command displays a new window, from which you set further constraints on the portion of the route to be graphed. These constraints are based upon the data pertinent to the route. This window has the same capabilities as the Filter window available from reports.
- **Color By** – This command displays a new window, from which you select the column whose values will color the line graph, with each value having a different color. Select the No Column entry in the drop-down list when you don't want to color by any column's values.

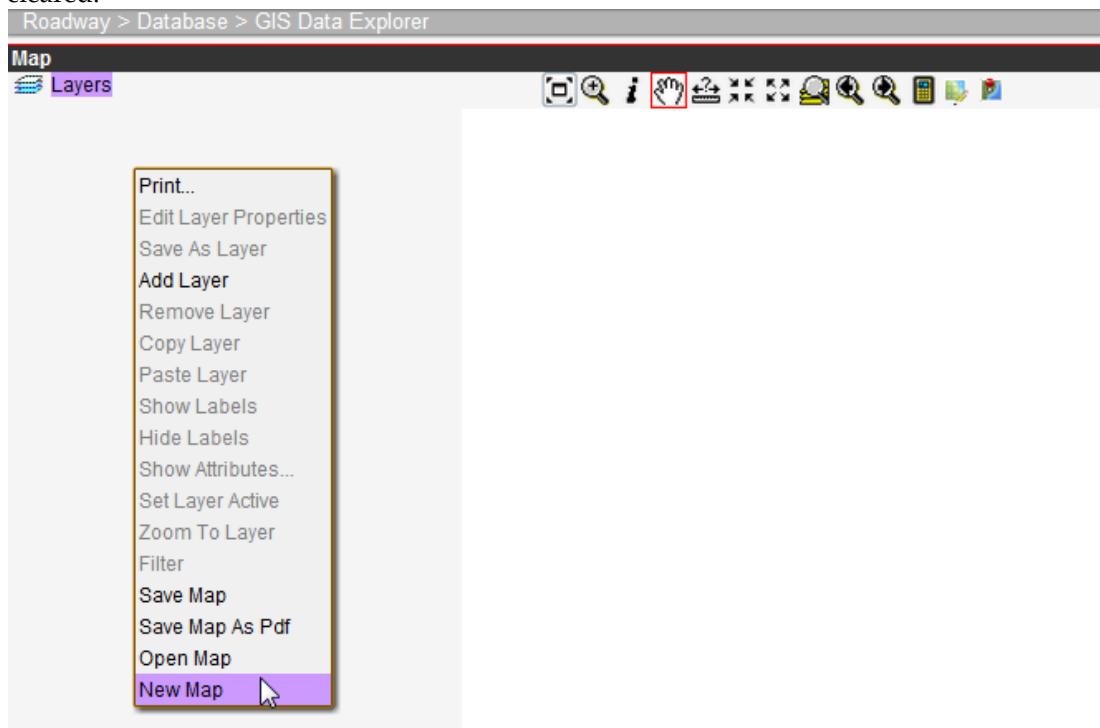
3.4.5 Working with GIS Data Explorer

The information in this section applies to all GIS Map windows (floating map). The first time that you display the GIS Data Explorer window it will be blank (that is, no themes will be shown in the left pane and no map in the right pane). You must add themes to the left pane via the Add Layers command that is found on the shortcut menu that is displayed by right-clicking the left pane. After adding a theme, the system will display the theme in the right pane. The system will remember the theme(s) you select and will display the theme(s) the next time you display the window

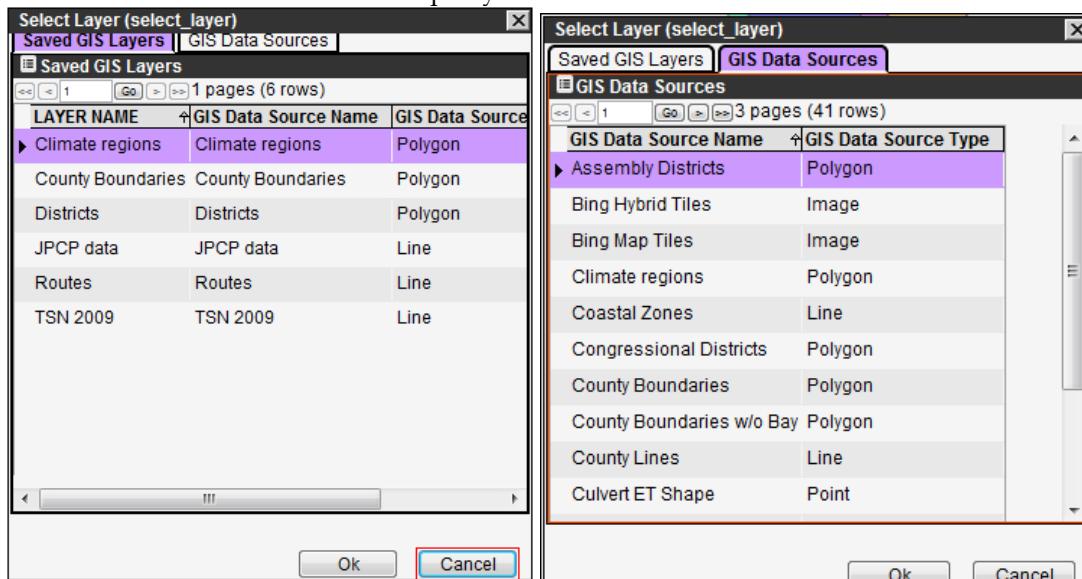
1. Open the GIS Data Explorer window (Roadway >Database> GIS Data Explorer). A map window is displayed with a Layers pane on the left. The window will open as you left it the last time you were in it. It will not have any data the first time you open it.



2. To clear the Map display, right-click and select New Map, the Layers and Map display are cleared.

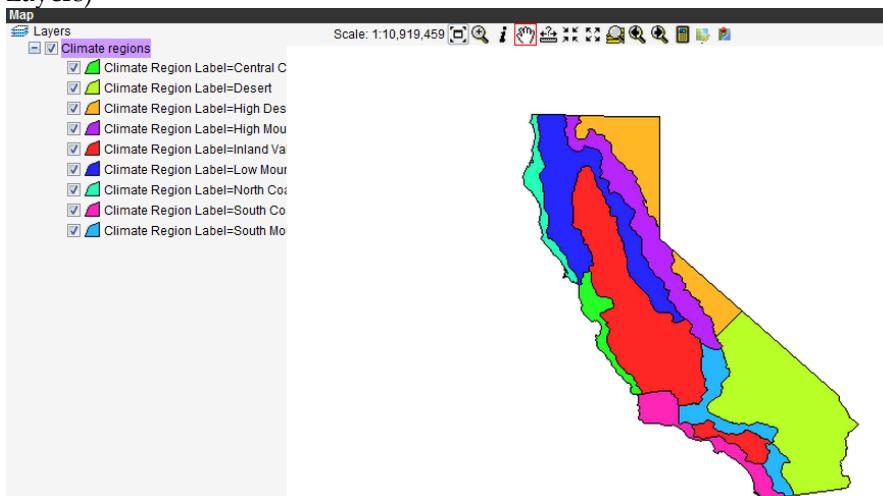


3. Right-click and select Add Layer option, the Select Layer pop-up window opens and you can select from the available the GIS Map Layers.

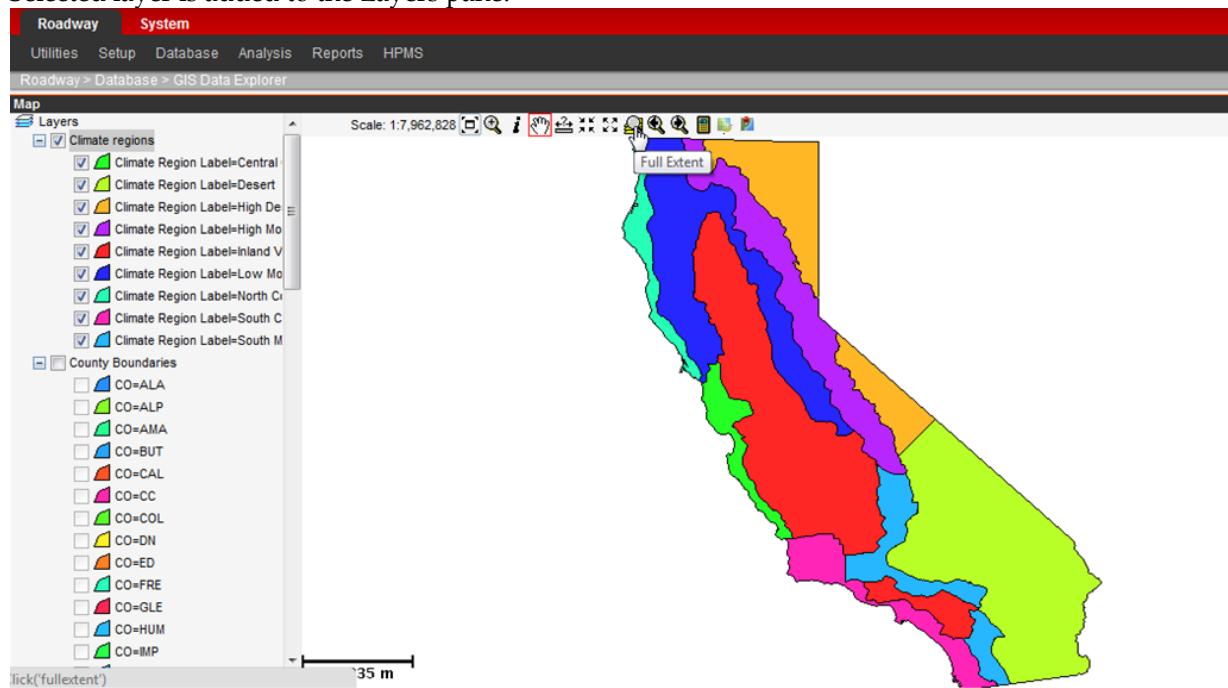


Note: This dialog box essentially contains the "library" of layers that may be added to the map. This dialog box contains two tabs: Saved GIS Layers and GIS Data Sources. These tabs are described below:

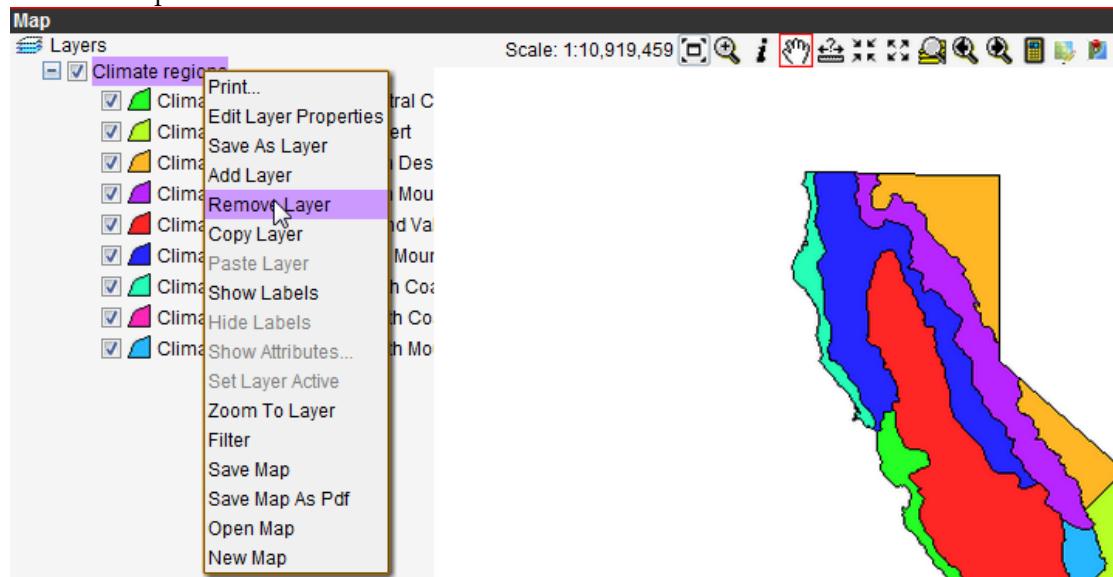
- The Saved GIS Layers tab shows those layers that you previously saved from this or any other window (floating map window) in the system. It also shows those layers saved by other users if the user marked the layer as a "public" layer when the user saved the layer.
 - The GIS Data Sources tab shows the data sources that are saved in the Manage GIS Data Sources window (see page **Error! Bookmark not defined.**). When you select a data source, the system applies the default styling to the source to create a layer and then displays the layer in the Floating Map window.
4. Select the desired Layer Name from the pop up window that is not already displayed on the Map window and click Ok(For example select the Climate regions layer from the Saved GIS Layers)



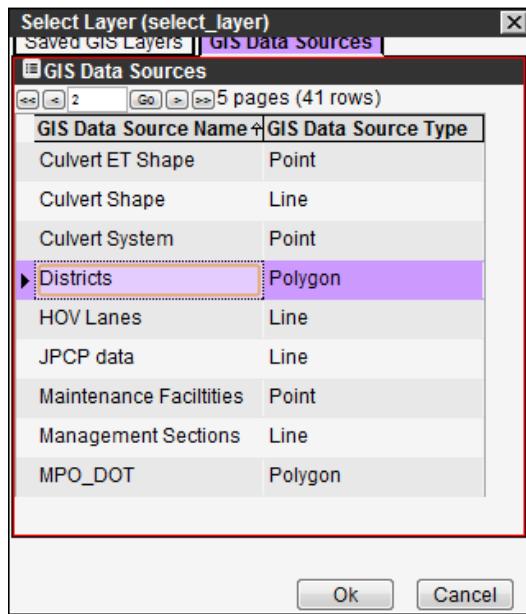
5. Selected layer is added to the Layers pane.



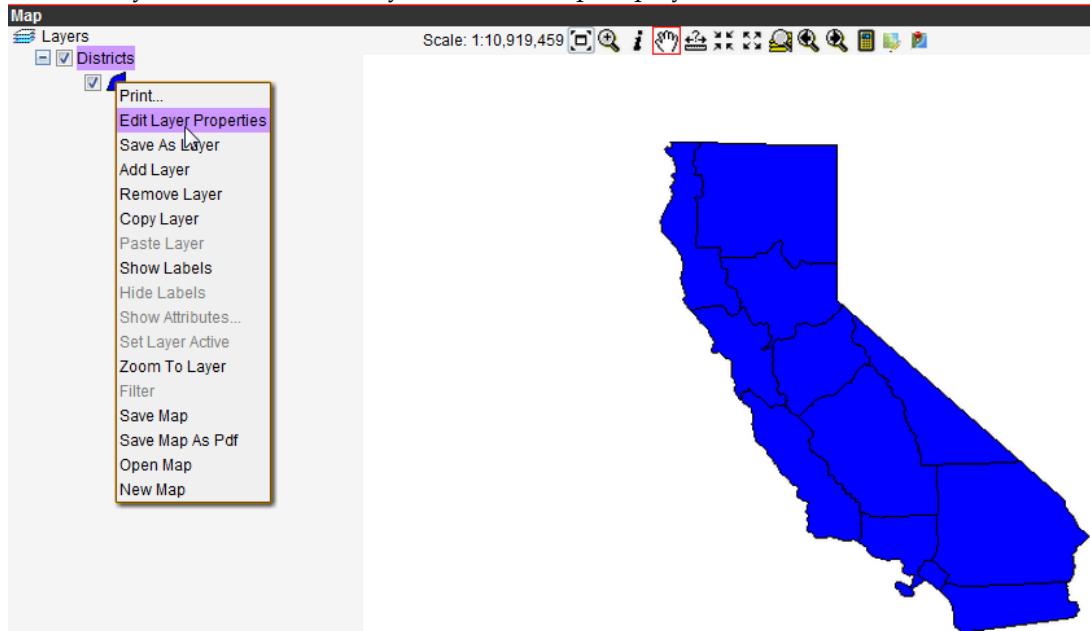
6. Right click on the layer added on the layers pane and select Remove layer. Layer is removed from the map.



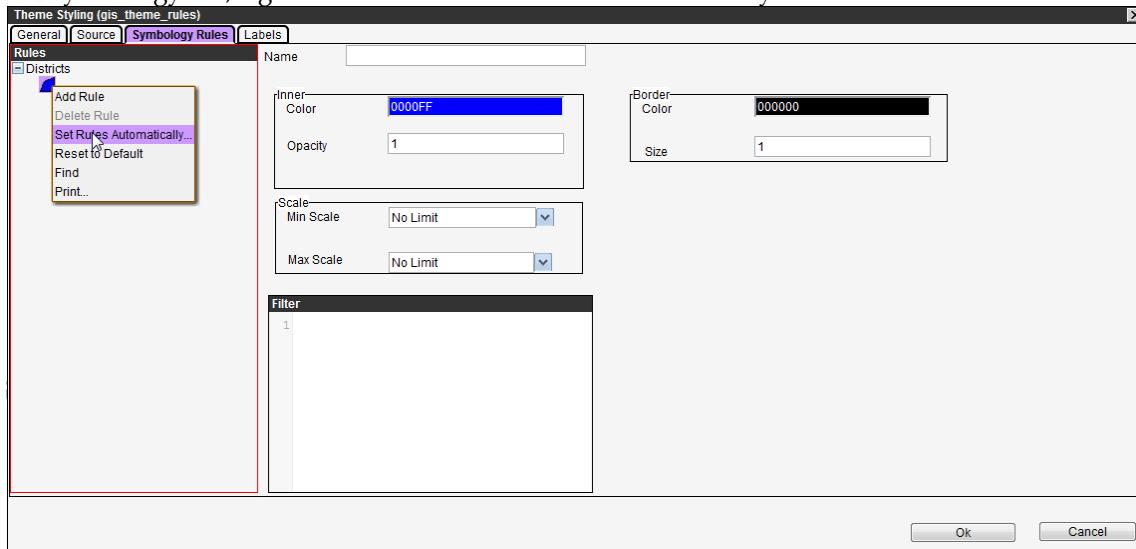
7. Right-click and select Add Layer option, the Select Layer pop-up window opens and you can select from the available the GIS Map Layers. Choose the District maps from the GIS Data Sources tab and click the OK button.



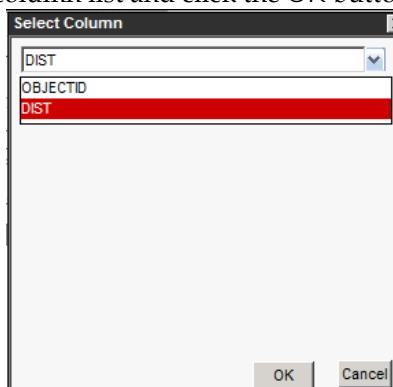
8. Selected layer is added to the Layers list and Map display.



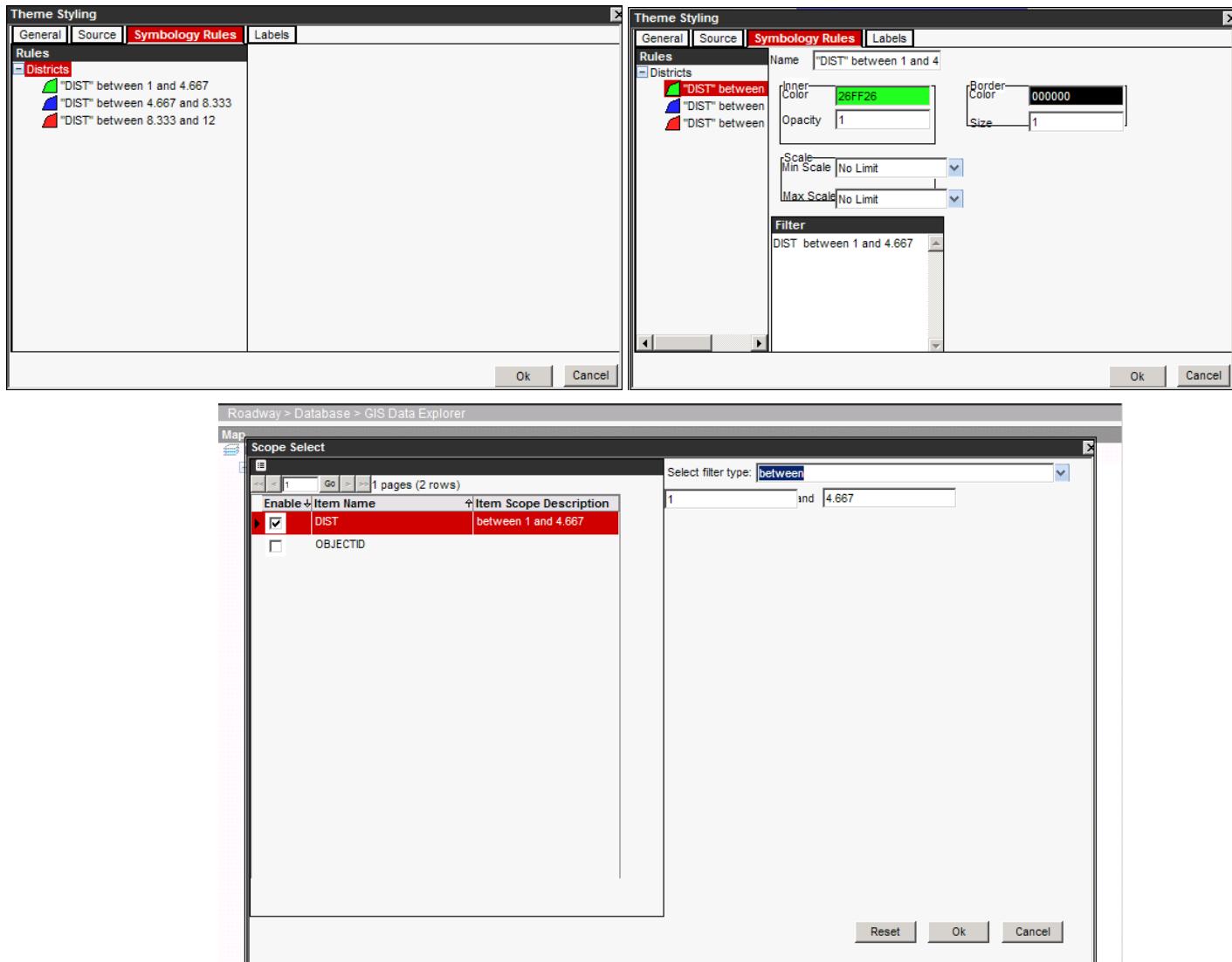
9. Right-click and select Edit Layer Properties option, the Theme Styling window opens, click on the Symbology tab, right-click and select Set Rules Automatically



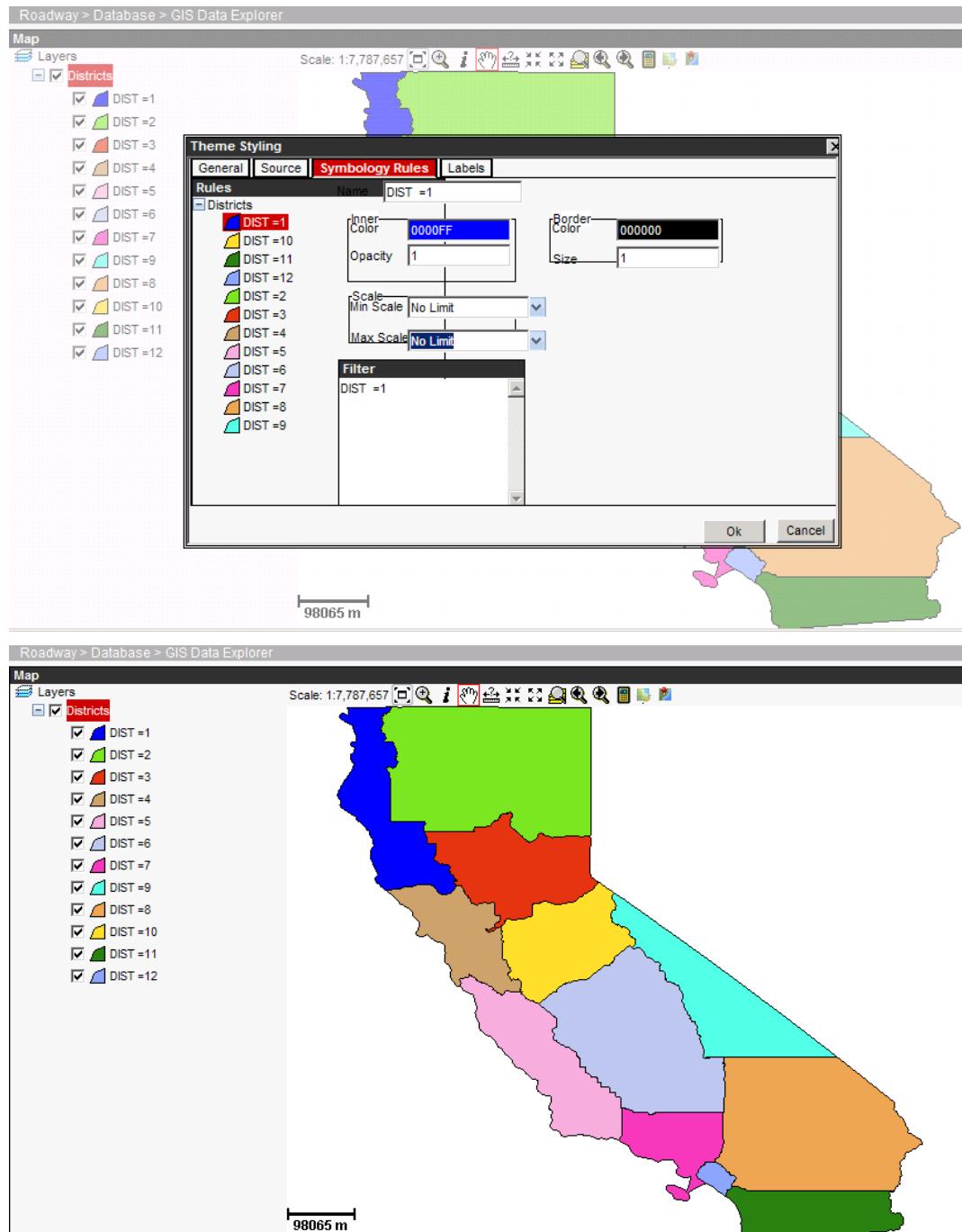
10. Right click in the Rules pane and select Set Rules Automatically. With this command you select a column that will be used to divide the GIS data into groups and then the system automatically creates sub-layers for each distinct value in the column. Choose DIST from the column list and click the OK button.



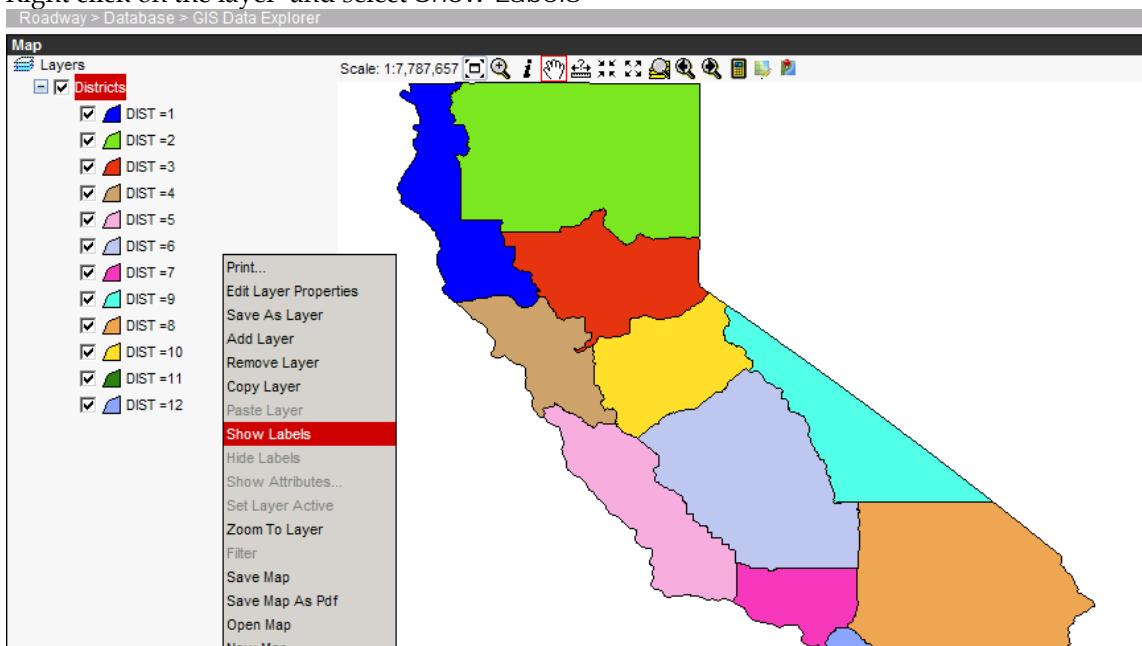
11. The Theme Style window that appears will look similar to the first image below. In this case you will need to edit the automatically generated rules by selecting the first record in the Rules pane (see second window below), then edit the Filter Pane on the bottom left, When you right-click this field, a shortcut menu appears with an Edit command, which displays the Filter dialog box as shown in the third image below where you will change the filter to '= 1'.



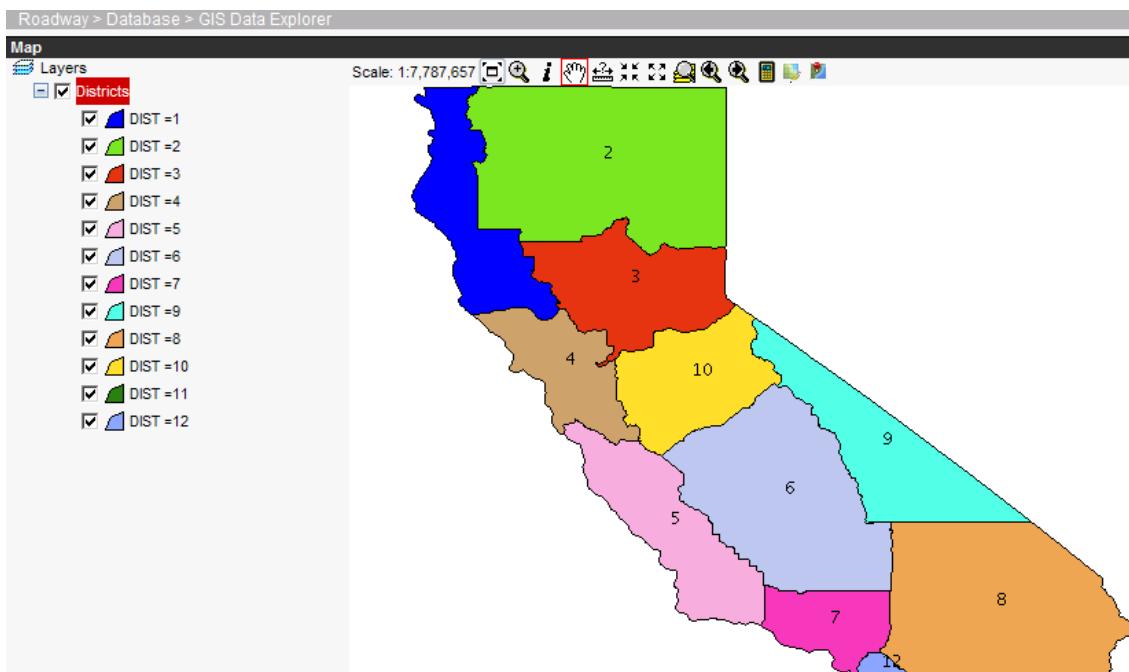
12. Similarly, update the Filter pane for the other two rows, after which you can use the Add Rule right click option shown in Step 9 to add a record for the other 12 Districts. At the end of this process your results will look similar to the image below. Click OK to display the map when completed.



13. Right click on the layer and select Show Labels



14. Associated labels are displayed on the map

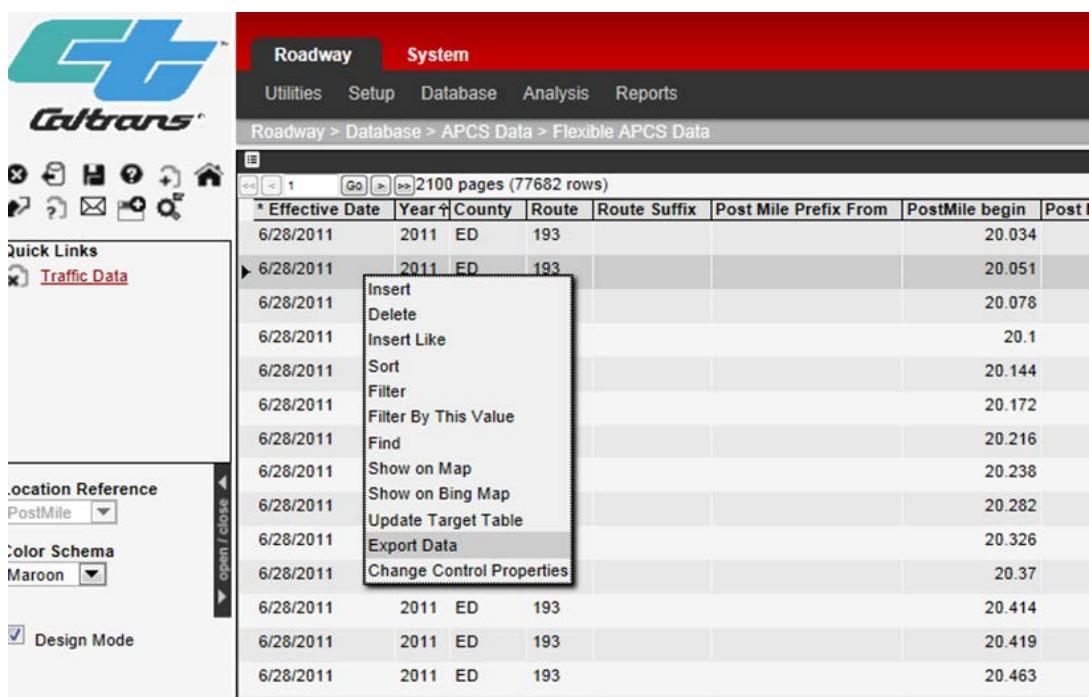


3.4.6 Exporting Data

After the data is imported successfully, data will be ready for viewing and for further analysis like sorting, filtering and exporting the data. There are multiple ways to look at most of the data within the application database.

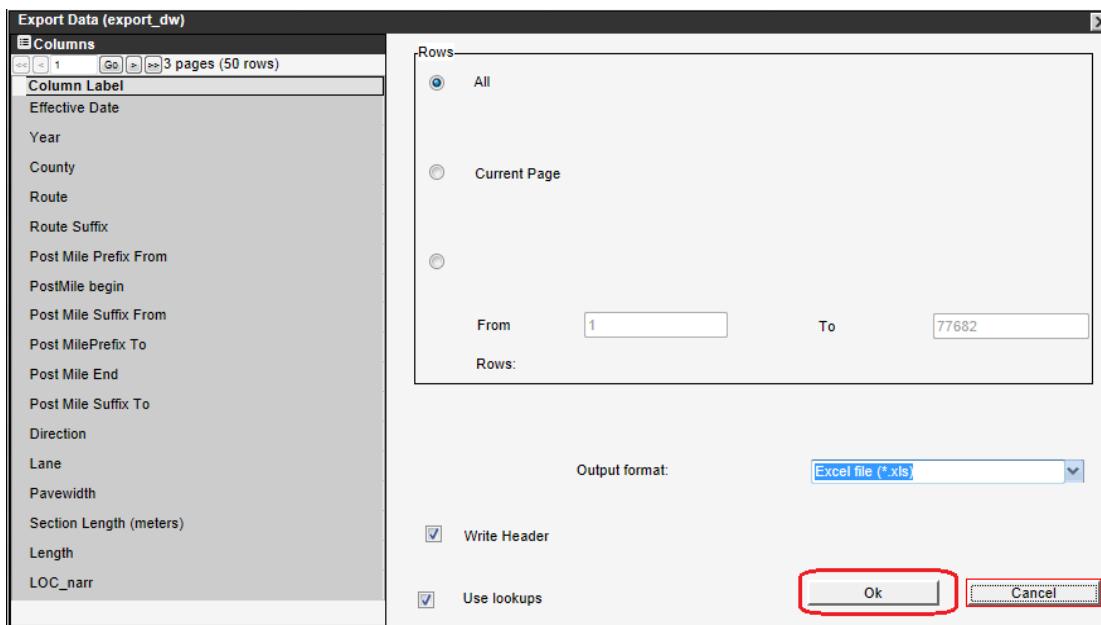
To view this, go to any of the data windows. Follow the process below, the Flexible APCS data example is listed:

1. Go to Flexible APCS Data window (Roadway > Database > APCS Data > Flexible APCS Data). This window had the APCS data for Flexible pavement type.
2. Check whether the filter is on or not. If the filter is on there will be an icon  located to the left top corner of the window. If the filter is on, right-click in the data window and click Filter. A dialog box pops up.
3. Click Reset button on the bottom of the window and click OK. This clears the data filter.
4. Right-click the data window and click Export Data.



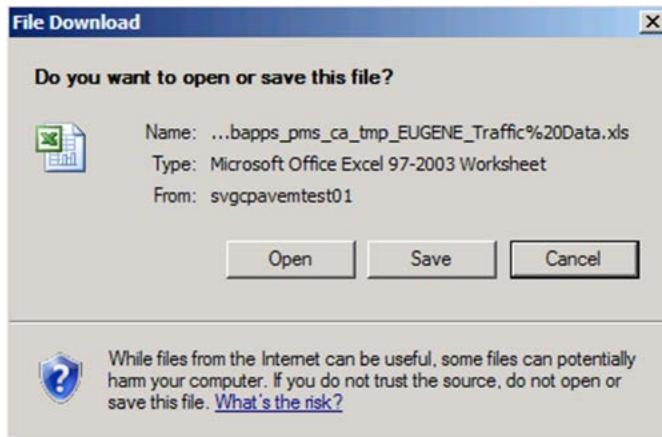
Effective Date	Year	County	Route	Route Suffix	Post Mile Prefix From	PostMile begin	Post M
6/28/2011	2011	ED	193			20.034	
6/28/2011	2011	ED	193			20.051	
6/28/2011						20.078	
6/28/2011						20.1	
6/28/2011						20.144	
6/28/2011						20.172	
6/28/2011						20.216	
6/28/2011						20.238	
6/28/2011						20.282	
6/28/2011						20.326	
6/28/2011						20.37	
6/28/2011	2011	ED	193			20.414	
6/28/2011	2011	ED	193			20.419	
6/28/2011	2011	ED	193			20.463	

5. A dialog box pops up; click OK on the dialog box.



- The steps for saving are a function of your browser as well as your browser settings for handling downloaded files. If the file download dialog box comes up, click Save on the dialog box, and choose the necessary place to save the file. Hence the data file with Flexible APCS data sections has been exported.

Example using I.E.7 (Caltrans Standard Browser)



- The same process is repeated to view the data for other data windows.

3.4.7 Show Data on Google Map/ Bing Map

- Open the Master Work Plan Data window (Roadway > Analysis > Network Analysis > Master Work Plan).

- In the Select WP Type field at the top of the window, click the down arrow and then click the work plan which you like to see on a map.

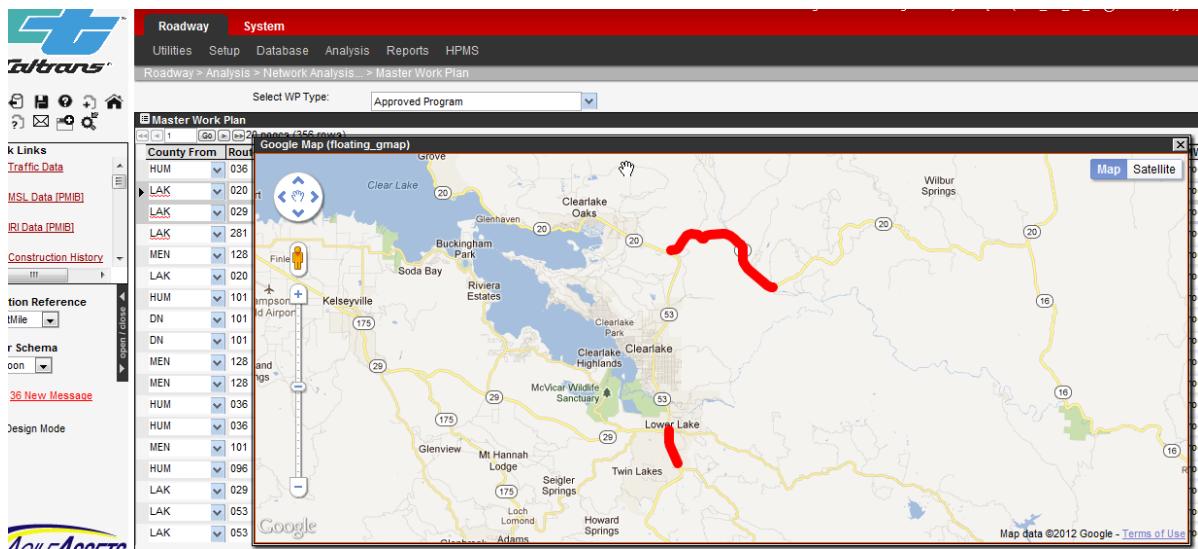
County From	Route From	Route To	Post Mile Suffix From	Post Mile Prefix To	Post Mile End	Post Mile Suffix To	Direction	Lane
LAK	053		0		3.1		Asc.	All
MON	101		0	R	1.9		Asc.	All
RIV	078		0		16.4		Asc.	All
INY	136		0		10		Asc.	All
MNO	182		0		6.5		Asc.	All
STA	099		0	R	6.5		Asc.	All
SHA	005		0		0.9		Asc.	All
YOL	113		0	R	11.1		Asc.	All
SIE	089		0		6.6		Asc.	All

The system displays the line items for the selected work plan after you make your selection.

- Select one row or multiple rows (Shift+ Click)
- Right Click and Select Show on Google Map/ Show on Bing Map whichever is available.

County From	Route From	Route Suffix (From)	Post Mile Prefix From	Post Mile Begin	Post Mile Suffix From	Post Mile Prefix To	Post Mile End	Post Mile Suffix To	Dir
HUM	036		Insert	35.4			40.5		Asc
LAK	020		Insert Like	31.8			37.1		Asc
LAK	029		Delete	19			20.3		Asc
LAK	281		Copy Analysis Results	14			17		Asc
MEN	128		Create Pavement Construction Record	0			11.6		Asc
LAK	020		Copy From Master WP	13.5			31.4		Asc
HUM	101		Show on Google Map	79.8			87.8		Asc
DN	101		Sort	5.8			7.8		Asc
DN	101		Filter By This Value	4.4			9.4		Asc
MEN	128		Find	31			38.8		Asc
MEN	128		Filter	20.2			50.9		Asc
HUM	036		Edit Location By GPS	1.7			13.5		Asc
HUM	036		Show on Map	21.1			27		Asc
MEN	101		Show on Bing Map	0.5			33.7		Asc
HUM	096		Export Data				3.7		Asc

5. Selected rows are displayed on the Google/Bing Map.



Note: You can continue to select records in the background, the map will update to display the selected records.

3.4.8 Viewing APCS Data using Hyperlink to Fugro's iVision Software

iVision is a web application that offers synchronized viewing of the APDS data collected by Fugro using any web browser. iVision allows for synchronized viewing of right-of-way videolog, pavement images, and the collected pavement management and condition data over the internet.

Hyperlinks to the iVision Application is available in the following window:

- Flexible APDS Data window (Roadway > Database > APDS Data > Flexible APDS Data)
- JPCP APDS Data window (Roadway > Database > APDS Data > JPCP APDS Data)
- CRCP APDS Data window (Roadway > Database > APDS Data > CRCP APDS Data)
- Profiler (Roadway > Database > APDS Data > Profiler Data)
- Network Master Data window (Roadway > Analysis > Network Analysis... > Network Master > Network Master Data)

Follow the instructions below to open iVision from the PaveM application.

1. Go to Flexible APCS Data window (Roadway > Database > APCS Data > Flexible APCS Data) and find the iVision field, it will contain a hyperlink labeled '[iVision](#)'.

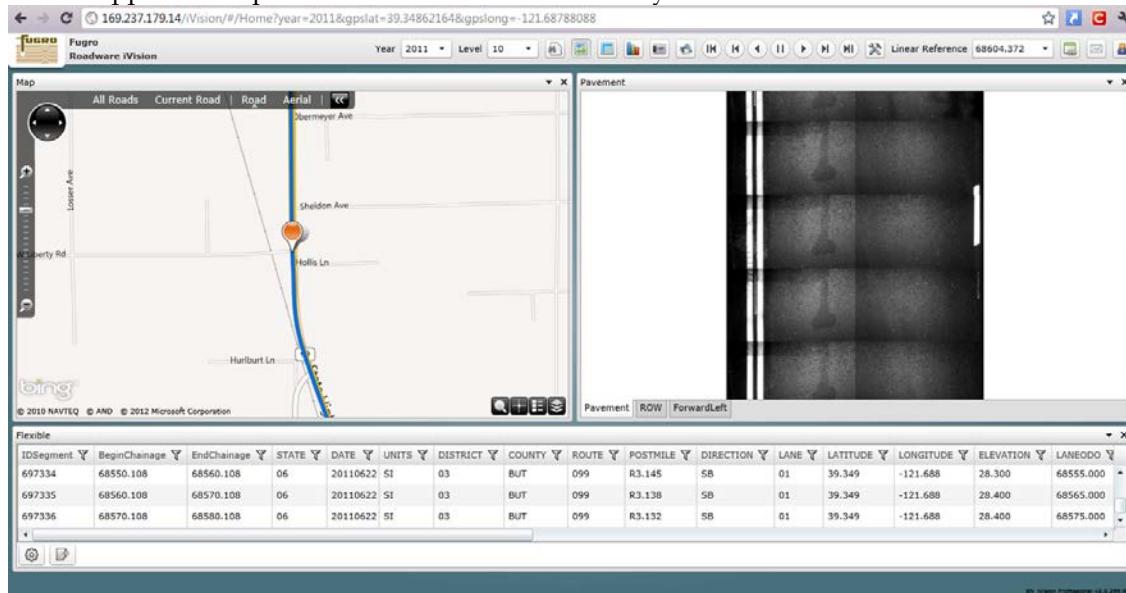
Roadway > Database > APCS Data > Flexible APCS Data

10000 pages (10000 rows)			
Year	2011	XFC_NARR	0
Rte_Sfx	099	XFC_seal	0
County From	BUT	XFC_WIDE	0
Post Mile Prefix From	R	DSEnd	30731
PostMile Begin	3.07	User Update	
Post Mile Suffix From		Date Update	
Post MilePrefix To	R	Filename	16MOI800
Post Mile End	3.114	LaneDev	<input type="checkbox"/>
Post Mile Suffix To		APCS_Lanetype	FLX
Direction	Desc.	Bridge	<input type="checkbox"/>
Lane	1	Lowspeed	<input type="checkbox"/>
Pavewidth	0	Rinfo	NA
Section Length (meters)	80	Shld_Type	FLX
Length	0.048	Elevation	28.5
LOC_narr	0	Latitude	39.34862164
LOC_seal	0	Longitude	-121.68788088
LOC_wide	0	iVision	iVision
PHL_area	0	Outside Lane Flag	<input type="checkbox"/>
PHL_cnt	0	Length of Starting Data S	10
TVC_narr	0	Length of Ending Data Se	10
TVC_seal	0	Couplet?	<input type="checkbox"/>
TVC_wide	0	NHS	<input type="checkbox"/>
Constr	<input type="checkbox"/>	* Effective Date	6/22/2011
WPC_lwp	0		
WPC_rwp	0		
XFC_len	0		
Direction	SB		
DSBegin	30651		
WPC_High	0		
WPC_MED	0		
WPC_Narrow	0		
WPC_SEAL	0		

2. Click on the hyperlink for any a record with the Flexible APCS dataset. If you are not already logged into the iVision application you will be presented with a login page in a new browser window.

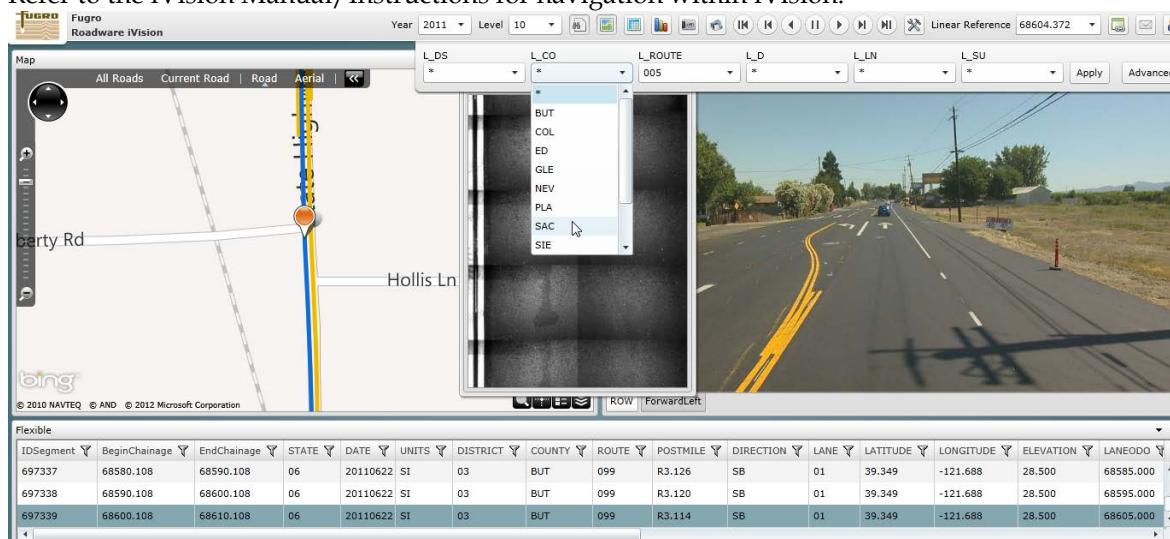
The dialog box is titled "Login". It contains two text input fields: "User Name (Email)" and "Password", both with placeholder text. At the bottom are two buttons: "Login as Guest" and "Login".

3. If you're already logged into iVision or after entering the User Name and Password, the iVision application opens to the location on the record you selected in PaveM.



4. In iVision, users can specify the exact location they would like to view using the map, typing in the location or by simply using a drop down selection: by county, route number, direction, milepost. iVision includes the mapping functionality of Microsoft® Bing Maps™, allowing the user to navigate road network data intuitively. Bringing a familiar user interface through this powerful web application puts the fastest and safest decision making tools in the hands of those who need it most.

Refer to the iVision Manual/Instructions for navigation within iVision.



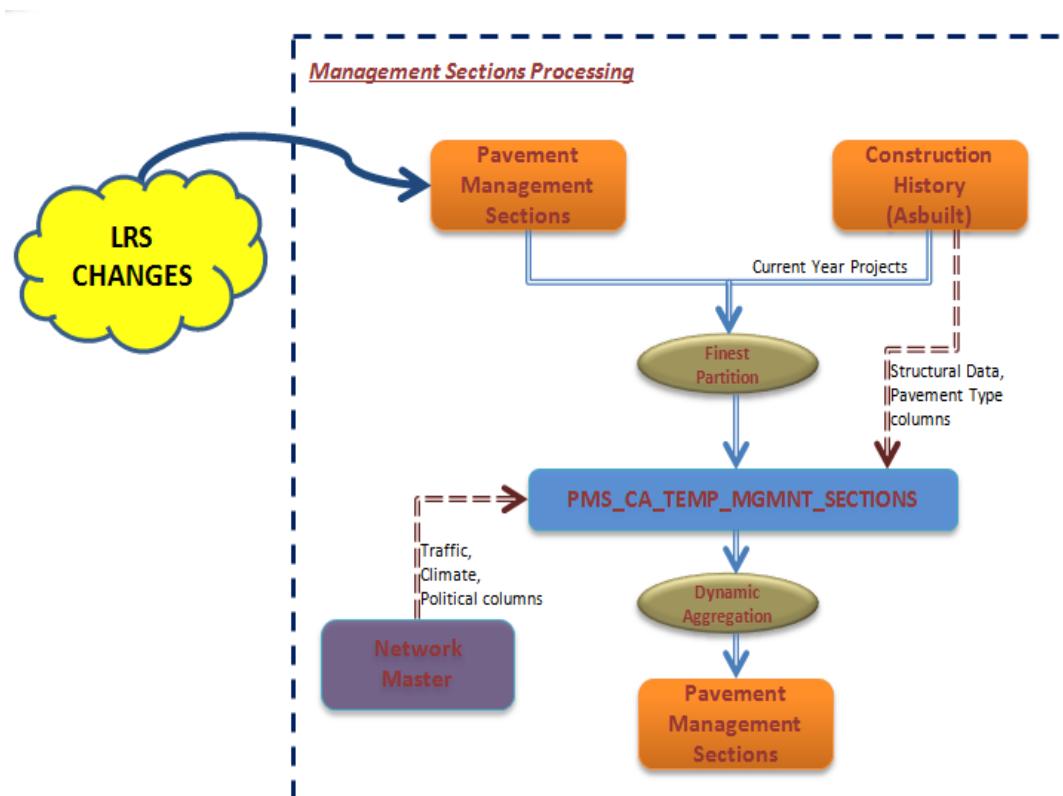
4 UPDATING PAVEMENT MANAGEMENT SECTIONS

4.1 Overview

This chapter covers updating the Pavement Management Sections. These updates occur following completion of the season's paving work.

Pavement management sections are updated in a three step process – In the above section in Figure 2: Caltrans PaveM Software Data Flow, the right bottom side part explains the process of Management Sections processing. The two steps are listed below.

- After the LRS transactions are made to the Pavement Management Sections table, Run a “finest partitioning” process to overlay last season’s paving contracts on top of the current pavement management sections and create a temporary table ‘PMS_CA_TEMP_MGMT_SECTIONS’ of sections that are split based on the limits of both current pavement management sections and last season’s contracts.
- Aggregate the adjacent pavement sections with homogeneous characteristics in order to create longer pavement management sections where the minimum length is 0.1 miles and maximum is 10 miles.
- Review and adjust limits of the pavement management sections as needed.



4.2 How to Run Finest Partition/Aggregation

1. Display the Schedules window (System Module > Tools > System Job > Schedules).
2. Select 'Populate Temporary Mgmt Sections table' from 'System Job Name' field.

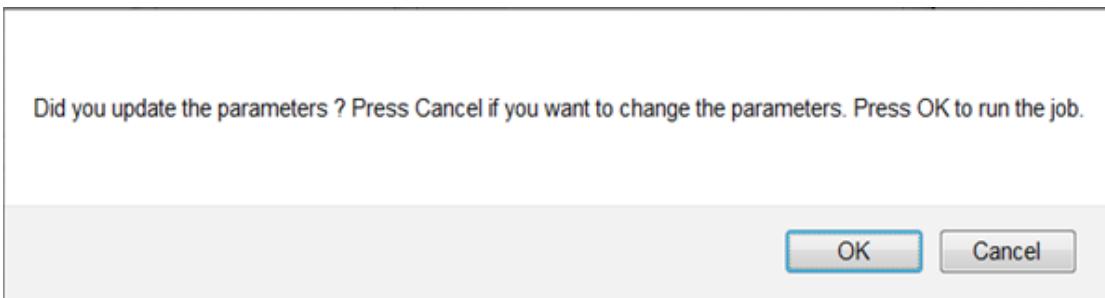
The screenshot shows the 'Schedules' window with the 'Jobs' tab selected. The list contains various system jobs, including 'Populate Temporary Mgmt Sections table', which is highlighted with a purple selection bar. The window has a standard header with tabs for 'Roadway' and 'System', and a menu bar with 'Utilities', 'Setup', 'LRS & GIS', 'Tools', and 'Reports'.

* SYSTEM JOB NAME	CRON EXPRESSION	Commit Between Executables	Schedule
PaveM - CAS Projects Import			
PaveM - TSN Highway Inventory Data			
PaveM - CAS Contract Items Import			
PaveM - OE Data Import			
PaveM - PRSM Data Import			
PaveM - PRSM Milestone Import			
Populate all Lanes and Directions tables from NETWORK_LANES_COUNT			
Populate Network Master			
Populate Performance Master			
Populate PMS_MGMT_SECTIONS			
► Populate Temporary Mgmt Sections table			
Proc Fill Equipment Expense Universe			
Recompile Jasper Reports	SYSTEM JOB NAME		
Reload CA LRS Tables Job			

3. Right click and click Run Job.

The screenshot shows the same 'Schedules' window as above, but with a context menu open over the 'Populate Temporary Mgmt Sections table' row. The menu options include 'Insert Schedule', 'Delete Schedule', 'Run Job' (which is highlighted with a purple selection bar), 'Set Schedule', 'Next fire date', 'Sort', 'Find', 'Work With Attachments', and 'Export Data'. The menu has a standard Windows-style appearance with a black background and white text.

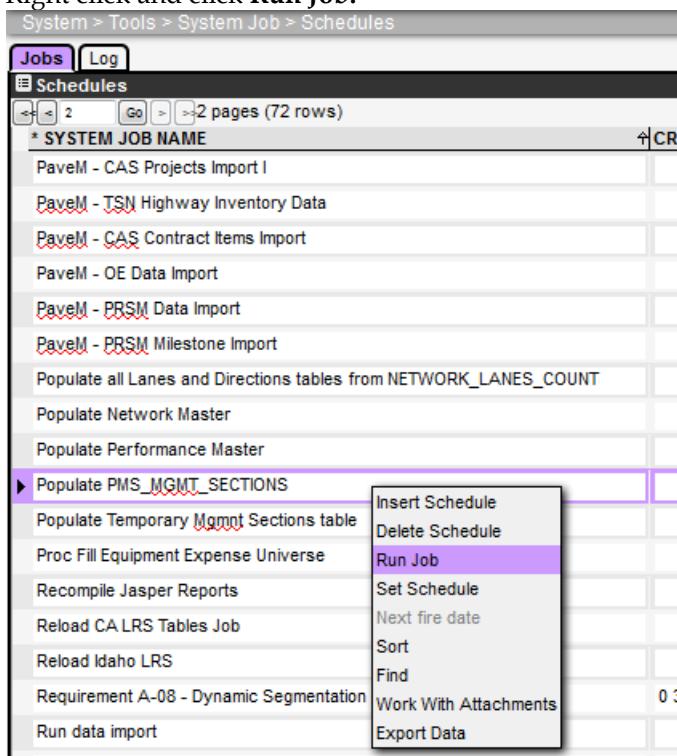
4. System prompts for 'Update of parameters' Click OK.



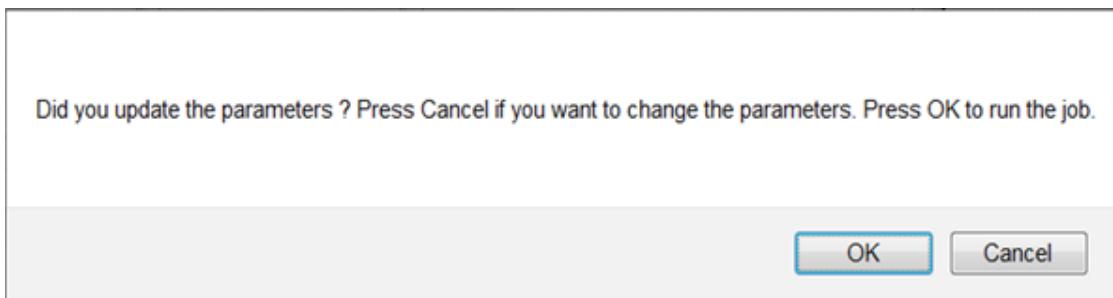
5. In a few minutes, system job fills 'PMS_CA_TEMP_MGMT_SECTIONS' table.
 6. Select 'Populate PMS_MGMT_SECTIONS' from 'System Job Name'

* SYSTEM JOB NAME	CRON EXPRESSION	Commit Between E
PaveM - CAS Projects Import I		
PaveM - TSN Highway Inventory Data		
PaveM - CAS Contract Items Import		
PaveM - OE Data Import		
PaveM - PRSM Data Import		
PaveM - PRSM Milestone Import		
Populate all Lanes and Directions tables from NETWORK_LANES_COUNT		
Populate Network Master		
Populate Performance Master		
▶ Populate PMS_MGMT_SECTIONS		
Populate Temporary Mgmt Sections table		
Proc Fill Equipment Expense Universe		
Recompile Jasper Reports		

7. Right click and click **Run Job**.



8. System prompts for 'Update of parameters' Click **OK**



5 RECORDING “PAVEMENT” WORK

5.1 Overview

This chapter covers the process of recording pavement work.

There is a data entry window within the system that is used to enter the contract information. This window is accessed under the following menu location: Roadway > Database > Construction > Construction History.

You can view, insert, edit, and/or modify data related to work performed on pavements. Data is recorded in these windows by the limits of the work as it was performed on the road.

As with other database windows, the limits for a project do not have to coincide with the limits of any pavement management sections. This is because the software will automatically apply pavement structure information to pavement management sections when the master files are created. The Contracts and Layers Data windows allow you to view pavement projects exactly where they occur. The system then uses an algorithm to build the entire road structure for all mileage based on that information.

5.1.1 *The Contracts and Layers Data Windows*

The Contracts window contains the following panes:

- Constr. History Sections (records information pertinent to the work performed)
- Typical Sections (records information about Typical Sections placed during the work)
- Constr. History Sections Location (records the location of the work)
- Material Layer Information (records information about each paving layer placed during the work)

5.1.1.1 Construction History Sections Pane

The Constr. History Sections pane contains information related to the work performed as a whole like Contract data - includes the Year work was completed, Treatment, Work Code and other information. You should fill in as many of these fields as are applicable to the work performed.

5.1.1.2 Typical Sections Pane Description

This Typical Sections pane contains typical sections list for the selected contract – includes Typical section ID and Typical section name. Under each contract they can be one or more typical sections and for each typical the location segments are inserted in Construction History Sections Location pane.

5.1.1.3 Construction History Sections Location Pane

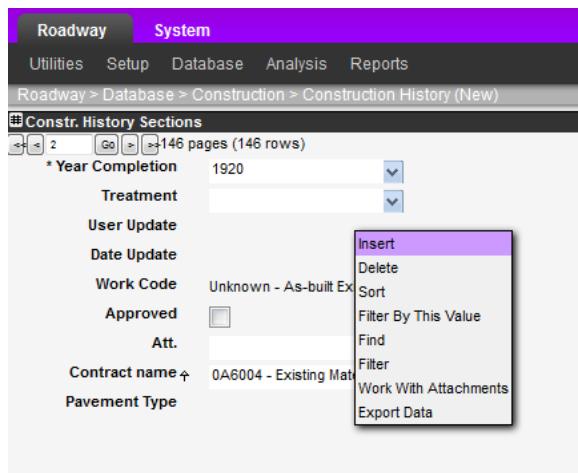
The Constr. History Sections Location pane contains location-related information for the typical section in for that particular contract. In this pane you will enter the route and county or state based mile points, direction and lane information as appropriate for the work.

5.1.1.4 Material Layer Information Pane Description

The Material Layer Information pane allows you to enter material properties for each layer. For each layer placed (or milled) within a given contract you should insert a new row in this pane and enter data in all appropriate fields. The contents of this pane are different for each of the three data entry windows Asphalt, Concrete, and Surface Treatment.

5.2 Entering Data for a Completed Project

1. Display the Construction History (New) window for the type of work you are entering Roadway > Database > Construction > Construction History (New)
2. Right-click in the top Contracts Data pane and then click Insert. This will insert a new record into the database.
3. Enter data into the construction history sections pane, filling in each of the main portions of the form with appropriate values.



4. In the Typical Sections pane right-click and then click Insert. Enter the appropriate values. Repeat for each layer to be entered.

Typical Sections		
* Typical Section ID	* Typical Section Name	HPMS Base Type
1	placed	
2	placed	
3	placed	
4	placed	

5. In the Constr. History Sections Location pane right-click and then click Insert. Enter the appropriate location data for your contract.

Constr. History Sections Location							
County From	Route From	Route Suffix (From)	Post Mile Prefix From	Post Mile begin	Post Mile Suffix From	Post MilePrefix To	Post Mile End
PLA	080			14.385			16.857

- In the Material Layer Information pane, right click and then click Insert. Enter characteristics of the first layer. Repeat for each layer to be entered.

Material Layer Information								
* Layer	Color	* Material Code	* Thickness (ft.)	Mix ID	Date Update	User Update	Att.	Comm
1		HMA	0.4101					
2		CTB	0.7546					
3		AS	0.4921					

- Click the Save icon to save your data.

5.3 Adding a New Layer to an Existing Project

To add a new layer to an existing contract:

- Display the Construction History (New) window for the type of work you are entering Roadway > Database > Construction > Construction History (New).
- In the Constr. History Sections pane, click the row showing the road section for which layer information will be added. In most cases you will need to locate the road section using the navigation toolbar and/or the sort, find or filter commands.
- In the Material Layer Information pane, right-click and then click Insert. A new row is added to the table.
- In the new record, click in the Layer column and then type the ID code for the layer.
- In the Material Code column, click the down arrow and then click the material for the layer.
- In the Thickness column, type the thickness of the layer.
- Repeat steps 3 through 6 for any additional layers.
- When all layers are entered, click to save the new information.

6 UPDATING MODELS AND ANALYSIS PARAMETERS

6.1 Overview

This chapter covers updating models and parameters that are used for unconstrained needs and optimization analysis.

Instructions are provided below for the following activities:

- Updating unit costs used to estimate costs of future treatments
- Updating decision trees used in the optimization routines to assign treatments to pavement sections based on their condition and characteristics
- Updating pavement performance models (also known as deterioration models)

6.2 Updating Unit Costs

The following process explains how to view and update unit costs at central office levels and at district levels.

1. To view and update the unit costs at HQ, login in to the system, select ‘California Department of Transportation’ as the department. Click **Submit**.
2. Go to Treatments window. (Roadway > Setup > Network Analysis > Treatments) Treatment costs are listed according to Treatment Name and Work Code.

*Treatment	*Treatment Name	*Unit Cost	*Selection Priority	Exclusion Priority	Exclusion Years	Cost	Budget Gro	*Work Code	GHG Ma
Do Nothing	Do Nothing	\$0.00	0	1	0	0 Unit Cost Per Lane Mile	Rehab	Unknown	
HMA-Very Thin-<=0.1'	HMA-Very Thin-<=0.1'	\$100,000.00	20	4	2	2 Unit Cost Per Lane Mile	Rehab	Thin Overlay	
CSOL	CSOL	\$725,000.00	130	13	3	3 Unit Cost Per Lane Mile	Rehab	Crack, Seal and Overlay (CSOL)	
Lane Replacement	Lane Replacement	\$1,000,000.	140	14	5	5 Unit Cost Per Lane Mile	Rehab	Slab replacement	
Grind	Grind	\$50,000.00	105	11	5	5 Unit Cost Per Lane Mile	Rehab	Grind	
Slab Replacement	Slab Replacement	\$0.00	110	10	2	2 Replace Slabs Expression	Rehab	Slab replacement	
Grind/Replace slabs	Grind/Replace slabs	\$0.00	120	12	3	3 Replace and grind Slabs Expression	Rehab	Grind with Slab Replacement	
Seal Coat	Seal Coat	\$40,000.00	10	3	2	2 Unit Cost Per Lane Mile	Rehab	Seal Coat	
HMA-Thin->0.1<=0.2	HMA-Thin->0.1<=0.2	\$200,000.00	30	5	3	3 Unit Cost Per Lane Mile	Rehab	Thin Overlay	
HMA-Medium->0.2<=0.5'	HMA-Medium->0.2<=0.5'	\$600,000.00	40	8	4	4 Unit Cost Per Lane Mile	Rehab	Thin Overlay	
HMA-Thick->0.5'	HMA-Thick->0.5'	\$900,000.00	50	9	5	5 Unit Cost Per Lane Mile	Rehab	Thin Overlay	
Full-Depth Recycling	Full-Depth Recycling	\$350,000.00	70	7	4	4 Unit Cost Per Lane Mile	Rehab	Full Depth Reclamation	

3. View and update unit costs as needed.

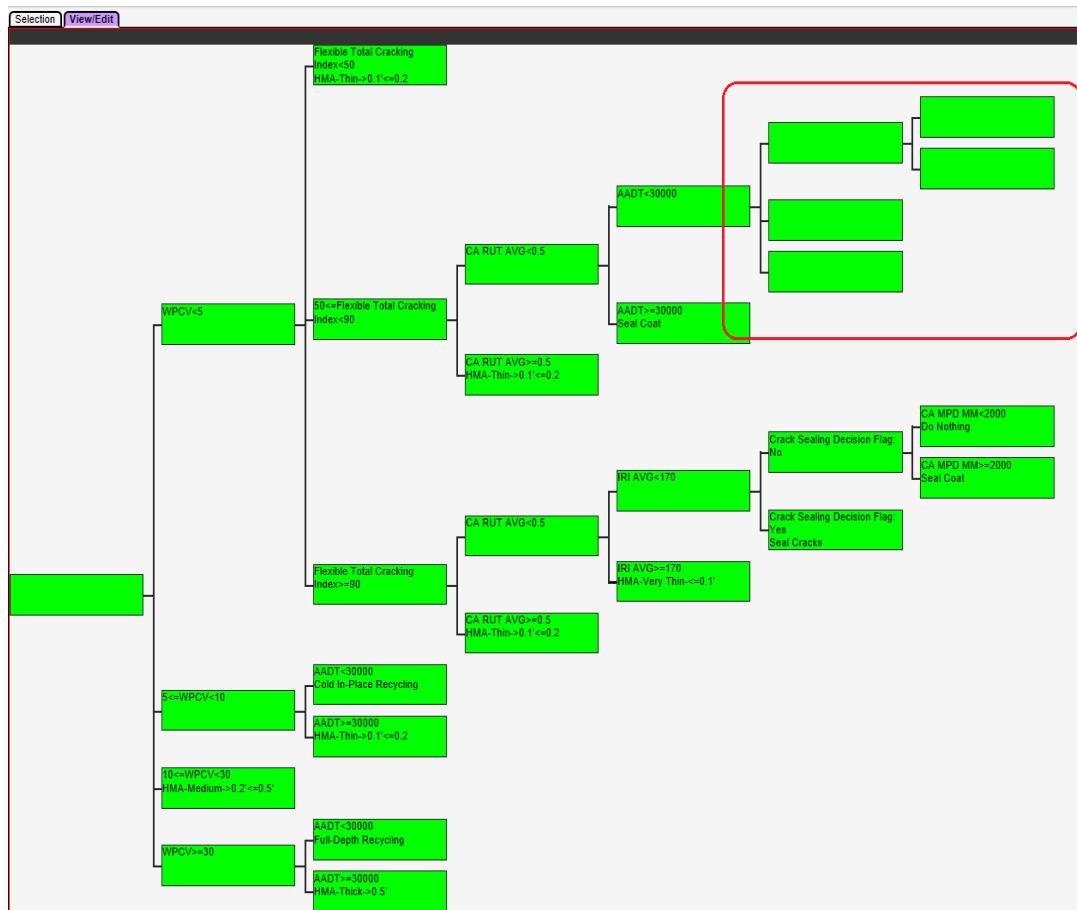
6.3 Updating Decision Trees

Decision trees define the rules that govern assignment of pavement treatments within Scenario Analysis. These rules include the conditions that trigger the need for a treatment as well as the specific type of

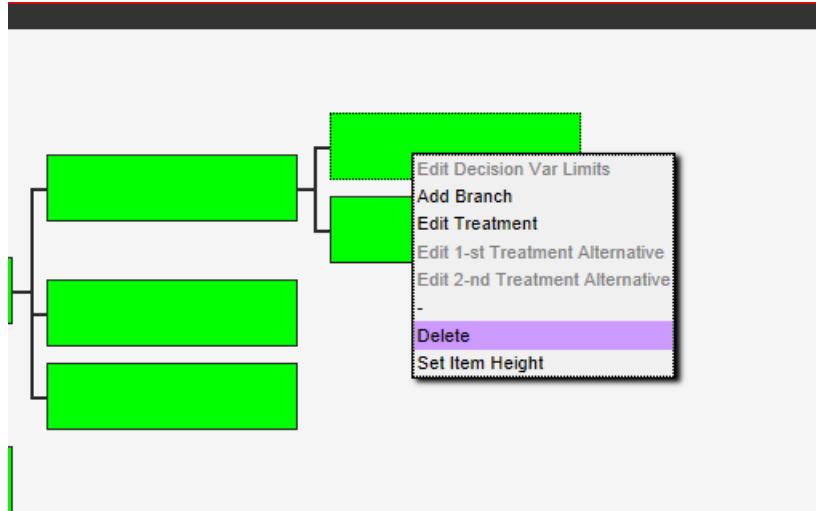
treatment to be assigned. The decision tree subsystem applies only to the Optimization network analysis methods used to predict conditions and needs into the future.

6.3.1 Updating an Existing Decision Tree

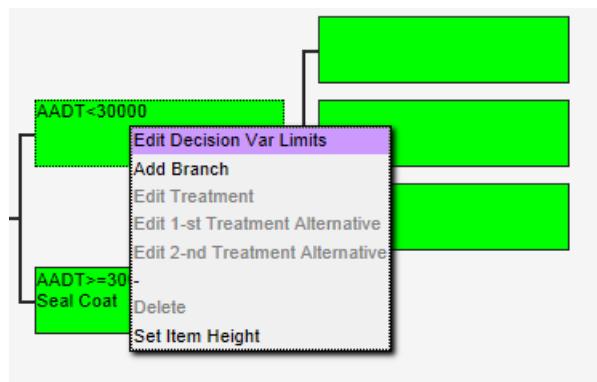
1. Display the Decision Trees window (Roadway > Setup > Network Analysis > Decision Trees).
2. In the ‘Decision Trees’ pane, click the “Flexible Decision Tree” record. Click the View/Edit tab. Before changing the tree, note the exact structure of the tree so that you can again change it back to its original structure.
3. Right-click an end node of one of the branches and then click Add Branch. A dialogue box is displayed, enter 3 and click OK.
4. For the first node out of the three new nodes added in step 3, right-click then click Add Branch. A dialogue box is opened, enter 2 and click OK. Two new branches are added to the tree structure.



5. Right-click on one of the nodes added in step 4 and then click Delete. With this, both child nodes are deleted.



6. Right-click a parent node and then click Edit Decision Variables. The Decision Tree Node dialog box opens.

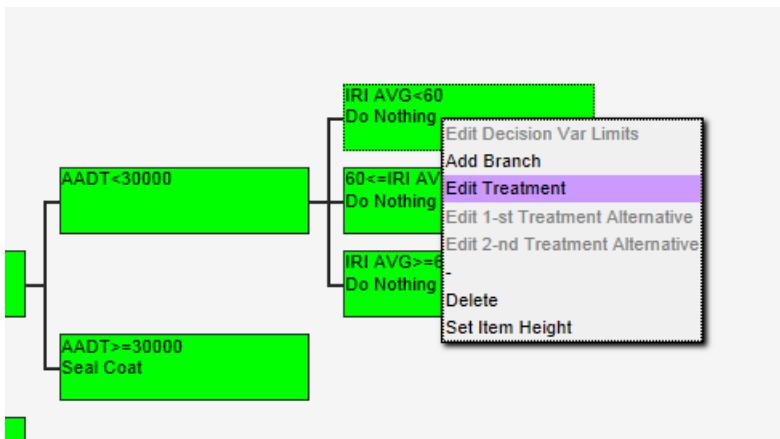


7. In the left pane, select a decision variable and then, in the 'High Limits' column of the right pane, enter the threshold values that determine branching. After setting the branching criteria, click the OK button.

Column ID	Column Label	View Type
CA_APACS_JPC_CK3_PCT	3rd Stage Cracking %	R-Number
CA_MPDM_MM	CA MPD MM	R-Number
CA_CLIMATE_REGION_ID	Climate Region	T-List
CA_TRANSCRACKING	Crack Sealing Decision Flag	C-CheckBox
ESAL	ESALs	R-Number
CA_FHT_VAL	Faulting Value (in.)	R-Number
CA_IRI_AVG	IRI AVG	R-Number
NUMBER_OF_LANES	Number of Lanes	R-Number
WC_ID	Pavement Type	T-List
PAVE_AGE	Pvmnt Age	R-Number
CA_TOTAL_LANES	Total Number of Lanes	R-Number
CA_WHEELPATH	wheelpath	T-List

NODE NUM	LOW LIMIT	HIGH LIMIT
1	60	60
2	60	90
3	60	

8. The dialog box closes and the nodes show the new branching criteria. Right-click an end node (that is, one with no children) and then click Edit Treatment. The Select Treatment dialog box opens.



9. In the dialog box, click the down arrow and then click the desired treatment. After selecting the treatment, click the OK button.



10. The dialog box closes and the node shows the selected treatment. Click the Setup tab and then click the icon. Make sure you change the tree structure back to its original structure.

6.3.2 Creating a New Decision Tree

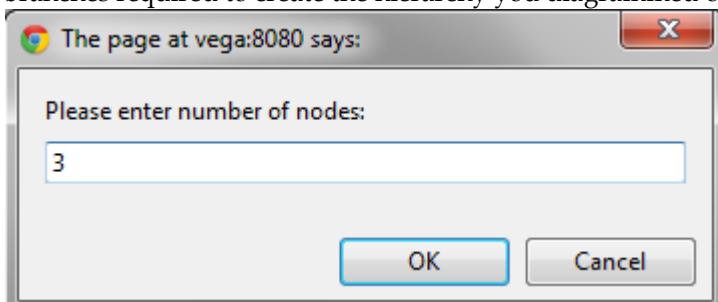
- Prior to defining a new decision tree within the PaveM system, it may be helpful to sketch out the logic for the tree on paper.
- Display the Decision Trees window (Roadway > Setup > Network Analysis > Decision Trees).

DEC TREE NAME	Comments	User Update	Date Update
Incben Rigid Decision Tree		VYSHNAVI	1/23/2012
Flexible Decision Tree		VYSHNAVI	1/24/2012
Incben Flexible Decision Tree		VYSHNAVI	1/24/2012
Rigid Decision Tree		VYSHNAVI	2/13/2012

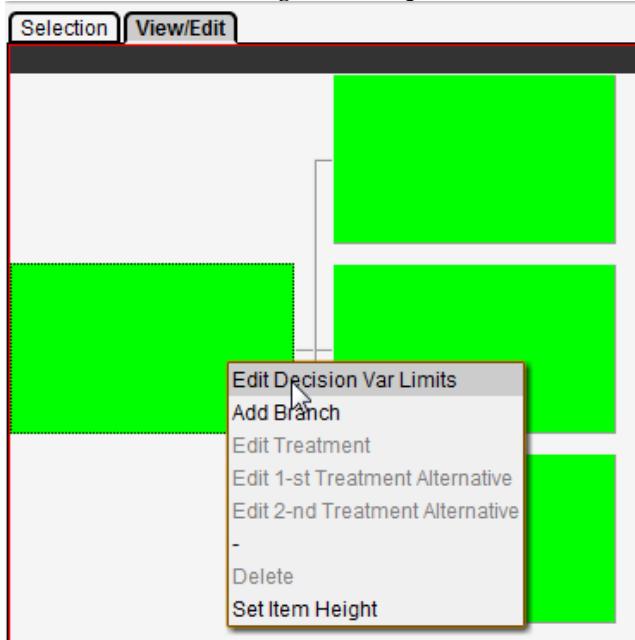
3. In the 'Decision Trees' pane, right click and click **Insert**. A new row is inserted. Type any name in the given box, for example "Dec test tree" and click the save icon. Click the View/Edit tab. The application shows a single node that is the start of the decision tree.

The screenshot shows the 'Decision Trees' pane with a table of five rows. The second row, 'Dec test tree', has its 'User Update' field highlighted. Below the table, the software interface includes a red header bar with 'Roadway' and 'System' tabs, a navigation bar with 'Utilities', 'Setup', 'Database', 'Analysis', 'Reports', and 'HPMS', and a breadcrumb path 'Roadway > Setup > Network Analysis... > Decision Trees'. A context menu is open over the 'Dec test tree' row, listing options: 'Edit Decision Var Limits', 'Add Branch' (which is selected and highlighted in grey), 'Edit Treatment', 'Edit 1-st Treatment Alternative', 'Edit 2-nd Treatment Alternative', a separator line, 'Delete', and 'Set Item Height'.

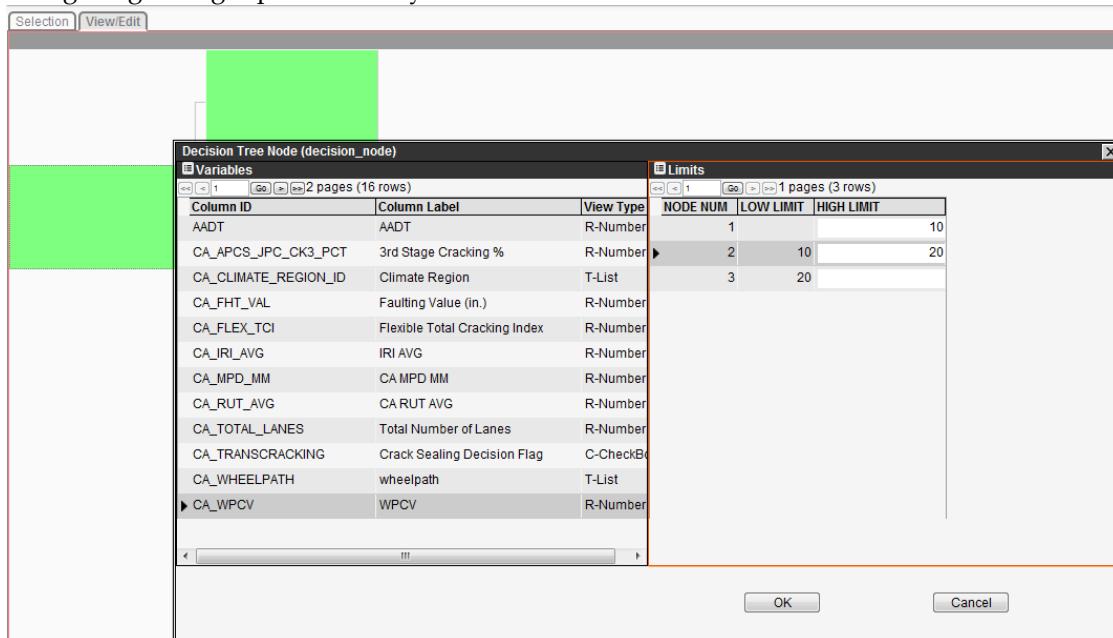
4. Right-click the node and then click Add Branch. A dialogue box is opened, enter the number of branches required to create the hierarchy you diagrammed on paper (example shown below).



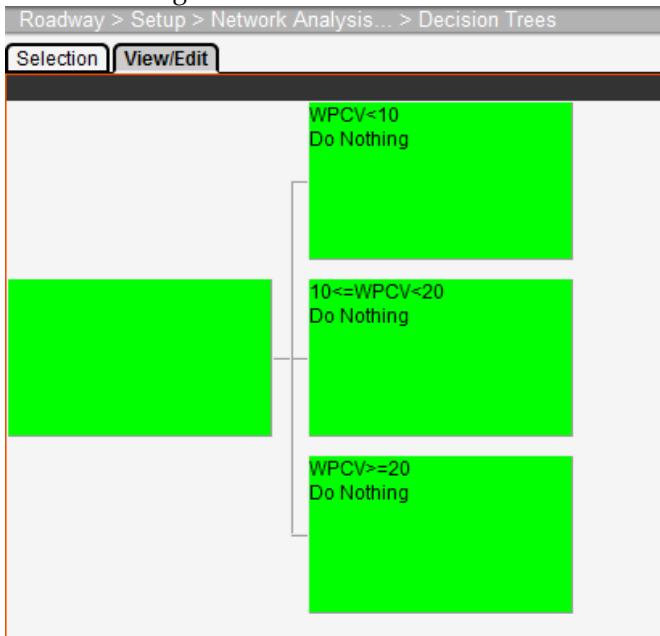
5. Once all of the branches are created, add the decision variables and values that govern branch selection. To do this, right-click a parent node and then click **Edit Decision Var Limits**.



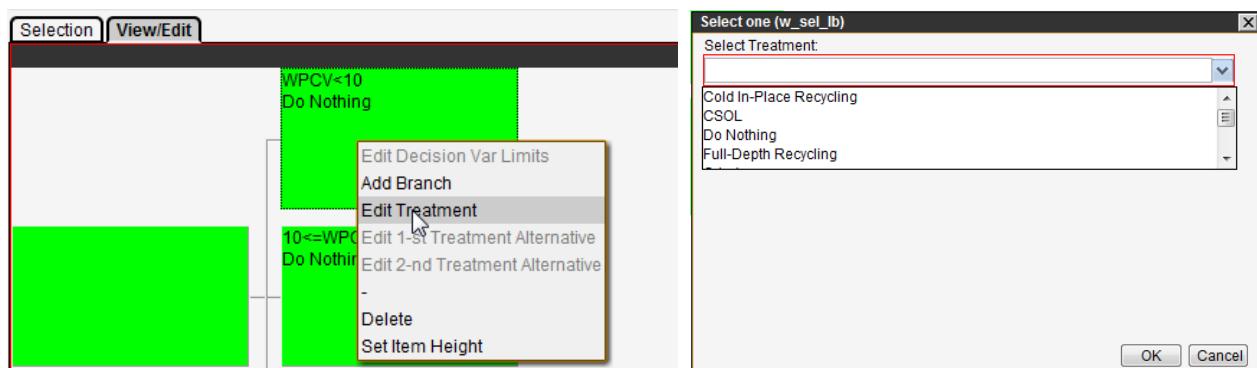
6. In the left pane of the dialog box, click the desired decision variable. The system responds by configuring the right pane for entry of the values that cause each child node to be selected.



- Configure the right pane of the dialog box to appropriately select each child node. Click OK to close the dialog box.



- Repeat steps 5 through 7 for the remaining parent nodes in the decision tree. Now that the decision variables and values are set, the final task is to assign treatments to the termination points of each branch in the decision tree.
- To assign the first treatment, right-click the first termination node and then click Edit Treatment. The system responds by displaying a dialog box so you may select the desired treatment. in the dialog box, click the down arrow to display the list of treatments and then click the desired treatment.



- Click OK to close the dialog box. The selected treatment is shown in the termination node. Repeat the same process for all the end nodes where the treatments are required.
- To save the decision tree go to 'Selection' tab and click the save icon.

6.4 Updating Treatments

We define treatments in this window, which allows them to be available for network analysis. Treatments are used in all analyses with decision trees to provide an estimate of the treatment type and costs of recommended future projects as well as the condition consequences of these projects. The system provides you with the ability to add, remove, and maintain as many treatments as desired.

6.4.1 The Treatments Window

The Treatments Window (Roadway > Setup > Network Analysis... > Treatments) provides the following panes: **Treatments**, **Improvements**, and **Other Improvements**. The difference between the Improvements pane and the Other Improvements pane is that the Improvement pane is for attributes that vary according to a performance model (that is, performance index values such as IRI or roughness) and the Other Improvements pane is for attributes that do not vary according to a performance model (such as traffic or pavement age).

The screenshot shows the 'Treatments' window with three main panes:

- Treatments** (Top Left): A grid of treatment records. Key columns include Treatment Name, Unit Cost, Selection Priority, Exclusion Priority, Exclusion Years, Cost, Budget Group, Work Code, and GHG Metric. One row is highlighted with a yellow background.
- Improvements** (Bottom Left): A grid of condition attributes and their improvement scripts. It includes columns for Condition Attributes, Future Detr Type, Condition Improvement Script, and Effective for.
- Other Improvements** (Bottom Right): A grid of changing attributes and their improvement scripts. It includes columns for Changing Attributes, Condition Improvement Script Other, Date Update, and User Update.

Treatments Pane Columns

The Treatments pane lists all treatments used for long-term projects and the costs associated with each. It includes the following columns:

- Treatment Name: This column provides the name of the treatment.
- Unit Cost: This column shows the unit costs for the treatment. The costs are calculated using the method selected in the Cost column.
- Selection Priority: This column shows the Treatment Priority number, which determines which treatment from the decision trees should be used in optimization analysis. Treatment priority must be a unique number. The user should assign treatment priority based on local knowledge and your agency's policy. This number is not used for INCBEN analysis.
- Exclusion Priority: This column sets the value for the treatment exclusion priority, which sets the priority of this treatment in regard to other treatments. When the selected treatment is applied,

then all other treatments with equal or lower treatment exclusion priority values will not be applied for the number of years given in the Year column.

- Exclusion Year: This column shows exclusion years. For those treatments with a future deterioration type of either Improvement Deteriorates in N Years or Increases Index RSL by N Years (as set in the Future Detr Type column in the Improvements pane), the value in this column indicates how long the improvement in condition should last until the condition returns to that experienced by the pavement section (according to its underlying performance model).
- Budget Category: This column shows the budget category assigned to the treatment. The budget category is typically configured to be one of three values: (1) Reconstruction; (2) Rehabilitation; or (3) Resurfacing. The value for the budget group is set in the Calculated Expressions window. During optimization analyses that are constrained by budget, the system assigns a treatment to a section and attempts to subtract the cost of the treatment from the budget category assigned in this column. If the budget category has sufficient funds for the treatment, the treatment is assigned to the section and the budget category's value is decremented by the treatment's cost. On the other hand, if the budget category has insufficient funds to cover the cost of the treatment, then the section is skipped and is not considered for improvement in the current analysis year. For analyses that are not constrained by budget, the system ignores this column.
- Work Code: This column specifies the work code for the treatment. The work code is selected from a drop-down list. Note that if a work code is not assigned to a treatment, any line item in a work plan that shows the treatment cannot be used to generate a construction history record.

The Improvements Pane Columns

- Condition Attributes: This column provides a drop-down list that contains all condition attributes that change according to a performance model.
- Future Detr Type – This column contains a drop-down list with the following deterioration methods:
 - Increases Index RSL by N Years – For the condition attribute, after treatment and improvement, the deterioration is set based upon the model selected using the Default Model Structure window's decision tree, but the model's coefficients will be automatically adjusted to extend the life of the road section by N years (based upon the RSL threshold as defined in the Performance Models window)
 - Improvement Deteriorates in N Years – For the condition attribute, after treatment and improvement, the deterioration is set to return to the "before treatment" model after N years after which the "before treatment" model is used. (The value of N is either set directly in the Effective for Years column or results from the Groovy script specified in the Groovy Script for Number of Years column.)
 - New PC Model – A new deterioration model for the condition attribute that deteriorates is applied based upon the model selected using the Default Model Structure window's decision tree.
 - Section Model If Exists, Otherwise New PC Model – If there is a model for the section, then, after treatment, it will be used; otherwise, the model selected using the Default Model Structure window's decision tree will be used. Note: Section models are always used during the first years of analysis prior to treatment. The same section model will continue to be used after treatment if you select this option.
- Condition Improvement Script – This column shows the groovy script expression for determining the "condition improvement".

- Effective for ...Years – This column specifies how the N value for the two future deterioration types Increases Index RSL by N Years and Improvement Deteriorates in N Years is determined. Provided the Groovy Script for Number of Years column is null, the system uses the value entered in this column directly for the N value. (If the Groovy Script for Number of Years column is not null, the N value from the Groovy script overrides any value entered in this column).
- Groovy Script for Number of Years – This column specifies how the N value for the two future deterioration types Increases Index RSL by N Years and Improvement Deteriorates in N Years is determined. When a script is selected in this column, the system uses it to calculate the N value (and ignores the Effective for ... Years column).

The Other Improvement Pane Columns:

- Changing Attributes – This column provides a drop-down list that contains all non-Performance Index based attributes (that is, attributes that don't change according to a performance model, such as pavement age or traffic).
- Condition Improvement Script Other – This column shows the name of the Groovy script that determines the “condition improvement” estimate.

As an example, a treatment could be applied to a Slab Replacement. The resulting improvements from this treatment could then be to improve the IRI AVG value. The Improvements pane would show how the IRI AVG value changes and the Other Improvements pane would change the work code to ‘Slab replacement’ and pavement type to Rigid.

6.4.2 Creating a treatment and its improvements in treatments window

The Treatments pane lists all treatments utilized by your agency and the costs associated with each. It includes the following columns. The following process explains how to view and insert a new treatment into the system.

1. Go to Treatments window (Roadway > Setup > Network Analysis... > Treatments)
 - Right click and click **Insert** in ‘Treatments’ pane. A row is inserted into the pane.
 - Enter the name of treatment as ‘Test Treatment-1’ in ‘Treatment Name’ field
 - Enter \$13.00 in ‘Unit Cost’ field
 - Enter ‘150’ in ‘Selection Priority’ field
 - Enter ‘12’ in ‘Exclusion Priority’ field
 - Enter ‘3’ in ‘Exclusion Years’
 - Select ‘Unit Cost Per Lane Mile’ from the drop down of ‘Cost’ field
 - Select ‘Rehab’ from the drop down of ‘Budget Group’ field
 - Select an appropriate work code from the ‘Work Code’ field
 - Right click and click **Insert** in ‘Improvements’ pane. A new row is inserted into the system.
 - Select ‘CA_FLX_TCV’ from the drop down of ‘Condition Attributes’ field
 - Select ‘New PC model’ from the ‘Future Detr Type’ field

- Select 'Improve to -100' from the drop down of 'Condition Improvement Script' field
- Right click and click **Insert** in 'Improvements' pane. A new row is inserted into the system.
 - Select 'IRI AVG' from the drop down of 'Condition Attributes' field
 - Select 'New PC model' from the 'Future Detr Type' field
 - Select 'Improve by 20' from the drop down of 'Condition Improvement Script' field
- Right click and click **Insert** in 'Improvements' pane. A new row is inserted into the system.
 - Select 'CA MPD MM' from the drop down of 'Condition Attributes' field
 - Select 'New PC model' from the 'Future Detr Type' field
 - Select 'Improve to - 1.750' from the drop down of 'Condition Improvement Script' field
- Right click and click **Insert** in 'Improvements' pane. A new row is inserted into the system.
 - Select 'CA_RUT_AVG' from the drop down of 'Condition Attributes' field
 - Select 'New PC model' from the 'Future Detr Type' field
 - Select 'Improve to - 0.13' from the drop down of 'Condition Improvement Script' field
- Right click and click **Insert** in 'Improvements' pane. A new row is inserted into the system.
 - Select 'WPCV' from the drop down of 'Condition Attributes' field
 - Select 'New PC model' from the 'Future Detr Type' field
 - Select 'Improve to - 0' from the drop down of 'Condition Improvement Script' field
- Right click and click **Insert** in 'Other Improvements' pane. A new row is inserted into the system.
 - Select 'Work Code' from the drop down of 'Changing Attributes' field
 - Select 'Seal Coat' from the drop down of 'Condition Improvement Script Other' field
- Right click and click **Insert** in 'Other Improvements' pane. A new row is inserted into the system.
 - Select 'Pavement Type' from the drop down of 'Changing Attributes' field
 - Select 'Set to Flexible' from the drop down of 'Condition Improvement Script Other' field.

2. Click the save  icon.

6.5 Updating Performance Models

Pavement performance modeling is essential for good pavement management practice on all levels, from the project level to the network level. Pavement performance models are generally developed based on pavement historical data and/or engineering judgment. The default models specified in PaveM were provided and developed by Caltrans.

Pavement performance models can be broadly divided into two categories: group models and pavement management section models. AgileAssets Pavement Manager uses group-based models where a group is a

set of pavement segments defined by one or more variables. These variables are called performance classes in PaveM. For example, say pavement type and annual average daily traffic (AADT) are selected as performance classes. Pavement type is divided into two levels (flexible and rigid), while AADT is divided into three levels (light, medium, and heavy.) This means that there is a total of 6 groups (flexible light, flexible medium...rigid heavy). Pavement management section models, on the other hand, are models that are specified for individual pavement management sections based on their characteristic features.

Pavement performance prediction is possibly the least technologically precise portion of pavement management for the following reasons:

- ❖ There are uncertainties in pavement behavior under changeable traffic loadings, environment, etc.
- ❖ It is difficult to quantify the numerous factors affecting pavement performance.
- ❖ There is error associated with using discrete testing points to represent the total pavement area when estimating pavement condition.

To develop the best possible models from the available data and update these models as more data becomes available is a very important task for engineers and researchers in pavement management.

The system produces a wide range of deterministic models for groups of similar pavements. The software is highly flexible in terms of allowing these models to be developed.

6.5.1 Types of Models Supported by AgileAssets Pavement Analyst

The table below shows the model forms used for performance modeling. You can calculate and select from each of the regression equations to choose the appropriate model.

Table 2: Types of Models

Model Type	Model Form	Description
Linear	$y = a + bx$	The rate of deterioration of the pavement condition is the same from year to year.
Exponential	$y = a + be^{cx}$	The pavement condition remains nearly constant for a number of years, and then rapidly deteriorates.
Inverse Exponential	$y = a + be^{cx}$	The pavement condition remains nearly constant for a number of years, and then rapidly deteriorates.
Hyperbolic	$y = a + 1 / (b + cx)$	The pavement condition deteriorates steadily with the greatest rate of deterioration occurring in the early years.
Piecewise Linear	$y = a_i + b_ix$ (with intersection at the end points)	You specify up to six coordinates, and the system draws a straight line between each coordinate. This type allows you to specify points in time where the deterioration rate "jumps" to a new value, where it again remains constant until the next discontinuity.
Power	$y = a + bx^c$	This type of model is a special form of the exponential type. Like an exponential-type graph, the pavement condition remains nearly constant for a large number of years, and then rapidly deteriorates. However, the rate of deterioration is based directly on time rather than a logarithm.

Model Type	Model Form	Description
Sigmoidal	$y = a + be^{(-c/x)^d}$	The pavement condition remains nearly constant for a number of years, then rapidly deteriorates, and then remains nearly constant again.

Where y = condition attribute being predicted, x = age (years), and a, b, c, and d = regression coefficients.

6.5.2 Performance Modeling Set-up

Several data elements must be configured before models can be specified:

- ❖ A set of Performance Index (PI) definitions must be developed.
- ❖ A set of Road Structure Categories must be established.
- ❖ A set of Performance Classes must be defined.
- ❖ A definition for each PI Condition State must be defined.

Performance Indices are measurements of a particular aspect of pavement condition (such as IRI AVG and RUT). They are generally developed during the implementation of the PaveM system, with the actual measurement values imported into the system.

Performance Classes are variables that define homogeneous sets of pavements within the road network. (Homogeneity in this case means that, for performance class levels, pavements with similar road structure categories perform in a similar manner and provide more uniform data for performance models.) During configuration of your system, AgileAssets and Caltrans staff determined which variables were available for creating performance classes. In the analysis, you can select from the available variables to create performance models by making them active or inactive.

A performance class (model group) is defined for each combination of the values of the activated performance class variables. In Caltrans it is activated by Pavement type, Work Code(Treatment), ESALS/yr and Climate region(2 values) variables. Further the 2 pavement types are taken into account which are Flexible and Rigid, 9 Work codes for Flexible and 5 Work codes for Rigid, 3 categories of ESALS, and Climates regions are clubbed into 2 categories.

This produces a combination of $(1 \times 9 \times 3 \times 2) + (1 \times 5 \times 3 \times 2) = 90$ groups for creating models and results in a matrix of groups as shown in the table below.

Pavement Type	Work Code (Treatment)	ESALS/yr	Climate Region
Flexible	1-Full Depth Reclamation	1- ESALS < 100000	1- Climate Region 1 2- Climate Region 2
		2- 100000<=ESALS<500000	1- Climate Region 1 2- Climate Region 2
		3- ESALS >=500000	1- Climate Region 1 2- Climate Region 2
	2 - Thick Overlay and Reconstruct	1- ESALS < 100000	1- Climate Region 1 2- Climate Region 2
		2- 100000<=ESALS<500000	1- Climate Region 1 2- Climate Region 2

	3- ESALS >=500000	1- Climate Region 1 2- Climate Region 2
3 - Very Thin Overlay	1- ESALS < 100000	1- Climate Region 1 2- Climate Region 2
	2- 100000<=ESALS<500000	1- Climate Region 1 2- Climate Region 2
	3- ESALS >=500000	1- Climate Region 1 2- Climate Region 2
4 - Medium Overlay	1- ESALS < 100000	1- Climate Region 1 2- Climate Region 2
	2- 100000<=ESALS<500000	1- Climate Region 1 2- Climate Region 2
	3- ESALS >=500000	1- Climate Region 1 2- Climate Region 2
5 - Thin Overlay	1- ESALS < 100000	1- Climate Region 1 2- Climate Region 2
	2- 100000<=ESALS<500000	1- Climate Region 1 2- Climate Region 2
	3- ESALS >=500000	1- Climate Region 1 2- Climate Region 2
6 - Seal Coat	1- ESALS < 100000	1- Climate Region 1 2- Climate Region 2
	2- 100000<=ESALS<500000	1- Climate Region 1 2- Climate Region 2
	3- ESALS >=500000	1- Climate Region 1 2- Climate Region 2
7 - Cold in-Place	1- ESALS < 100000	1- Climate Region 1 2- Climate Region 2
	2- 100000<=ESALS<500000	1- Climate Region 1 2- Climate Region 2
	3- ESALS >=500000	1- Climate Region 1 2- Climate Region 2
8- Seal Cracks	1- ESALS < 100000	1- Climate Region 1 2- Climate Region 2
	2- 100000<=ESALS<500000	1- Climate Region 1 2- Climate Region 2
	3- ESALS >=500000	1- Climate Region 1 2- Climate Region 2
9 - Unknown	1- ESALS < 100000	1- Climate Region 1 2- Climate Region 2
	2- 100000<=ESALS<500000	1- Climate Region 1

		2- Climate Region 2
		1- Climate Region 1
		2- Climate Region 2
Rigid	1 -Crack Seal and Overlay (CSOL)	1- Climate Region 1
		2- Climate Region 2
		1- Climate Region 1
	2- PCC Lane Replacement	2- Climate Region 2
		1- Climate Region 1
		2- Climate Region 2
	3- Grind	1- Climate Region 1
		2- Climate Region 2
		1- Climate Region 1
	4- Grind with Slab Replacement	2- Climate Region 2
		1- Climate Region 1
		2- Climate Region 2
	5-Slab Replacement	1- Climate Region 1
		2- Climate Region 2
		1- Climate Region 1
	6-Unknown	2- Climate Region 2
		1- Climate Region 1
		2- Climate Region 2

In the PaveM system this matrix is represented using a tree structure in the Default Model Structure window. Caution is recommended when choosing to use a Performance Class variable for modeling. When the number of performance classes is increased, the number of models that must be maintained increases exponentially. When selecting performance classes and defining their levels, keep in mind that depending on how you structure the model tree, the total number of models required by the system may be as many as the number of Performance Classes x number of Defined Performance indices. Thus, if you have 10 PIs and 24 Performance Groups you will need to create and maintain 240 models.

6.5.3 Specifying Performance Models

You can use the Models window to specify a new performance model or to edit and review an existing one.

To specify a new performance model:

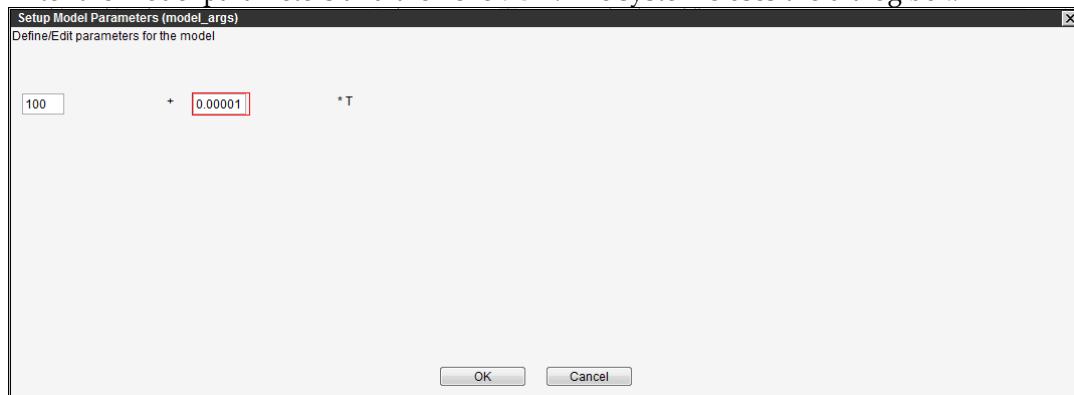
1. Open the Performance Models List window (Roadway > Setup > Performance Setup > Performance Models List).
2. In the Models window, right-click and then click Insert. The system inserts a new record.
3. In the new record, highlight the default name and then type a new name that describes the model.

PMS MODEL NAME	Model Type	MODEL EXP
a-high;beta-high,ro-high	Sigmoidal	$100 + -80 * EXP(-1 * (20 / T))$
Model 2965		
a-high;beta-high,ro-low	Sigmoidal	$100 + -80 * EXP(-1 * (10 / T))$
a-high;beta-high,ro-med	Sigmoidal	$100 + -80 * EXP(-1 * (15 / T))$
a-high;beta-low,ro-high	Sigmoidal	$100 + -80 * EXP(-1 * (20 / T))$
a-high;beta-low,ro-low	Sigmoidal	$100 + -80 * EXP(-1 * (10 / T))$
a-high;beta-low,ro-med	Sigmoidal	$100 + -80 * EXP(-1 * (15 / T))$
a-high;beta-med,ro-high	Sigmoidal	$100 + -80 * EXP(-1 * (20 / T))$
a-high;beta-med,ro-low	Sigmoidal	$100 + -80 * EXP(-1 * (10 / T))$
a-high;beta-med,ro-med	Sigmoidal	$100 + -80 * EXP(-1 * (15 / T))$
a-low;beta-high,ro-high	Sigmoidal	$100 + -90 * EXP(-1 * (20 / T))$
a-low;beta-high,ro-low	Sigmoidal	$100 + -90 * EXP(-1 * (10 / T))$
a-low;beta-high,ro-med	Sigmoidal	$100 + -90 * EXP(-1 * (15 / T))$

4. Click the down arrow in the Model Type column and then select the type of the model. After selecting the type of model, the system displays a dialog box for the model parameters.

* PMS MODEL NAME	* Model Type	MODEL EXP
a-high;beta-high,ro-high	Sigmoidal	$100 + -80 * \text{EXP}(-1 * (20 / T ^ (3)))$
a-high;beta-high,ro-low	CalTrans 3rdSt and Weelpath Cracking	$100 + -80 * \text{EXP}(-1 * (10 / T ^ (3)))$
a-high;beta-high,ro-med	Exponential	$100 + -80 * \text{EXP}(-1 * (15 / T ^ (3)))$
a-high;beta-low,ro-high	Hyperbolic	$100 + -80 * \text{EXP}(-1 * (20 / T ^ (1)))$
a-high;beta-low,ro-low	Inverse Exponential	$100 + -80 * \text{EXP}(-1 * (10 / T ^ (1)))$
a-high;beta-low,ro-med	Linear	$100 + -80 * \text{EXP}(-1 * (15 / T ^ (1)))$
a-high;beta-med,ro-high	Piecewise Linear	$100 + -80 * \text{EXP}(-1 * (20 / T ^ (2)))$
a-high;beta-med,ro-low	Power	$100 + -80 * \text{EXP}(-1 * (10 / T ^ (2)))$
a-high;beta-med,ro-med	Sigmoidal	$100 + -80 * \text{EXP}(-1 * (20 / T ^ (2)))$
a-low;beta-high,ro-high	Universal Power	$100 + -80 * \text{EXP}(-1 * (15 / T ^ (2)))$
a-low;beta-high,ro-low	Sigmoidal	$100 + -80 * \text{EXP}(-1 * (20 / T ^ (3)))$
a-low;beta-high,ro-med	Sigmoidal	$100 + -80 * \text{EXP}(-1 * (10 / T ^ (3)))$
a-low;beta-low,ro-high	Sigmoidal	$100 + -80 * \text{EXP}(-1 * (15 / T ^ (3)))$
a-low;beta-low,ro-low	Sigmoidal	$100 + -80 * \text{EXP}(-1 * (20 / T ^ (3)))$
a-low;beta-low,ro-med	Sigmoidal	$100 + -80 * \text{EXP}(-1 * (10 / T ^ (3)))$
a-low;beta-med,ro-high	Sigmoidal	$100 + -80 * \text{EXP}(-1 * (15 / T ^ (3)))$
a-low;beta-med,ro-low	Sigmoidal	$100 + -80 * \text{EXP}(-1 * (20 / T ^ (3)))$
a-low;beta-med,ro-med	Sigmoidal	$100 + -80 * \text{EXP}(-1 * (10 / T ^ (3)))$

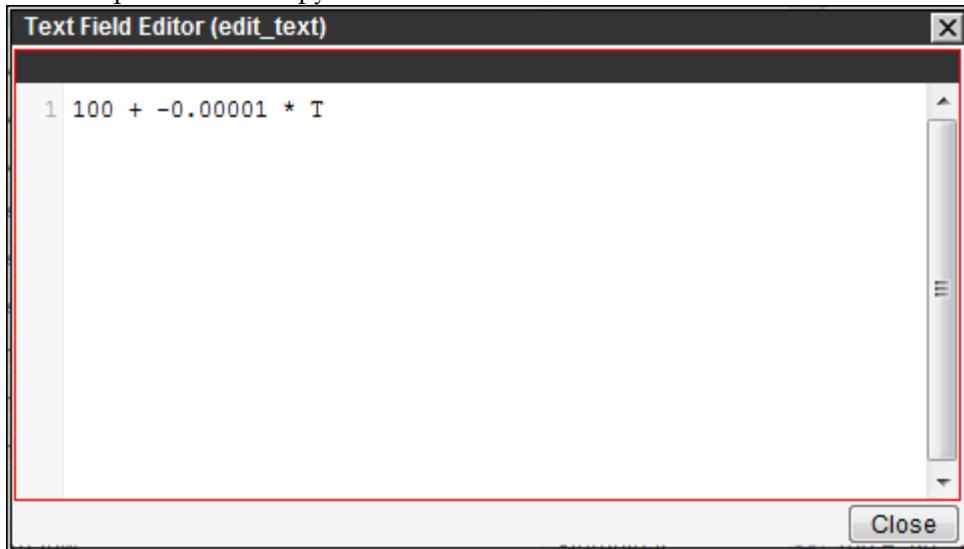
5. Enter the model parameters and then click OK. The system closes the dialog box.



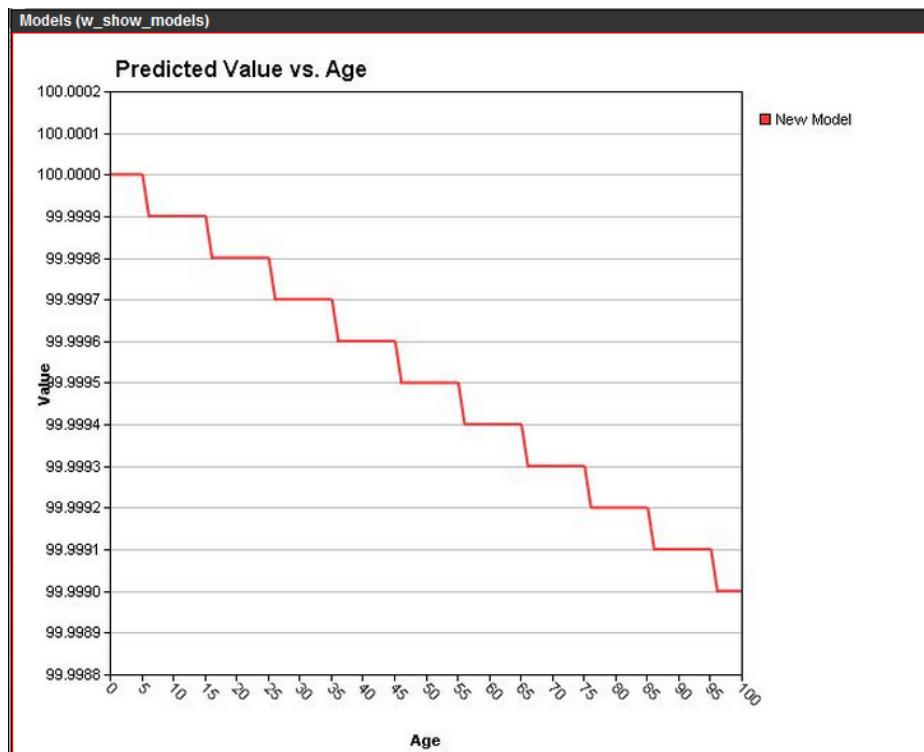
6. Click to save the new model.

7. To edit the parameters of a model that has been already specified, right-click the model expression and then click Edit Model Parameters. The dialog box from step 5 appears that shows the model expression. Edit the expression and click OK.

8. You may also want to copy the model expression and for use in another format for your records. Double-click the model expression and the following window pops up. You can highlight the model expression and copy it with CTRL+C.



9. If desired, you can view the created model graphically by right-clicking and then clicking Show Selected.
10. A pop-up window opens and shows the model as defined. An example is shown below. Click the close icon in the top right corner to close the window.



7 UPDATING MASTER WORK PROGRAMS

7.1 Overview

This chapter covers the process of maintaining Master Work Plans/Programs (MWP) in the PaveM. Several different work programs can be maintained in the PaveM. These work plans can be updated regularly for when the project will be performed, where it will be performed, the intended treatment, and estimated project cost. This list is termed a work plan, and it constitutes the final list of sections proposed for repair based upon network analysis results and, as necessary, user intervention. The system allows you to develop multiple work plans, with the different work plans being defined in the "Work Plan Type" window (Roadway > Setup > Network Analysis > Work Plan Type) and the data for each work plan being entered in this window. The data is then used in scenario analysis and reports.

7.2 Entering and Updating MWP Projects

There are two ways to enter project information into the MWP. The first way is to insert the locations into the MWP and second is to copy the selected sections from the scenario analysis into the MWP.

7.2.1 Entering Project Data in MWP window

1. Login and go to 'Master Work Plan' window (Roadway > Analysis > Network Analysis > Master Work Plan)
2. Select the 'Approved Program' from the drop down of the 'Select Work Plan Type' which is located on top of the window. The system retrieves the data available to your login administrative unit that is associated with that work plan.

County From	Route From	Route	Begin	Post Mile Suffix From	Post Mile Prefix To	Post Mile End	Post Mile Suffix To	Direction	Lane
LAK	053		0			3.1		ASC.	All
MON	101		0	R		1.9		ASC.	All
RIV	078		0			16.4		ASC.	All
INY	136		0			10		ASC.	All
MNO	182		0			6.5		ASC.	All
STA	099	R	0	R		6.5		ASC.	All
SHA	005		0			0.9		ASC.	All
YOL	113	R	0	R		11.1		ASC.	All
SIE	089		0			6.6		ASC.	All

Note: The Approved Program work plan may also be viewed in the Approved Master Work Plan window (Roadway > Analysis > Network Analysis... > Approved Master Work Plan (aka Leo's DB)). This window contains many more data elements but the data source is the same and the steps for entering project data are similar.

- You may edit any project in the data pane or you may create a new project by right-clicking and selecting the Insert command.

The screenshot shows the 'Master Work Plan' window with a context menu open over a row. The menu options include: Insert, Insert Like, Delete, Copy Analysis Results, Create Pavement Construction Record, Copy From Master WP, Sort, Filter By This Value, Find, Filter, Edit Location By GPS, Show on Map, Show on Bing Map, Export Data, and Mass Update. The 'Insert' option is highlighted with a yellow box.

County From	Route From	Route Suffix (From)	Post Mile Prefix From	Post Mile Begin	Post Mile Suffix From	Post MilePrefix To	Post Mile End	Post Mile Suffix To	Direction	Lane
LAK	053			0			3.1		Asc.	All
MON	101			R			1.9		Asc.	All
RIV	078						16.4		Asc.	All
INY	136						10		Asc.	All
MNO	182						6.5		Asc.	All
STA	099			R			6.5		Asc.	All
SHA	005						0.9		Asc.	All
YOL	113			R			11.1		Asc.	All
SIE	089						6.6		Asc.	All
GLE	045						17.2		Asc.	All
MER	140						11.9		Asc.	All
SOL	113						7		Asc.	All
MON	101			R			2		Asc.	All
LAS	147			0			0.5		Asc.	All
SBD	010			0			9.2		Asc.	All
MEN	128			0			11.6		Asc.	All
RIV	062			0		R	6.7		Asc.	All
MNO	270			0			9.8		Asc.	All
SIE	089			0			15.1		Asc.	All
KER	119			0			4.3		Asc.	All
AMA	088			0			5.5		Asc.	All

- A new row is inserted in the window. Type in all the required values to the work plan like County, Route name, Direction, Lane, PostMile Prefix From, PostMile Begin, PostMile Prefix To, PostMile End , Plan year, Treatment, Estimated cost, Administrative Unit and so on.

The screenshot shows the 'Master Work Plan' window with a table containing 20 rows of data. The columns include: To, Post Mile End, Post Mile Suffix To, Direction, Lane, * MWP Project Status, * Plan Year, * Budget Group, * Treatment, Estimated Cost, Location Desc., Administrative Unit, and Lane Mile.

To	Post Mile End	Post Mile Suffix To	Direction	Lane	* MWP Project Status	* Plan Year	* Budget Group	* Treatment	Estimated Cost	Location Desc.	Administrative Unit	Lane Mile
	3.1		Asc.	All	Programmed	2012	Rehab	CSOL	\$7,908.00	In Lake County	DISTRICT 01	1
	3.3		Asc.	All	Programmed	2012	Rehab	CSOL	\$7,908.00	In Lake County	DISTRICT 01	1
	1.9		Asc.	All	Programmed	2014	Rehab	CSOL	\$46,276.00	In San Luis Obispo County	DISTRICT 05	3
	16.4		Asc.	All	Programmed	2011	Maintenance	Full-Depth Recycling	\$2,000.00	IN IN RIVERSIDE	DISTRICT 08	2

- Click the icon to save the new information.

7.2.2 Example of Checking for Section Overlaps

- Login and go to 'Master Work Plan' window(Roadway > Analysis > Network Analysis > Master Work Plan)
- Select the 'Approved Program (STIP)' from the drop down of the 'Select Work Plan Type' which is located on top of the window. The system retrieves the data available to your login administrative unit that is associated with that work plan.

3. Select the 1st section and right click and click on **Insert Like**.

County From	Route From	Route Suffix (From)	Post Mile Prefix From	PostMile begin	Post Mile Suffix From	PostMilePrefix To	Post Mile End	Post Mile Suffix To	Direction	Lane
LAK	029			20.1			20.4		Asc.	All
LAK	053			0			3.1		Asc.	All
MEN	128			31			38.8		Asc.	All
MON	068			16.7			21.9		Asc.	All
MON	068			13.5	R		16.8		Asc.	All
MON	068			10.8			13.2		Asc.	All
SBD	040			50.9	R		73.1		Asc.	All
SD	015			0.5	M		4		Asc.	All
SBD	062			38.5			66		Asc.	All
SBD	062			91			106		Asc.	All
FRE	168			30.2			40		Asc.	All
SLO	101			63.2	R		69.3		Asc.	All
MON	101			0	R		1.9		Asc.	All
NAP	029			36.9			38.1		Asc.	All
FRE	005			44.7			45.1		Asc.	All

4. The same section is inserted right below the 1st section with the same attribute values. This means that now there are two sections which overlap.

County From	Route From	Route Suffix (From)	Post Mile Prefix From	PostMile begin	Post Mile Suffix From	PostMilePrefix To	Post Mile End	Post Mile Suffix To	Direction	Lane
LAK	029			20.1			20.4		Asc.	All
LAK	029			20.1			20.4		Asc.	All
LAK	053			0			3.1		Asc.	All
MEN	128			31			38.8		Asc.	All
MON	068		R	16.7			21.9		Asc.	All
MON	068			13.5	R		16.8		Asc.	All
MON	068			10.8			13.2		Asc.	All
SBD	040		R	50.9	R		73.1		Asc.	All
SD	015			0.5	M		4		Asc.	All
SBD	062			38.5			66		Asc.	All

5. Click the icon to save the new information. It gives a message saying 'Section Overlaps another section'. Please check the mile points.

The screenshot shows the 'Master Work Plan' data grid with several rows of road segment information. A warning dialog box is overlaid on the screen, titled 'Message from webpage', containing the text: 'The segment overlaps another segment. Please check the milepoints'. The 'OK' button is visible at the bottom right of the dialog.

County From	Route From	Route Suffix (From)	Post Mile Prefix From	PostMile begin	Post Mile Suffix From	PostMilePrefix To	Post Mile End	Post Mile Suffix To	Direction	Lane
LAK	029			20.1			20.4		Asc.	All
LAK	029			20.1			20.4		Asc.	All
LAK	053			0			3.1		Asc.	All
MEN	128				31			38.8	Asc.	All
MON	068		R	16.7			21.9		Asc.	All
MON	068			13.5		R	16.8		Asc.	All
MON	068			10.8			13.2		Asc.	All
SBD	040		R	50.9					All	
SD	015			0.5					All	
SBD	062			38.5					All	
SBD	062			91					All	
FRE	168		T	30.2					All	
SLO	101			63.2					All	
MON	101		R	0					All	
NAP	029			36.9					All	
FRE	005			44.7					All	
SM	280			9.6					All	

6. Now edit the mile points of both the sections as such there is no overlapping.

The screenshot shows the same 'Master Work Plan' data grid as before, but with changes made to the 'PostMile begin' and 'PostMileEnd' columns for the overlapping segments. The second row now has '20.2' in 'PostMile begin' and '20.4' in 'PostMileEnd', while the first row still has '20.1' in both. A red box highlights the 'PostMile begin' and 'PostMileEnd' cells of the second row.

County From	Route From	Route Suffix (From)	Post Mile Prefix From	PostMile begin	Post Mile Suffix From	PostMilePrefix To	Post Mile End	Post Mile Suffix To	Direction	Lane
LAK	029			20.1			20.2		Asc.	All
LAK	029			20.2			20.4		Asc.	All
LAK	053			0			3.1		Asc.	All
MEN	128			31			38.8		Asc.	All
MON	068		R	16.7			21.9		Asc.	All
MON	068			13.5		R	16.8		Asc.	All

7. Click the icon to save the new mile points information. The data is saved successfully.

7.2.3 Creating Projects from Scenario Result Line Items

The system supports multiple scenario analyses, and you may copy line items out of one of these scenario analyses into a work plan by following these steps:

1. Open the Master Work Plan Data window (Roadway > Analysis > Network Analysis > Work Plan Data).
2. In the Select WP Type field at the top of the window, click the down arrow and then click the work plan into which you will copy line items.

Roadway System

Utilities Setup Database Analysis Reports HPMS

Roadway > Analysis > Network Analysis... > Master Work Plan

Select WP Type: Approved Program

County From	Route From	Route	Begin	Post Mile Suffix From	Post Mile Prefix To	Post Mile End	Post Mile Suffix To	Direction	Lane
LAK	053		0			3.1		ASC.	All
MON	101		0		R	1.9		ASC.	All
RIV	078		0			16.4		ASC.	All
INY	136		0			10		ASC.	All
MNO	182		0			6.5		ASC.	All
STA	099	R	0		R	6.5		ASC.	All
SHA	005		0			0.9		ASC.	All
YOL	113	R	0		R	11.1		ASC.	All
SIE	089		0			6.6		ASC.	All

The system displays the line items for the selected work plan after you make your selection.

- Right-click in the data pane and then click Copy Analysis Results.

Roadway System

Utilities Setup Database Analysis Reports HPMS

Roadway > Analysis > Network Analysis... > Master Work Plan

Select WP Type: Approved Program

To	Post Mile End	Post Mile Suffix To	Direction	Lane	* MVP Project Status	* Plan Year	* Budget Group	* Treatment	Estimated Cost	Location Desc	Administrative Unit
	3.1		Asc.	All	Programmed	2012	Rehab	CSOL	\$7,908.00	In Lake County fr	DISTRICT 01
	3.3		Asc.	All	Programmed	2012	Rehab	CSOL	\$7,908.00	In Lake County fr	DISTRICT 01
	1.9		Asc.	All	Prog	Insert		CSOL	\$46,276.00	In San Luis Obis	DISTRICT 05
	16.4		Asc.	All	Prog	Insert Like		Full-Depth Recycling	\$2,000.00	IN IN RIVERSIDE	DISTRICT 08
	10		Asc.	All	Prog	Delete		CSOL	\$2,205.00	In Inyo County n	DISTRICT 09
	6.5		Asc.	All	Prog	Create Pavement Construction Record		CSOL	\$1,905.00	In Mono County	DISTRICT 09
	6.5		Asc.	All	Prog	Copy From Master WP		CSOL	\$808.00	IN STANISLAUS	DISTRICT 10
	0.9		Asc.	All	Prog	Sort		CSOL	\$35,000.00	In Tehama and : DISTRICT 02	
	11.1		Asc.	All	Prog	Filter By This Value		CSOL	\$7,500.00	In Yolo County fr	DISTRICT 03
	6.6		Asc.	All	Prog	Find		CSOL	\$750.00	IN SIERRA COU	DISTRICT 03
	17.2		Asc.	All	Prog	Filter		CSOL	\$1,878.00	IN COLUSA AND	DISTRICT 03
	11.9		Asc.	All	Prog	Edit Location By GPS		CSOL	\$2,184.00	IN MERCED CO	DISTRICT 10
	7		Asc.	All	Prog	Show on Map		CSOL	\$650.00	In Solano Count	DISTRICT 04
	2		Asc.	All	Prog	Show on Bing Map		CSOL	\$1,000.00	In San Luis Obis	DISTRICT 05
	0.5		Asc.	All	Prog	Export Data		CSOL	\$1,000.00	In Plumas and L	DISTRICT 02
					Mass Update			CSOL			

- The system displays a dialog box for selecting the scenario analysis out of which you will copy line items.

Work Plan from Analysis (pms_analysis_scenario_wp)

Select Scenario: CalTrans Test1

Plan Year	Co	Test Scenario - O-01	Test Scenario - A-18	x (From)	Post Mile Prefix From	Post Mile Begin	Post Mile Suffix From	Post Mile Prefix To	Post Mile End
1 SA		Test Scenario - A-16				13.5			14.0
1 YOL		Test Scenario - A-16				9.199			9.2
1 SAC		Test Scenario - A-10				1.721			1.721
1 SAC						4.686			4.686
1 PLA				R		64.178	L	R	64.178
1 SAC						20.979			21.0
1 SAC						19.272			19.0
1 NEV						15.545			15.0
1 SAC						18.374			18.0

5. In the Select Scenario field at the top of the dialog box, click the down arrow and then click the desired scenario from which you will copy line items. After selecting the scenario analysis, the system displays the line items from the analysis scenario.

Work Plan from Analysis (pms_analysis_scenario_wp)

Select Scenario	Test Scenario - A-18	▼			
Scenario Work Plan					
<> 1 <> 3 pages (29 rows)					
Plan Year	County From	Route From	Route Suffix (From)	Post Mile Prefix From	PostMile Begin
► 1	PLA	080		R	62.541
1	SAC	080		M	3.901
1	SAC	080		M	5.36
1	SAC	080		M	6.392
1	SAC	080		M	8.692
1	SAC	005			19.027
2	YOL	113		R	10.721
2	NEV	080		R	9.065
2	SAC	005			21.477
2	SUT	099			8.805

6. Select the line items you wish to copy. Use SHIFT+click to select multiple, adjacent line items or CTRL+click to select multiple, non-adjacent line items.
 7. Once the records are selected, right-click and then click Copy Selected Items.

Work Plan from Analysis (pms_analysis_scenario_wp)

Select Scenario Test Scenario - A-18

Scenario Work Plan

1 Go 3 pages (29 rows)

Plan Year	County From	Route From	Route Suffix (From)	Post Mile Prefix From	PostMile Begin	Post Mile Suffix From	Post MilePrefix To	Post Mile
1	PLA	080		R	62.541	R	R	64.
1	SAC	080		M	3.901		M	4.
1	SAC	080		M	5.36		M	6.
1	SAC	080		M	6.392		M	6.
1	SAC	080		M	8.692		M	8.
1	SAC	005		M	19.027			19.
2	YOL	113		R	10.721		R	11.
2	NEV	080		R	9.065	R	R	11.
2	SAC	005			21.477			22.
2	SUT	099			8.805			8.

- The system copies the selected line items to the Work Plan Data window. Note that the dialog box remains open so you may select additional line items if necessary.

Master Work Plan												
(1) 1 pages (10 rows)												
County	From	Route From	Route Suffix (From)	Post Mile Prefix From	PostMile Begin	Post Mile Suffix From	PostMilePrefix To	Post Mile End	Post Mile Suffix To	Direction	Lane	* MWP Project Status
BUT	149				0	R		3		ASC.	All	Awarded
BUT	149			R		1	R		4	ASC.	All	Awarded
SAC	080			M		3.901	M		4.742	ASC.	3	Scenario Recommended
SAC	080											
SAC	080											
SAC	080											
SAC	080											
Work Plan from Analysis (pms_analysis_scenario_wp)												
Select Scenario Test Scenario - A-18												
Scenario Work Plan												
< > >>> 3 pages (29 rows)												
Plan Year	County	From	Route From	Route Suffix (From)	Post Mile Prefix From	PostMile Begin	Post Mile Suffix From	PostMilePrefix To	Post Mile End			
	1	PLA	080		R		62.541	R				
	1	SAC	080		M		3.901	M				
	1	SAC	080		M		5.36	M				
	1	SAC	080		M		6.392	M				
	1	SAC	080		M		8.692	M				
	1	SAC	005				19.027					
	2	YOL	113		R		10.721	R				
	2	NEV	080		R		9.065	R				
	2	SAC	005				21.477					
	2	SUT	099				8.805					

Note: If any of the projects overlap existing projects within your existing master work plan they are NOT copied and will remain highlighted in the window after the process is complete.

9. When all desired line items are copied, click the close window "X" icon in the upper right corner to close the dialog box.
10. In the Work Plan Data window, click to save the new line items in the selected work plan.

7.3 Deleting Completed Projects from the MWP

To delete completed projects, follow these steps:

1. Open the Master Work Plan window (Roadway > Analysis > Network Analysis > Master Work Plan).
2. In the Select WP Type field at the top of the window, click the down arrow and then click the work plan from which the sections need to be deleted.

County From	Route From	Route	Begin	Post Mile Suffix From	Post Mile Prefix To	Post Mile End	Post Mile Suffix To	Direction	Lane
LAK	053		0			3.1		Asc.	All
MON	101		0	R		1.9		Asc.	All
RIV	078		0			16.4		Asc.	All
INY	136		0			10		Asc.	All
MNO	182		0			6.5		Asc.	All
STA	099		R	0	R	6.5		Asc.	All
SHA	005			0		0.9		Asc.	All
YOL	113		R	0	R	11.1		Asc.	All
SIE	089			0		6.6		Asc.	All

3. Once you select the work plan, the sections in the work plan are displayed in the bottom pane. You can select the line items you wish to copy. Use SHIFT+click to select multiple, adjacent line items or CTRL+click to select multiple, non-adjacent line items.
4. Once the records are selected, right-click and then click Delete. Click the icon to save the changed information.
5. To delete all projects with a status of "Completed", right-click and click Filter. A dialog box opens. Select 'MWP Project Status' from the left pane and select 'in list' from the drop of 'select filter type' in the right hand side pane. A list of options is displayed in the bottom part of the right side pane. Check the box for 'Completed' and click OK.
6. The data is filtered to the sections which has 'Completed' as their 'MWP project status'.
7. Use SHIFT+click to select all of the projects on the filtered list.
8. Once the records are selected, right-click and then click Delete. Click the icon to save the changed information.

7.4 Updating Project Status in Master Work Program

Each work plan project is assigned a status that must be updated when projects are added, completed, or deferred. The following steps show the process of updating the project status for any master work program:

1. Go to 'Master Work Plan' window (Roadway > Analysis > Network Analysis > Master Work Plan).
2. Select any work program from the drop down of 'Select WP Type' item which is located on top of the central part of this window.

County From	Route From	Route To	Post Mile Prefix To	Post Mile End	Post Mile Suffix To	Direction	Lane
LAK	053			3.1		ASC.	All
MON	101			1.9		ASC.	All
RIV	078			16.4		ASC.	All
INY	136			10		ASC.	All
MNO	182			6.5		ASC.	All
STA	099		R	6.5		ASC.	All
SHA	005			0.9		ASC.	All
YOL	113		R	11.1		ASC.	All
SIE	089			6.6		ASC.	All

3. When any work plan is selected from the drop down the sections that are involved in that work plan are displayed in the bottom pane of the called 'Master Work Plan'
4. Find the column called 'MWP Project Status' in the 'Master Work Plan' data pane.
5. Change the project status of any required section from the drop down of 'MWP Project Status'.

Post Mile Prefix To	Post Mile End	Post Mile Suffix To	Direction	Lane	* MWP Project Status	* Plan Year	* Budget Group	* Treatment	Estimate
	3.1		Asc.	All	Programmed	2012	Rehab	CSOL	\$
R	1.9		Asc.	All	Awarded	2014	Rehab	CSOL	\$4
	16.4		Asc.	All	Completed	2011	Maintenance	Full-Depth Recycling	\$
	10		Asc.	All	PS&E	2011	Maintenance		\$
	6.5		Asc.	All	Scenario Recommended	2011	CAPM		\$
R	6.5		Asc.	All	Scenario Results	2011	Maintenance		\$
	0.9		Asc.	All	Programmed	2012	Rehab		\$3
R	11.1		Asc.	All	Programmed	2012	Rehab		\$
	6.6		Asc.	All	Programmed	2012	Maintenance		\$
	17.2		Asc.	All	Programmed	2011	Maintenance		\$
	11.9		Asc.	All	Programmed	2011	CAPM		\$

8 CONDUCTING STATEWIDE NETWORK ANALYSIS

8.1 Overview

This chapter covers the process of conducting network-level pavement analysis, including estimation of unconstrained pavement needs and running scenarios that optimize investments subject to budget constraints and performance targets.

Major steps in the analysis process are:

- Creating the Network Master File
- Conducting Optimization Analysis – Multi-Constraint Scenario Analysis.

8.2 Creating a Network Master File

The Network Master File (NMF) is the starting point for all network analyses. It contains the most current information for all pavement sections. It represents the current structure, traffic, classification, and condition for the network as a whole. Since the network master file provides input to network analysis, it must contain information for the full network. In those cases where data is not available, default data is applied.

The network master file typically uses your pavement management sections as the master for pavement section definitions. Other data (including distress data, traffic, condition in the form of performance index, and construction history) are all assigned to the NMF when it is filled. Data for the NMF is aggregated according to rules developed for your particular version of the system.

The NMF is the input data stream for network analysis. It must be re-calculated at least once per year for the current data set to be used in network analysis. It should also be re-calculated each time any of the condition indicator settings change. If you make changes to the database that will affect the NMF, you may want to run the system job sooner so you are working with the most current NMF. Below are the steps listed on creating/updating NMF.

1. Display the System Job window (System > Tools > System Job > Schedules).

2. Right-click the row showing 'Populate Network Master' in the Job Name column and then click Run Job.

The screenshot shows the 'System > Tools > System Job > Schedules' page. The 'Jobs' tab is selected. A list of system jobs is displayed in a table with columns for 'SYSTEM JOB NAME', 'CRON EXPRESSION', and 'Commit Between Execut'. A context menu is open over the row for 'Populate Network Master', with the 'Run Job' option highlighted.

* SYSTEM JOB NAME	CRON EXPRESSION	Commit Between Execut
Fill Work Owner Summ Job #1		<input type="checkbox"/>
File Network Lines Tables (Count, Line Lanes and then Line Directions)		<input type="checkbox"/>
FillNetworkLineDirections		<input type="checkbox"/>
FinestPartitionTest		<input type="checkbox"/>
Make NETWORK_LINE_DIRECTIONS table		<input type="checkbox"/>
New Utilities WOs Per Calendar Year		<input type="checkbox"/>
PaveM - CAS Project II		<input type="checkbox"/>
PaveM - CAS Projects Import I		<input type="checkbox"/>
PaveM - TSN Highway Inventory Data		<input type="checkbox"/>
PaveM - CAS Contract Items Import		<input type="checkbox"/>
PaveM - OE Data Import		<input type="checkbox"/>
PaveM - PRSM Data Import		<input type="checkbox"/>
PaveM - PRSM Milestone Import		<input type="checkbox"/>
Populate all Lanes and Directions tables from NETWORK_LANES_COUNT		<input type="checkbox"/>
▶ Populate Network Master		<input type="checkbox"/>
Populate Performance Master		<input type="checkbox"/>
Populate PMS_MGMT_SECT		<input type="checkbox"/>
Populate Temporary Mgmt S		<input type="checkbox"/>
Proc Fill Equipment Expense		<input type="checkbox"/>
Recompile Jasper Reports		<input type="checkbox"/>
Reload CA LRS Tables Job		<input type="checkbox"/>

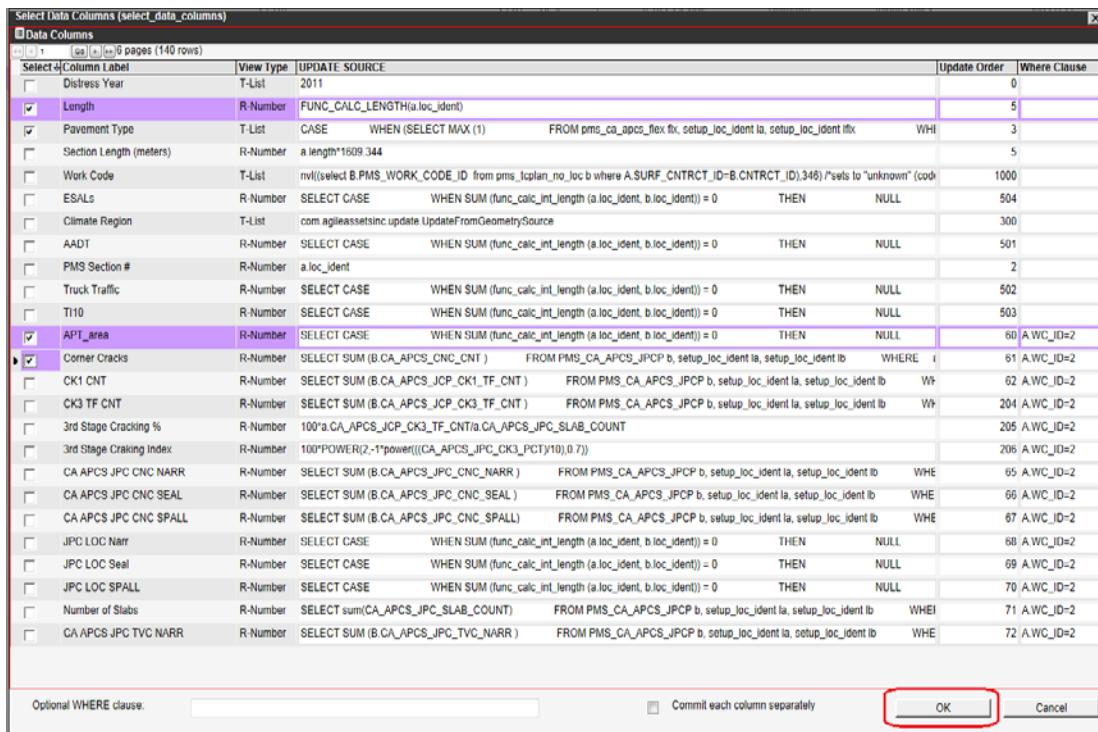
3. The application displays a dialogue box. . Click OK.

The screenshot shows the 'System Job > Schedules' page. A modal dialog box titled 'Message from webpage' is displayed in the foreground. The dialog contains a question: 'Did you update the parameters? Press Cancel if you want to change the parameters. Press OK to run the job.' with 'OK' and 'Cancel' buttons. The background shows a grid of system jobs with columns for 'SYSTEM JOB NAME', 'CRON EXPRESSION', 'Commit Between Executables', 'Scheduled?', and 'Comments'.

4. The job calculated in few minutes.
5. Go to Network Master Data window. (Roadway > Analysis > Network Analysis > Network Master > Network Master Data). Observe that Network Master Window filled in and columns are all calculated.
6. If you just want to update the attributes ever in the NMF window. Right click and click on **Update Target Table**.

The screenshot shows the 'Network Master Data' grid. A context menu is open over a specific row, with the 'Update Target Table' option highlighted. The menu also includes other options like 'Mass Update', 'Calculate RSL', 'Sort', 'Filter', 'Work With Attachments', 'Filter By This Value', 'Find', 'Show on Google Map', 'Show on Map', 'Show on Bing Map', and 'Export Data'.

7. A dialogue box is popped up, check the box for any required columns those need to be updated using CNTRL/SHIFT buttons and click **OK** in the bottom right side of the box.



8. In few minutes the data is calculated for the selected columns in the dialogue box.

8.3 Conducting Optimization Analysis

The purpose of optimization analysis is to create an optimal work plan using a single objective and multiple constraints (and constraint subdivisions, if so configured), or conduct a multi-year analysis.

8.3.1 Optimization Analysis Window Description

The optimization analysis window is used to define and run multiple scenarios, each having different settings, budgets, analysis periods, and so forth. The results from each scenario are stored separately and can be reviewed in this and other windows throughout the system.

The Optimization Analysis window provides the following tabs that allow you to switch between different components within work plan optimization:

- ❖ Setup – This tab is where all parameters for an optimization are established.
- ❖ Results – This tab shows the optimal recommended work plan.
- ❖ Constr. Results – This tab shows the predicted values of each constraint compared to the input constraint value. This allows you to identify the constraints that have controlled the analysis results.
- ❖ Report – This tab shows the constraints selected in the Reporting Functions pane of the Setup tab and the value of each constraint after optimization.

8.3.1.1 Setup Tab

The Setup tab is where all parameters for a work plan optimization are established. When the Optimization Analysis window first opens, the Setup tab is always the tab that is displayed. This tab contains the Scenarios pane on the upper left, a Yearly Financial Parameters pane on the lower left, a Constraints pane on the upper right, and a Reporting Functions pane on the lower right. These panes are described below.

8.3.1.2 Scenarios Pane

The Scenarios pane is where you start the process of running optimization analysis. It may also be used to create new scenario definitions or delete scenarios that you no longer need. This pane contains the following fields:

- ❖ Has Results – This check box indicates if the scenario has already been run. When a check mark is NOT displayed, then the results information shown in the other tabs is irrelevant.
- ❖ Scenario Number – This is a sequential number automatically assigned to identify the scenario. It cannot be edited.

Note: To find a particular scenario, enter the scenario number in the field at the top of the pane and then click the Find Scenario button.
- ❖ Scenario Name – This is a short description of the scenario. This description should be informative to other users.
- ❖ Year of Condition Data – The year you enter in this field is the year of condition data to be used in the scenario and also sets the first year of the scenario as this year plus one. (In most cases, the Network Master File contains only a single year's data and the value in this field sets the year of that data. For those cases where the Network Master File contains data from multiple years, the year in this field configures what records will be used for optimization.)
- ❖ Analysis Length – This is the number of years in the optimization period.
- ❖ Save Details – This check box determines whether the system saves the details of the scenario analysis. When it is checked, the details from the analysis are saved and may be viewed in the Detailed Scenario Results window. When it is not checked, the details are not saved, although the overall results of the analysis will still be available in the Results tab.
- ❖ Decision Tree Set – This field determines what decision tree set will be used in the analysis.
- ❖ Work Plan Type – This field provides a drop-down list of all available work plans (which are defined in the Setup Work Plan Type window). When you select a work plan from the drop down list, then the projects and costs from this work plan are first included in the optimization and then remaining rehabilitation recommendations are taken from decision tree results. If you do not select a work plan, then the optimization is run without consideration of a pre-defined work plan; it gets its rehabilitation recommendations entirely from decision tree results. (Note: To remove a work plan from the Work Plan Type field so no plan is selected, highlight the displayed work plan and then press the Delete or Backspace key.)
- ❖ Analysis Scope – This read-only field shows the data elements that are included in the scenario. The scope is set with the Edit Scope command.
- ❖ MWP Scope – This read-only field shows what work plans are included in the scenario. The plans are included by using the Edit MWP Scope command.
- ❖ Max Sec for Solver – This field sets the maximum amount of time (in seconds) that the optimization analysis will be allowed to run before settling on a solution. (In some optimization analyses, many optimal solutions are available and the routine will "hunt" among solutions

without settling on one and ending. Since these solutions are only marginally different than one another, forcing the routine to finish by setting the maximum amount of time that it can "hunt" is necessary and appropriate.)

- ❖ User Update — This read-only field illustrates the name of the user who is conducting the analysis.
- ❖ Date Updated — This read-only field shows the date the scenario was last updated.
- ❖ Comments — Optionally, you may include information in this field to describe the scenario.
- ❖ Attachment — This read-only field shows whether any attachments are attached to the specific optimization scenario. Attachments can be assigned with the Work With Attachments... command.
- ❖ Budget Relaxation (%) — This field is used for the multi-year optimization analysis only when 'minimize budget' is used as the objective. When you utilize this type of objective, you include a % value in this field that sets a boundary for how much the budget may vary in a particular year compared to the total budget specified for the scenario. This constraint limits the amount an individual year's budget may vary compared to the average budget over the analysis period. For example, if you were running a ten year analysis with a budget of \$1,000,000 per year, then entering 0.1 (10%) for budget relaxation would allow the total budget in any year to vary between \$900,000 and \$1,100,000 (10% above or below the yearly amount specified.)
- ❖ Analysis Type — This field determines whether the optimization routine uses multi-constraints in a single year or over multiple years. It may also be used to estimate the influence of changes performed in the MWP (Estimate MWP Influence), or select a simple algorithm, in which only one constraint is applied to an objective in a single year (e.g., in Ranking or Prioritization).
- ❖ Scheduled — When this field is checked, the user has the option of running the optimization analysis in the background through the System Jobs window.
- ❖ Administrative Unit — This field is set to the user's login administrative unit when each scenario is created and it is a read only field. When opening the scenario window only those scenarios assigned to the user's login Administrative Unit are visible.
- ❖ Decompose Model — When this check box is selected, the analysis engine will attempt to break the analysis into simpler, more quickly solved sub-analyses. A sub-analysis is performed for each independent constraint. (If the constraints are not independent of each other, then the analysis will not be broken down). *This column is not currently shown in PaveM but can be added by the System Administrator at any time.*
- ❖ Restrict Section Models — The model class tree in the Performance Models window determines what model is used to estimate deterioration for all road sections that match the criteria of each branch within the decision tree. It is possible however to also create models on a section by section basis within the system as well. There are also global settings within the software that can be used to assign criteria as to when to apply any sections' assigned model. If this check box is selected, the system will check the assigned criteria before using a section model in place of the tree assigned model. If the criterion is met the section model will be used if not the section model will be ignored. *This column is not currently shown in PaveM but can be added by the System Administrator at any time.*

When you right-click the scenarios pane, the following special commands are available along with the standard window commands:

- ❖ Run Scenario — This command executes the currently selected scenario.
- ❖ Insert — This command creates a new scenario.

- ❖ Edit Scope – This command allows you to set the analysis scope for the optimization. Analysis scope allows you to limit the data elements included in the optimization. When you execute this command, the application displays a new window. This window shows the variables that may be utilized to limit the scope of the analysis. You use this window in the same way as the Filter window. (The variables are designated and can be changed in the Analysis Columns Configuration window.). After setting the analysis scope, the selected elements are shown in the Analysis Scope field.
- ❖ Edit MWP Scope – This command allows you to incorporate into the optimization scenario projects that are already planned by your agency as documented in the Master Work Programs window. After setting what work plans will be included in the optimization, the work plans are shown in the MWP Scope field.
- ❖ Copy Scenario – This command allows you to create a new scenario by copying the parameters of the current scenario.
- ❖ Download MPS File – This command allows you to store on your local computer a copy of the MPS-formatted file that is the input to the solver. *MPS (Mathematical Programming System) is a file format for presenting and archiving linear programming (LP) and mixed integer programming problems.*
- ❖ Download LP File – This command allows you to store on your local computer a copy of the LP-formatted file. (The LP (*Linear Programming*)-formatted file will only be created if the Make LP File check box is selected.)
- ❖ Filter – The filter command allows you to select and project the scenarios that are restricted to some specific characteristic (for example, filter by “Has Results? – Yes” will only show the scenarios that have results. The filter remains in effect until removed or changed (logging off or changing modules will not remove the filter). Furthermore, a filter is only for a particular user. That is, the users may configure their own filter(s) for a scenario.
Note that, when a filter is applied, an exclamation point ! will appear in the title bar of the window or pane. You can double-click the icon in the title bar to display the Filter window.
- ❖ Filter by This Value – This command is similar to the Filter command with the difference that a specific filter is displayed depending on which row you right-click. For example, if you right-click the Analysis Scope row/field and click the Filter by this value, then the pop-up filter window will display only the Analysis Scope.

8.3.1.3 Yearly Financial Parameters Pane

The Yearly Financial Parameters pane allows you to enter values for discount rate and inflation for each year in the analysis period. These values must be entered as decimals (for example, 3% is entered as 0.03 – not 3). Also, for the discount rate, a positive value decreases the value of money over time.

8.3.1.4 Constraints Pane

Note: The constraints shown in the drop-down list in the Constraint Column are those columns with a check mark in the Is Constraint check box in the Setup PMS Columns window (Roadway > Utilities > Setup PMS Columns).

Each optimization requires one objective and, typically, multiple constraints. The Constraints pane allows you to configure the objective and constraints for the work plan optimization. When you right-click this pane, the following special commands are available along with the common commands:

- ❖ Propagate Years – This command copies the selected record for each year in the analysis period. This allows you to quickly specify constraints that differ by year within the analysis length.
- ❖ Activate Constraint Subdivisions – This command inserts records for each of the constraint subdivisions into which the selected constraint is subdivided as configured in the Setup Constraint Subdivisions window.

8.3.1.5 Reporting Functions Pane

This pane configures what constraints will be shown in the Report tab. It has no bearing on the optimization routine itself. Essentially, this pane allows you to see the value of a constraint after optimization without using the constraint to affect the outcome of the optimization routine. When you right-click this pane, the following special command is available along with the common commands:

- ❖ Activate Constraint Subdivisions – This command inserts records for each of the constraint subdivisions into which the selected constraint is subdivided as configured in the Setup Constraint Subdivisions window.

8.3.1.6 Results Tab

The Results tab is the output recommended workplan from the analysis. It provides a list of pavement sections produced by the optimization routine, with recommended year, treatment and estimated costs for each project.

8.3.1.7 Constr Results Tab

The Constr Results tab shows the predicted values of each constraint compared to the input constraint value. This allows you to identify the constraints that have controlled the analysis results. For example in a budget limited scenario this tab will show you the total cost of the recommended projects compared to the allowed budget specified for each year in the analysis period.

8.3.1.8 Report Tab

This tab shows the constraints you selected in the Reporting Functions pane of the Setup tab and the values of the constraints after the optimization routine finishes.

8.3.2 Configuring Constraints for Optimization Analysis

Prior to conducting optimization analysis, it is necessary to configure the constraints to be used – for example, if different condition targets are to be set based on traffic volumes, you would need to specify the different AADT categories to be distinguished. To configure optimization constraints:

1. Open the Setup Constraints Subdivisions window (Roadway > Analysis > Network Analysis > Setup Constraint Partitions). An example of this window is shown below.

The screenshot shows the 'Setup Constraint Partitions' window with the following details:

- Table View:**
 - Header: Constraint Type
 - Rows: 1 page (6 rows)
 - Columns: * Add Constr., Comments, Date Update, User Update
 - Data: Includes entries like 'By Budget Group', 'By Pavement Type', 'New Constraint', etc.
- Constraint Tree:**
 - Root node: Budget Group HM1
 - Child nodes: Budget Group HA-22 and Budget Group STIP

2. Point to the left pane, right-click, and then click Insert. The application creates a new record.
3. Highlight the text in the Add Constr. field and then type the name for this subdivision.

The screenshot shows the 'Setup Constraint Partitions' window with the following details:

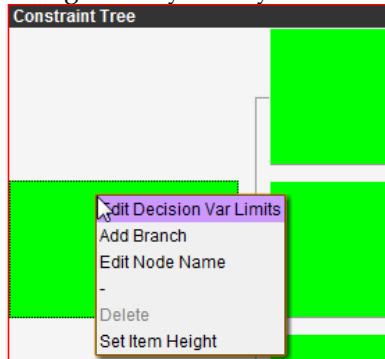
- Table View:**
 - Header: Constraint Type
 - Rows: 1 page (6 rows)
 - Columns: * Add Constr., Comments, Date Update, User Update
 - Data: Includes entries like 'By Budget Group', 'By Pavement Type', 'New Constraint', etc.
- Constraint Tree:**
 - Root node: Budget Group

4. In the right pane, right-click the displayed node and then click Add Branch. Because the outcome of any decision is at least two, at least two nodes are added to the tree.

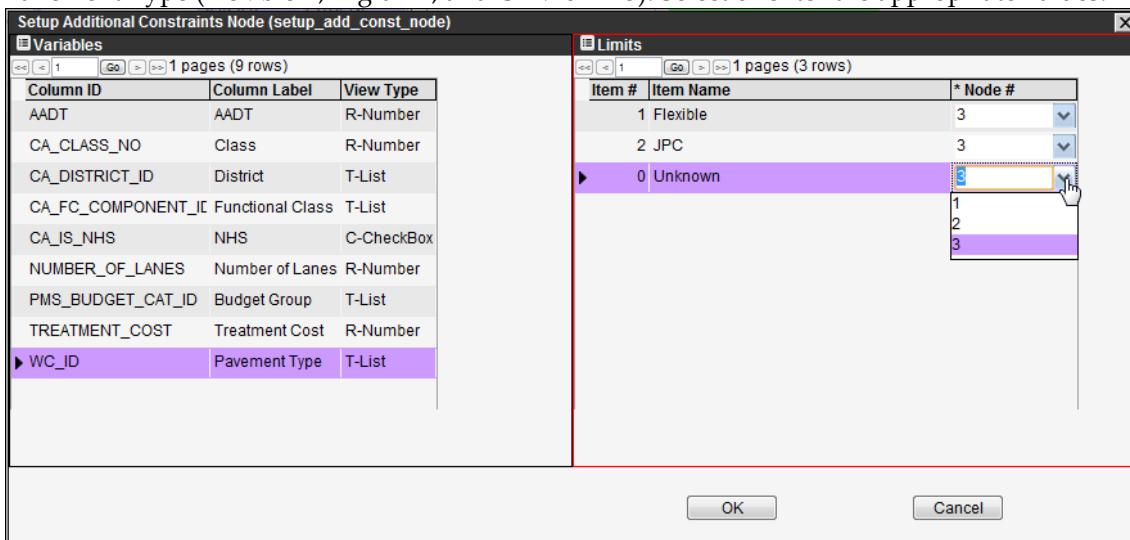
The three screenshots illustrate the process of adding a branch to the constraint tree:

- Step 1:** A context menu is open on the 'Budget Group' node in the constraint tree. The 'Add Branch' option is highlighted.
- Step 2:** A confirmation dialog box appears, asking "Please enter number of nodes:" with the value "3" entered.
- Step 3:** The constraint tree now shows four nodes under the 'Budget Group' node, indicating three new branches have been added.

5. Repeat step 4 as many times as necessary to obtain the proper division of your constraint.
6. Right-click the parent node and then click Edit Decision Var Limits. The application displays a dialog box so you may select the criteria by which each child node is activated.



7. In the pop-up window, select the variable that will be used to determine branching in the left pane (the available variables are those columns in the Analysis Columns Configuration window that have a check mark in the Is Add Constr. Column check box), and define the mapping for the variable on the right (define the criteria that will cause the different child nodes to activate). An example is shown below. In this example, the first branching is determined by the type of Pavement Type (Flexible-1, Rigid - 2, and Unknown-3). Select or enter the appropriate values.



8. Click OK. The system closes the dialog box. The application labels each of the child nodes with the variable and value that causes the node to activate.

Constraint type	Comments	Date Update	User Update
By Budget Group		8/4/2010	AARON
By Pavement Type		2/6/2012	VYSHNAVI
New Constraint		2/6/2012	VYSHNAVI
Preservation vs. Restoration		9/29/2010	AARON
By District		2/6/2012	VYSHNAVI
Func'l. Class Component		2/6/2012	VYSHNAVI

9. Click to save the new configuration.

Note: In step 7 above, the variables available for building the constraints divisions have been flagged as such variables in the Analysis Columns Configuration window (Roadway > Utilities > Analysis Columns Configuration).

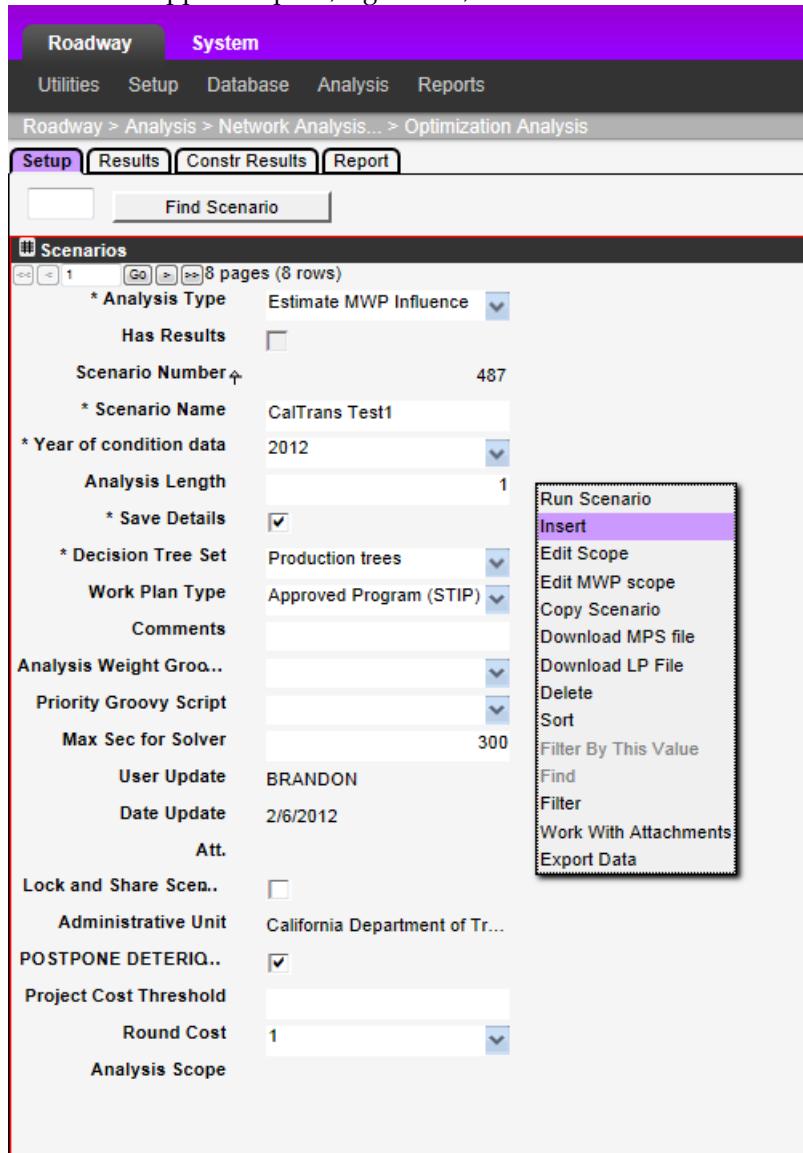
8.3.3 Defining and Running a Multi-Constraint Optimization Analysis

The purpose of the network multi-constraint optimization is to create an optimal work plan (e.g., a series of pavement treatments applied to a set of road sections) using a single objective and multiple constraints (and/or constraint subdivisions) across one year of the analysis scope. The goal is to either minimize expenditure to achieve a desired set of performance targets on a set of road sections, or to maximize a condition or benefit indicator given a fixed budget. Thus the desired output of the analysis is a series of treatments to be applied to individual assets in each year, which minimize the treatment cost or maximize the condition-based benefit subject to some desired constraints.

Follow these steps to perform a multi-constraint optimization network analysis:

1. Open the Optimization Analysis window (Roadway > Analysis > Network Analysis > Optimization Analysis).

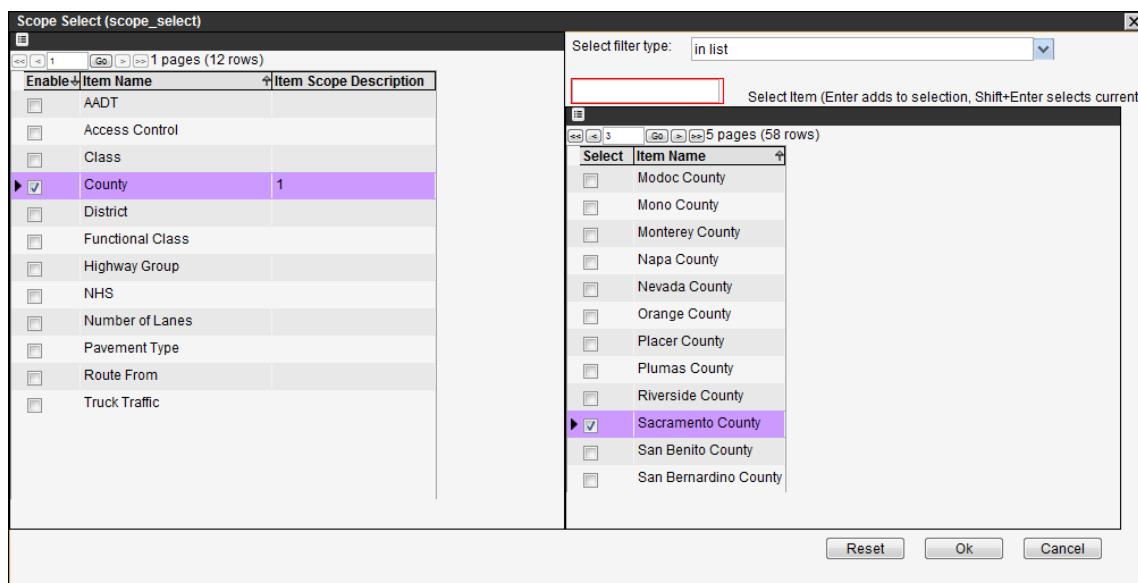
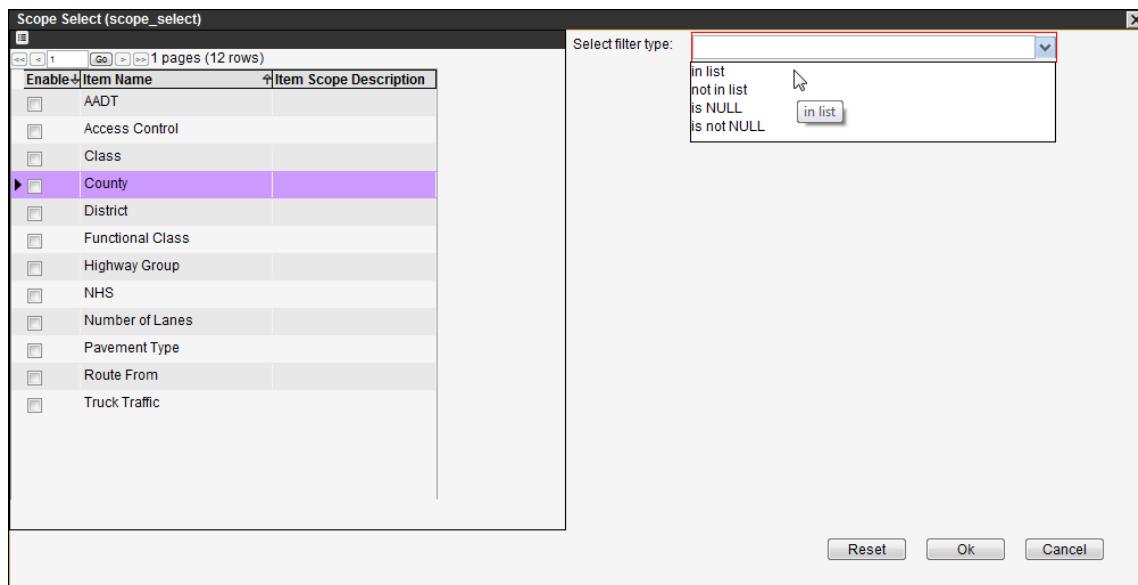
2. Point to the upper left pane, right-click, and then click Insert.



This creates a new scenario.

3. Highlight the text in the Scenario Name field and then type the name for this optimization.
4. Click in the Year of Condition Data field and then enter the year (in the format YYYY) of the most recent condition data that will be used in the optimization. Note that the year given in this field determines the starting year of the results of the optimization, which is the entered year plus one.
5. Click in the Analysis Length field and then type the number of years covered by this analysis. If you wish to save the details of the optimization for further study, click the Save Details check box. (The details may be viewed in the Detailed Optimization Results window)

6. If you wish to limit the data that is used in the analysis, right-click in the upper left pane and then click Edit Scope. This command displays a data selection window that you may use to select what data is used in the analysis.



- If you want to include the projects and costs from one or more work plans in the optimization, first select the work plan type, and then right-click in the upper-left pane and then click Edit MWP Scope. The Project Selection window opens. This window shows work plan attributes of status, plan year, and treatment. Work plan sections that meet the criteria that you define in this window will be placed into the optimization's recommended work plan. This data selection controls which projects are automatically included in the optimal work program by year, treatment, and/or status. In multi-year analyses, after pavement section(s) are assigned according to their status, they later become eligible for normal scenario work plan development.

The screenshot displays two windows from the Agile Assets software:

- Scenarios Window:** Shows a list of scenarios with various configuration options. A dropdown menu under "Work Plan Type" is open, showing a list of approved programs:
 - Approved Program
 - District Operations Workplan
 - District Scratch Pad 1
 - District Scratch Pad 2
 - District Scratch Pad 3
 - District Strategic Recommendations
 - HA-22 Program
 - HM1 Program
 - HQ Strategic Recommendations
 - HQ Strategic Recommendations – Scratch Pad
 - HQ Strategic Recommendations- Original
 - Test Scenario O-05 – A WP
 - Test O5, O6 wp
- Scope Select (scope_select) Window:** A modal dialog for selecting work plan scope. It contains two panes:
 - Left Pane:** A table titled "Scope Select (scope_select)" showing items:

Enable	Item Name	Item Scope Description
<input checked="" type="checkbox"/>	Approved	
<input checked="" type="checkbox"/>	MWP Project Status	1
<input type="checkbox"/>	Plan Year	
<input type="checkbox"/>	Treatment	
 - Right Pane:** A list titled "Select filter type: in list" with items:
 - Awarded
 - Completed
 - PS&E
 - Scenario Recommended
 - Scenario Results
 - Programmed

Note: The goal for work plan optimization is the development of an optimal work program. By default, optimization does not include or consider projects from a work plan because the objective of the optimization is to select the most appropriate projects given the input criteria. However, when running an optimization, there will be times where the input criteria should or must include projects that are already in the planning stages. The Edit MWP Scope command is available for this purpose.

8. If you wish inflation in the analysis, complete the records in the Yearly Financial Parameters pane.

Yearly Financial Parameters	
Year	Inflation Factor
1	0.07

Notes on Yearly Fin. Params: The Yearly Fin. [Financial] Params [Parameters] pane allows you to enter values inflation for each year in the analysis period. The **inflation rate** is a measure of inflation, the rate of increase of a price index. It is the percentage rate of change in price level over time. These values must be entered as decimals (for example, 3% is entered as 0.03 – not 3).

The inflation rate is the rate of increase of a price index (the percentage rate of change in price level over time). The inflation rate affects the budgeted dollar amount by the following formula: Value in Next Year = Value in Current Year \times (1 + Entered Inflation Value).

9. You are now ready to enter the records for the objective and the constraints to conduct the optimization. The first record in the upper right pane should be for the objective of the optimization. To enter the record for the objective of the optimization, follow these steps:
10. In the right pane, right-click and then click Insert. A new record is added to the pane.
11. Click the Is Objective check box.
12. Click the down arrow in the Constraint Column and then click the desired objective.

The screenshot displays the Agile Pavement Analyst software interface. The top navigation bar includes tabs for Setup, Results, Constr Results, and Report. The main workspace is divided into several panes:

- Scenarios Pane:** Contains fields for Analysis Type (Estimate MWP Influence), Scenario Number (509), Scenario Name (Tutorial 1), Year of condition data (2012), Analysis Length (1), Save Details (checked), Decision Tree Set (Production trees), Work Plan Type (Approved Program (STIP)), and Comments (copy of #487).
- Constraints Pane:** Shows a list of constraint types. One item, "Benefit", is highlighted with a purple background. Other items include 3rd Stage Cracking %, Benefit IRI/Traffic Reservation, Benefit IRI/Traffic Benefit, Faulting Value (in.), IRI AVG, IRI/Traffic Weighted Benefit, Preservation Benefit, Remaining Service Life (RSL) (Yrs), and Treatment Cost.
- Reporting Functions Pane:** Currently displays 0 pages (0 rows).

13. Depending on the objective selected, only a certain value may be permitted for the Constr. Type column and so the application automatically sets this column. If this does not occur, click the down arrow in the Constr. Type column and then click the appropriate constraint type.

The screenshot shows the 'Roadway > Analysis > Network Analysis... > Optimization Analysis' screen. In the 'Setup' tab, there is a 'Scenarios' section with various fields like 'Analysis Type' (set to 'Estimate MWP Influence'), 'Scenario Number' (509), 'Scenario Name' (Tutorial 1), 'Year of condition data' (2012), 'Analysis Length' (1), 'Decision Tree Set' (Production trees), 'Work Plan Type' (Approved Program (STIP)), and 'Comments' (copy of #487). To the right, the 'Constraints' pane is open, showing a table with columns: Is Objective, Constraint Column, Constr. Type, and Constraint Limit Value. A row for 'Benefit' is selected. A message dialog box titled 'Message from webpage' appears, stating 'Benefit must have constraint type of 'Weighted Average'' with 'OK' and 'Cancel' buttons. Below the message box, the 'Constraints' pane shows a context menu with options like 'Propagate Years', 'Insert', 'Set to included MWP budget', 'Activate Constraint Subdivisions', 'Insert Like', 'Delete', 'Sort', 'Find', and 'Export Data'.

While only one objective is allowed for an optimization, one or more constraints may be configured. A constraint record may apply to all years in the optimization period or multiple constraint records may be created for each year in the optimization period. Finally, for those constraints that have subdivisions as configured in the Setup Constraint Partitions window (Roadway > Analysis > Network Analysis > Setup Constraint Partitions), you may create records for each constraint Partition. The following steps provide a general process for entering subdivided constraint records:

14. In the Constraints pane, right-click and then click Insert. A new record is added to the pane.

This screenshot shows the same software interface as the previous one, but the 'Constraints' pane now has a context menu open over the 'Treatment Cost' row. The menu includes options such as 'Propagate Years', 'Insert', 'Set to included MWP budget', 'Activate Constraint Subdivisions', 'Insert Like', 'Delete', 'Sort', 'Find', and 'Export Data'.

15. Click the down arrow in the Constraint Column and then click the desired constraint.

16. Click the down arrow in the Constr. Type column and then click the desired constraint type.

17. In the Constraint Limit column, enter the value for the constraint. Note: Percentages are entered as a decimal value between 0 and 1 (for example, 5% is entered as 0.05 not 5).

18. If the constraint type is Percentage Above Threshold, enter the threshold value in the Condition Threshold column.

Is Objective	Constraint Column	Constr. Type	Constraint Limit Value	Condition Threshold	Scenario Y...	Add Co...
<input checked="" type="checkbox"/>	Treatment Cost	Total				
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.70	75		

19. Edit the 'Analysis Length' field to 5 in 'Scenarios' pane. If the constraint will apply to all years in the optimization period, leave the Scenario Year field blank. Otherwise, right-click the constraint record and then click Propagate Years in the shortcut menu. The application enters a constraint record for each year in the optimization period (which was set in step 5) as a copy of the record you right-clicked. It also enters the year in the Scenario Year field. You will now need to edit each newly inserted record to reflect the appropriate constraint limit.

Propagate Years

- Insert
- Set to included MWP budget
- Activate Constraint Subdivisions
- Insert Like
- Delete
- Sort
- Find
- Export Data

Is Objective	Constraint Column	Constr. Type	Constraint Limit Value	Condition Threshold	Scenario Y...	Add Co...
<input checked="" type="checkbox"/>	Treatment Cost	Total				
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.70	75	1	
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.65	75	2	
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.70	75	3	
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.65	70	4	
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.60	70	5	

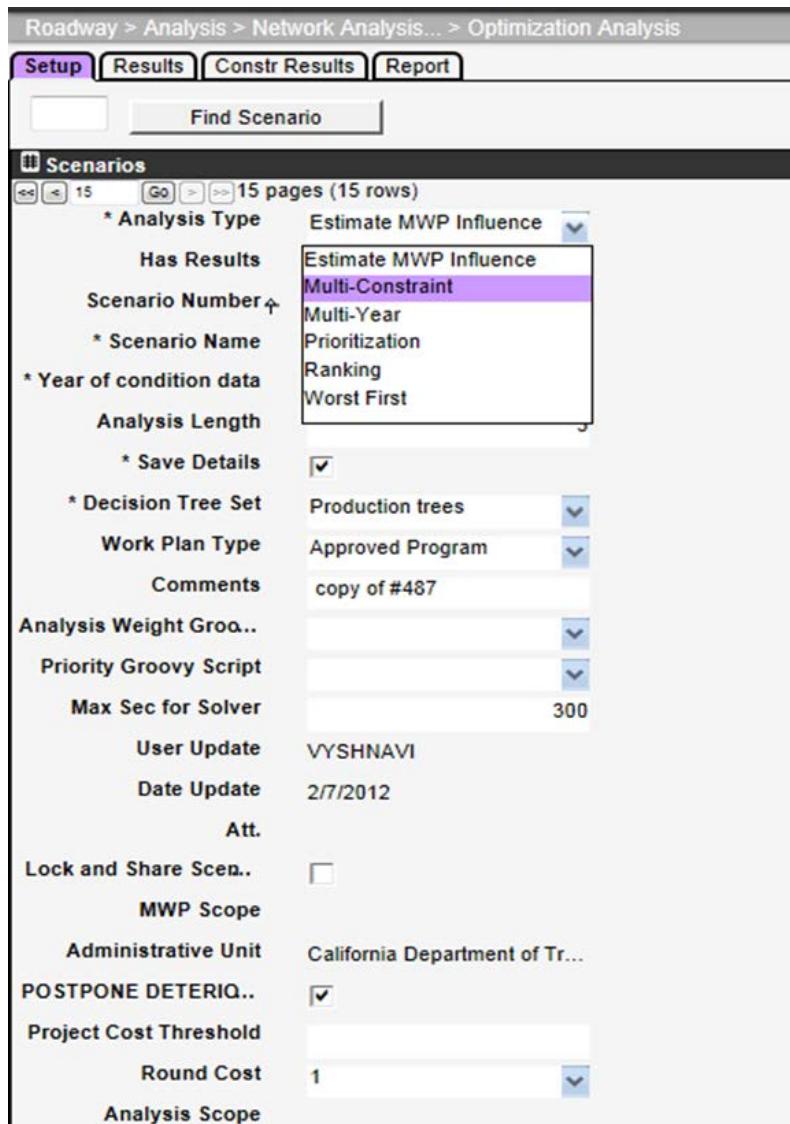
20. If the constraint will apply to all subdivisions of the constraint (if any), then you are finished with this constraint and may proceed to enter additional constraints as needed. On the other hand, if the constraint limit will vary for the different constraint subdivisions, right-click the constraint record and then click Activate Constraint Subdivisions in the shortcut menu. The application will then insert a record for each child node shown in the Setup Constraint Subdivisions window with the name of the node shown in the Node Name column. You will now need to edit each newly inserted record to reflect the appropriate constraint limit. After editing each record, you may proceed to enter additional constraints as needed.

Constraints						
Is Objective	Constraint Column	Constr. Type	Constraint Limit Value	Condition Threshold	Scenario Y...	Add Constr.
<input checked="" type="checkbox"/>	Treatment Cost	Total				
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.70	75	1	<ul style="list-style-type: none"> Propagate Years Insert Set to included MWP budget Activate Constraint Subdivisions Insert Like Delete Sort Find Export Data
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.65	75	1	
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.70	75	1	
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.65	75	1	
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.60	75	1	

Select Additional Constraints (select_add_const)				
Select Additional Constraints				
Add Constr.	Comments	User Update	Date Update	
By Budget Group	VYSHNAVI	2/7/2012		
By Pavement Type	VYSHNAVI	2/6/2012		
By District	VYSHNAVI	2/6/2012		
Funct. Class Component	VYSHNAVI	2/7/2012		
By Pavement Class	Class 1,2,3	SURESH	3/29/2012	

Constraints						
Is Objective	Constraint Column	Constr. Type	Constraint Limit Value	Condition Threshold	Scenario Y...	Add Constr.
<input checked="" type="checkbox"/>	Treatment Cost	Total				
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.70	75	1	<ul style="list-style-type: none"> 1 By Pavement Type Flexible
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.70	75	1	<ul style="list-style-type: none"> 1 By Pavement Type Rigid
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.70	75	1	<ul style="list-style-type: none"> 1 By Pavement Type Composite/Other
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.65	75	2	
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.70	75	3	
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.65	70	4	
<input type="checkbox"/>	IRI AVG	Percent Above Threshold	0.60	70	5	

21. You can insert a reporting function, by right-clicking on the Reporting Function pane. It has no bearing on the optimization routine itself. Essentially, this pane allows you to see the value of a constraint after optimization without using the constraint to affect the outcome of the optimization routine
22. Before you run the scenario, you need to specify the type of analysis. Click the down arrow in the Analysis Type in the Scenarios pane and then click Multi-Constraint. (Note that if you are performing other types of analysis (for example ranking, prioritization, etc.) select the appropriate/desired one.)



23. Once all constraints are configured, you are ready to run the optimization. Right-click the upper left pane and then click Run Scenario.

Roadway > Analysis > Network Analysis... > Optimization Analysis

Setup **Results** **Constr Results** **Report**

Find Scenario

Scenarios
15 pages (15 rows)

* Analysis Type	Multi-Constraint
Has Results	<input type="checkbox"/>
Scenario Number	509
* Scenario Name	Tutorial 1
* Year of condition data	2012
Analysis Length	5
* Save Details	<input checked="" type="checkbox"/>
* Decision Tree Set	Production trees
Work Plan Type	Approved Program
Comments	copy of #487
Analysis Weight Groo...	
Priority Groovy Script	
Max Sec for Solver	300
User Update	VYSHNAVI
Date Update	2/7/2012
Att.	
Lock and Share Scen..	<input type="checkbox"/>
MWP Scope	
Administrative Unit	California Department of Tr...
POSTPONE DETERIQU..	<input checked="" type="checkbox"/>
Project Cost Threshold	
Round Cost	1
Analysis Scope	

Run Scenario

- Run Scenario
- Insert
- Edit Scope
- Edit MWP scope
- Copy Scenario
- Download MPS file
- Download LP File
- Delete
- Sort
- Filter By This Value
- Find
- Filter
- Work With Attachments
- Export Data

Please wait... (wait)

1 Initialize Engine.

Hide **Stop**

Please wait... (wait)

1 Scenario 496 has completed successfully in 3min 28s

Close

The application performs the optimization and then displays the results in the Results tab. The Constr. Results tab will also show the actual constraint values at the end of optimization. Note: If the optimization takes a long time to complete, better performance may be obtained by entering an appropriate value in the Number of Nodes in Solution and/or Max Sec for Solver fields.

8.3.4 Defining and Running a Multi-Year Multi-Constraint Optimization Analysis

In multi-year multi-constraint optimization, the purpose is to create an optimal work plan using a single objective and multiple constraints (and/or constraint subdivisions) across two or more years. However, for the multi-year analysis, the work plan is now defined as a set of strategies applied to a set of road sections, and strategy is defined as a series of treatments according to a predetermined decision tree, initiated in some year within the time period of the analysis scope. As such, the desired output of the multi-year multi-constraint optimization analysis is a set of strategies implemented in the network that minimize the overall strategy cost or maximize the condition-based benefit across the network and within all the years throughout the analysis time period, subject to some desired constraints. This work plan then is the set of recommended individual strategies applied to a set of individual road sections.

Before conducting the multi-year analysis, you need to configure the strategies. For the strategy configuration, follow these steps:

24. Open the Setup Multi Year Project Data window (Roadway > Analysis > Network Analysis... > Setup MultiYear Project Data). The window contains two panes, as shown below. The left pane (Strategies) lists the various strategies that have been configured. For the strategy selected in the Strategies pane, the right pane (Strategy Details) shows the years covered by the strategy. For each year in the pane on the right, a check mark in the Budgeted column indicates whether money may be spent in the indicated year.

The screenshot shows the 'Setup Multi Year Project Data' window with two main panes:

- Strategies Pane:** Displays a table of strategies. The columns are: *Strategy Type Name, Strategy Duration, Comments, Date Update, User Update, and Att. There are 11 rows listed, including 'All Years' and various 'Defer' strategies from 01 to 09.
- Strategy Details Pane:** Displays a table of years from 1 to 10. The columns are: Budgeted? and Plan Year. Checkmarks are present in the 'Budgeted?' column for years 1 through 10.

Strategies					
*Strategy Type Name	Strategy Duration	Comments	Date Update	User Update	Att.
All Years	10		8/4/2010	ERIC	
Do Nothing	10		10/9/2009	TONYA	
Defer 01	10		5/25/2011	ERIC	
Defer 02	10		5/25/2011	ERIC	
Defer 03	10		5/25/2011	ERIC	
Defer 04	10		5/25/2011	ERIC	
Defer 05	10		5/25/2011	ERIC	
Defer 06	10		5/25/2011	ERIC	
Defer 07	10		5/25/2011	ERIC	
Defer 08	10		5/25/2011	ERIC	
Defer 09	10		5/25/2011	ERIC	

Strategy Details	
Budgeted?	Plan Year
<input checked="" type="checkbox"/>	1
<input checked="" type="checkbox"/>	2
<input checked="" type="checkbox"/>	3
<input checked="" type="checkbox"/>	4
<input checked="" type="checkbox"/>	5
<input checked="" type="checkbox"/>	6
<input checked="" type="checkbox"/>	7
<input checked="" type="checkbox"/>	8
<input checked="" type="checkbox"/>	9
<input checked="" type="checkbox"/>	10

25. You can create a new strategy by right-clicking the left (Strategies) pane and selecting the Insert command.

26. After creating the new strategy, type the Strategy Type Name (a), the Strategy Duration (b), and the Preparer's Comment if any.

* Strategy Type N...	Strategy Duration	Comments	Date Update	User Update	Att.
All Years	10		8/4/2010	ERIC	
Do Nothing	10		10/9/2009	TONYA	
Defer 01	10		5/25/2011	ERIC	
Defer 02	10		5/25/2011	ERIC	
Defer 03	10		5/25/2011	ERIC	
Defer 04	10		5/25/2011	ERIC	
Defer 05	10		5/25/2011	ERIC	
Defer 06	10		5/25/2011	ERIC	
Defer 07	10		5/25/2011	ERIC	
Defer 08	10		5/25/2011	ERIC	
Defer 09	10		5/25/2011	ERIC	
NEW_STRATEGY	6	Comment	2/7/2012	VYSHNAVI	

27. Right-click the right (Strategy Details) pane and select the Insert command (a) to add a single year or the Insert All command (b) to add all the years according to the Strategy Duration in the left pane. (That is, the right pane may be populated a single year at a time by using the Insert command or all years [using the value in the Strategy Duration field in the left pane] at once by using the Insert All command.)

The screenshot shows a context menu with the following options:

- Insert
- Insert All** (highlighted)
- Delete
- Delete All
- Sort
- Find
- Export Data

28. In the column Budgeted?, check the boxes corresponding to each year for which you wish money to be spent. Note that, by checking a box, you allow for the possibility that money may be spent in the indicated year.

Strategy Details	
Budgeted?	Plan Year
<input checked="" type="checkbox"/>	6
<input checked="" type="checkbox"/>	5
<input type="checkbox"/>	4
<input checked="" type="checkbox"/>	3
<input checked="" type="checkbox"/>	2
<input type="checkbox"/>	1

29. You have now created a new strategy. Click to save the new configuration.

Performing a multi-year multi-constraint optimization network analysis is very similar to the multi-constraint optimization analysis. You can follow the steps as shown below:

30. Follow exactly the same steps of the multi-constraint optimization as illustrated in the previous section.
31. Skip step 7, as you may not have a master work plan applied in the multi-year analysis.
32. Follow exactly the same steps of the multi-constraint optimization as illustrated in the previous section.
33. Before you run the scenario, you need to specify the type of analysis. Click the down arrow in the Analysis Type in the Scenarios pane and then click Multi-Year.

Roadway > Analysis > Network Analysis... > Optimization Analysis

Setup	Results	Constr Results	Report
<input type="button" value="Find Scenario"/>			
Scenarios 15 pages (15 rows)			
* Analysis Type: Estimate MWP Influence			
Has Results: Estimate MWP Influence			
Scenario Number: Multi-Year			
* Scenario Name: Prioritization			
* Year of condition data: Ranking			
Analysis Length: Worst First			
* Save Details: <input checked="" type="checkbox"/>			
* Decision Tree Set: Production trees			
Work Plan Type:			
Comments:			
Analysis Weight Group:			
Priority Groovy Script:			
Max Sec for Solver: 300			
User Update: VYSHNAVI			
Date Update: 2/7/2012			
Att.:			
Lock and Share Scen.: <input type="checkbox"/>			

34. Once all constraints are configured, you are ready to run the optimization. Right-click the upper left pane and then click Run Scenario. The application performs the optimization and then displays the results in the Results tab. The Constr. Results tab will also show the actual constraint values at the end of optimization. Note: If the optimization takes a long time to complete, better performance may be obtained by entering an appropriate value in the Number of Nodes in Solution and/or Max Sec for Solver fields.

8.4 Creating a Work Program from Scenario Results

The system supports multiple scenario analyses, and you may copy line items out of one of these scenario analyses into a work plan by following these steps:

1. Open the Work Plan Data window (Roadway > Analysis > Network Analysis > Master Work Plan).
2. In the Select WP Type field at the top of the window, click the down arrow and then click the work plan into which you will copy line items.

Count From	Route From	Route	Begin	Post Mile Suffix From	Post Mile Prefix To	Post Mile End	Post Mile Suffix To	Direction	Land
LAK	053		0			3.1		Asc.	All
MON	101		0	R		1.9		Asc.	All
RIV	078		0			16.4		Asc.	All
INY	136		0			10		Asc.	All
MNO	182		0			6.5		Asc.	All
STA	099		0	R		6.5		Asc.	All
SHA	005			0		0.9		Asc.	All
YOL	113		0	R		11.1		Asc.	All
SIE	089		0			6.6		Asc.	All

The system displays the line items for the selected work plan after you make your selection.

3. Right-click in the data pane and then click Copy Analysis Results.

The screenshot shows the 'Master Work Plan' grid. A context menu is open over a specific row, with the option 'Copy Analysis Results' highlighted. The grid columns include: To, Post Mile End, Post Mile Suffix To, Direction, Lane, *MWP Project Status, *Plan Year, *Budget Group, *Treatment, Estimated Cost, Location Desc, and Administrative Unit. The 'Estimated Cost' column shows values like \$7,908.00, \$7,908.00, \$46,276.00, etc. The 'Location Desc' and 'Administrative Unit' columns show details like 'In Lake County fr DISTRICT 01' and 'IN RIVERSIDE DISTRICT 08'.

4. The system displays a dialog box for selecting the scenario analysis out of which you will copy line items.

The dialog box title is 'Work Plan from Analysis (pms_analysis_scenario_wp)'. The 'Select Scenario' dropdown is set to 'CalTrans Test1'. The main area shows a grid of scenario data with columns: Plan Year, Scenario ID, Post Mile Prefix From, Post Mile Begin, Post Mile Suffix From, Post Mile Prefix To, and Post Mile End. The data includes various test scenarios and one '1 YOL' entry.

5. In the Select Scenario field at the top of the dialog box, click the down arrow and then click the desired scenario from which you will copy line items. After selecting the scenario analysis, the

system displays the line items from the analysis scenario.

Work Plan from Analysis (pms_analysis_scenario_wp)									
Select Scenario Test Scenario - A-18									
Scenario Work Plan									
Plan Year	County From	Route From	Route Suffix (From)	Post Mile Prefix From	PostMile Begin	Post Mile Suffix From	Post MilePrefix To	Post Mile E	
1	PLA	080		R	62.541	R	R	64.	
1	SAC	080		M	3.901		M	4.	
1	SAC	080		M	5.36		M	6.	
1	SAC	080		M	6.392		M	6.	
1	SAC	080		M	8.692		M	8.	
1	SAC	005			19.027			19.	
2	YOL	113		R	10.721		R	11.	
2	NEV	080		R	9.065	R	R	11.	
2	SAC	005			21.477			22.	
2	SUT	099			8.805			8.	

6. Select the line items you wish to copy. Use SHIFT+click to select multiple, adjacent line items or CTRL+click to select multiple, non-adjacent line items.
7. Once the records are selected, right-click and then click Copy Selected Items.

Work Plan from Analysis (pms_analysis_scenario_wp)									
Select Scenario Test Scenario - A-18									
Scenario Work Plan									
Plan Year	County From	Route From	Route Suffix (From)	Post Mile Prefix From	PostMile Begin	Post Mile Suffix From	Post MilePrefix To	Post Mile E	
1	PLA	080		R	62.541	R	R	64.	
1	SAC	080		M	3.901		M	4.	
1	SAC	080		M	5.36		M	6.	
1	SAC	080		M	6.392		M	6.	
1	SAC	080		M	8.692		M	8.	
1	SAC	005			19.027			19.	
2	YOL	113		R	10.721		R	11.	
2	NEV	080		R	9.065	R	R	11.	
2	SAC	005			21.477			22.	
2	SUT	099			8.805			8.	

8. The system copies the selected line items to the Work Plan Data window. Note that the dialog box remains open so you may select additional line items if necessary.
- Note: If any of the projects overlap existing projects within your existing master work plan they are NOT copied and will remain highlighted in the window after the process is complete.*
9. When all desired line items are copied, click the close window "X" icon in the upper right corner to close the dialog box.

8.5 Non Optimization Treatment Recommendations

This section describes the use of two windows that can be used to view treatment recommendations that are not a results of a scenario in the Optimization Analysis window. They are:

1. The Current Needs window (Analysis > network analysis>Section Current Needs)
The purpose of the Section Current Needs window is to show the general decision tree treatment recommendation for every section in the Network Master file. This is exactly the same set of treatments you would get if you ran a one-year prioritization method network analysis with

unlimited budget.

The recommended treatments in the Needed Treatments pane and the road sections in the Road Sections pane are always current. If you change your decision tree or Network Master file, these changes will be reflected in this window immediately and automatically.

2. Section Strategies window (Analysis> network analysis>Section Strategies)

This window allows you to develop, edit, and assign rehabilitation strategies to particular road sections for use in a multiple-year optimization. If you are running a multiple-year optimization, each section needs to be assigned a strategy in the Section Strategies window before running the optimization routine.

8.5.1 Current Treatment Needs of a Section

The Current Needs window displays the current treatment needs of the sections based on the decision trees configured. The detailed steps below are useful in helping to understand how the current need of each road section is determined.

1. Open the Section Current Needs window (Roadway > Analysis > Network Analysis... > Section Current Needs).

Decision Tree Set	Treatment (Alt1)	Treatment Cost (Alt1)	Treatment (Alt2)	Treatment Cost (Alt2)	Treatment (Alt3)	Treatment Cost (Alt3)
Production trees	HMA-Medium->0.2<=0.5'	\$13,437,000.00				
test type	HMA-Medium->0.2<=0.5'	\$13,437,000.00	Do Nothing	\$0.00	Do Nothing	\$0.00
Inc Ben	HMA-Medium->0.2<=0.5'	\$13,437,000.00	HMA-Thick->0.5'	\$20,155,500.00	HMA-Very Thin-<=0.1'	\$2,239,500.00

2. The treatment needs based on the current condition of the section selected in the 'Road Sections' pane is displayed in the lower 'Treatments Needs' pane. The treatments displayed are based on the decision trees, configured as per Caltrans business rules. (Rows are displayed for 'Production trees' decision tree and Inc Ben (Incremental Benefit) decision trees
3. Note down Pavement Type and its related values eg. For Flexible Pavement Type note the WPCV, Flexible Total Cracking Index, CA_RUT_AVG values for the selected section
 - For the section below
 (Route From - 080,
 Post Mile Prefix From - R,
 Post Mile Begin- 2.597,
 Postmile Prefix To- R,

Post Mile End- 5.224,
 Direction- Desc,
 Lane- 1)

- Pavement Type- Flexible
- WPCV- 0.0
- Flexible Total Cracking Index- 100
- CA_RUT_AVG- 3.5

4. Note down the treatment recommended (Eg . For the route selected above and for Inc Ben decision tree

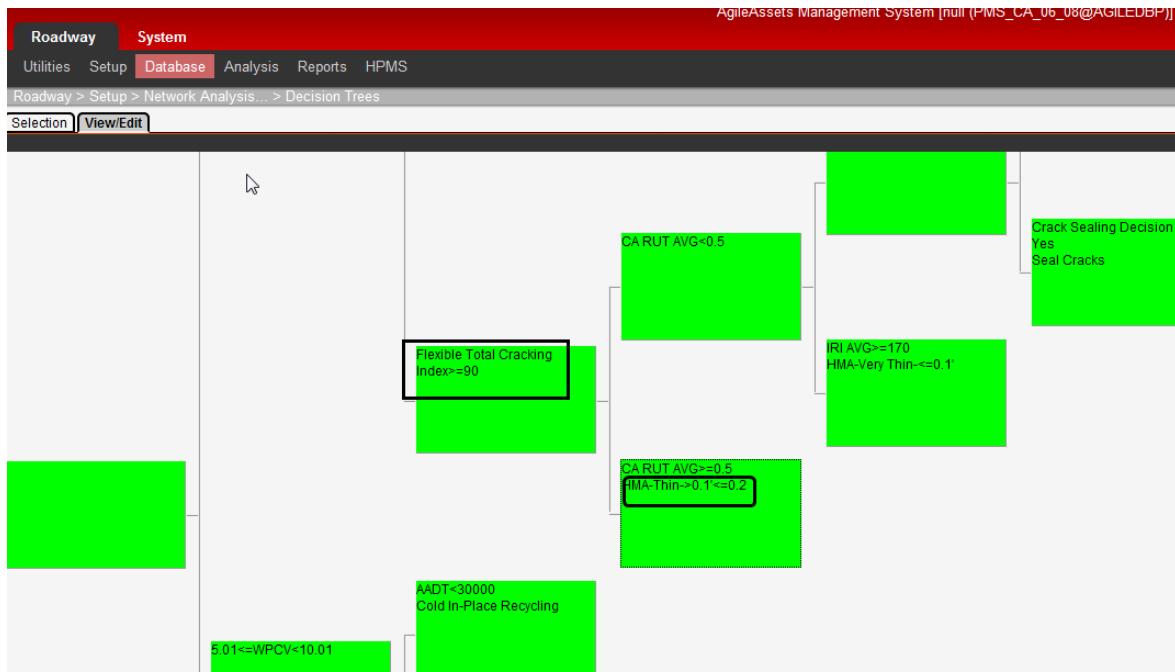
Decision Tree Set	Treatment (Alt1)	Treatment Cost (Alt1)	Treatment (Alt2)	Treatment Cost (Alt2)	Treatment (Alt3)	Treatment Cost (Alt3)
Production trees	HMA-Thin->0.1'<=0.2	\$525,400.00				
test type	HMA-Thin->0.1'<=0.2	\$525,400.00	No Nothing		\$0.00	\$0.00
Inc Ben	HMA-Thin->0.1'<=0.2	\$525,400.00	HMA-Medium->0.2'<=0.5'	\$1,576,200.00	HMA-Thick->0.5'	\$2,364,300.00

5. Display the Decision Trees window(Roadway > Setup > Network Analysis... > Decision Trees). A window with three panes and two tabs is displayed

* DEC TREE NAME	Comments	User Update	Date Update
Incben Rigid Decision Tree		VYSHNAVI	1/23/2012
Flexible Decision Tree		VYSHNAVI	1/24/2012
Incben Flexible Decision Tree		VYSHNAVI	1/24/2012
Rigid Decision Tree		VYSHNAVI	2/13/2012

6. Select the Connection Type (for eg. Inc Ben) and Upper Level (Decision Trees- Flexible Decision Tree. Decision Tree name is displayed on the Decision Trees panes as well.

7. Click on the View/ Edit Tab. The configured decision tree as per Caltrans business rules is displayed
8. Narrow down to the treatment based on the parameters on the section. This is the treatment suggested in the Section Current Needs window (Noted in step 4)



8.5.2 Developing and Assigning Rehabilitation Strategies to Road Sections

The Section Strategies window allows you to develop, edit, and assign rehabilitation strategies to particular road sections. (A strategy is a set of pavement treatments specified for one or more years on a pavement section). The detailed steps that follows are useful in helping to understand how the current need of each road section is determined.

1. Open the Section Strategies window (Roadway > Analysis > Network Analysis... > Section Strategies. This window contains the following panes: Road Sections, Strategies Assigned to Road Section, and Strategy Details.

The screenshot shows the AgileAssets Management System interface. The top navigation bar includes Roadway, System, Utilities, Setup, Database (which is selected), Analysis, Reports, and HPMS. Below the navigation is a breadcrumb trail: Roadway > Analysis > Network Analysis... > Section Strategies. The main content area is divided into three panes:

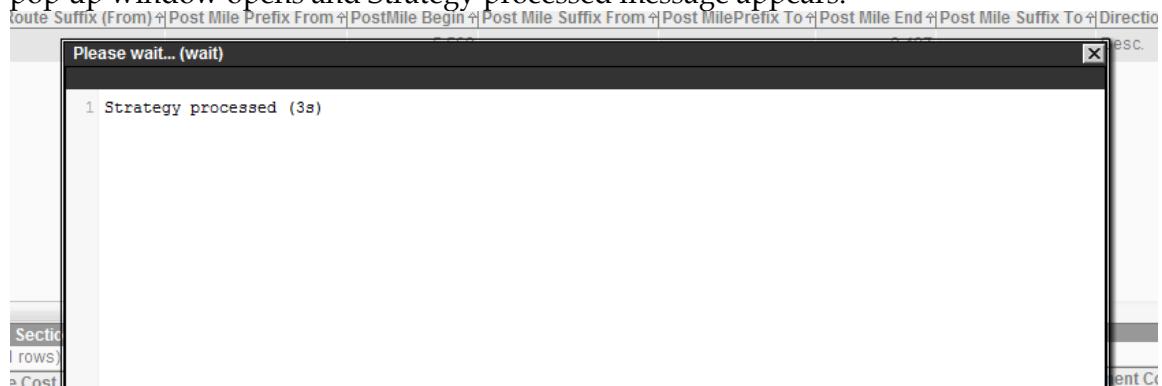
- Road Sections**: A table with columns: County From, Route From, Route Suffix (From), Post Mile Prefix From, Post Mile Begin, Post Mile Suffix From, Post Mile Prefix To, Post Mile End, Post Mile Suffix To, Direction, and Lane. One row is visible: NEV, 080, R, 2.597 L, R, 5.224 L, Desc., 1.
- Strategies Assigned to Road Section**: A table with columns: Strategy Type, Present Value Cost, Protected, Decision Tree Set, Strategy Duration, and Strategy Co. It lists 11 rows under 'All Years' strategy type, all assigned to 'Production trees'. The last row shows a Present Value Cost of \$63,048.00.
- Strategy Details**: A table with columns: Benefit, 3rd Stage Cracking %, Faulting Value (in.), Flexible Total Cracking Index, and IR. It lists 10 rows corresponding to the strategies in the previous pane. The last row shows a Benefit of 1188.31 and an IR of 99.9798.

2. The Road Sections pane lists all road sections in the Network Master file. Select any section on Route From '505', 'PostMile Begin' '5.569', 'PostMile End' '9.497' and Direction 'Desc' from 'Road Sections' pane and click OK
3. In 'Strategies Assigned to Road Section' pane right click and click on Insert.
4. Select 'All Years' from the dropdown of 'Strategy Type' field.

This screenshot shows a close-up of the 'Strategies Assigned to Road Section' pane. It displays a single row of data. The 'Strategy Type' dropdown is set to 'All Years'. The 'Present Value Cost' is listed as '\$63,048.00'. The 'Decision Tree Set' is 'Production trees'. The 'Strategy Duration' is '10'. The 'Strategy Co.' column is partially visible.

5. Click the Save icon

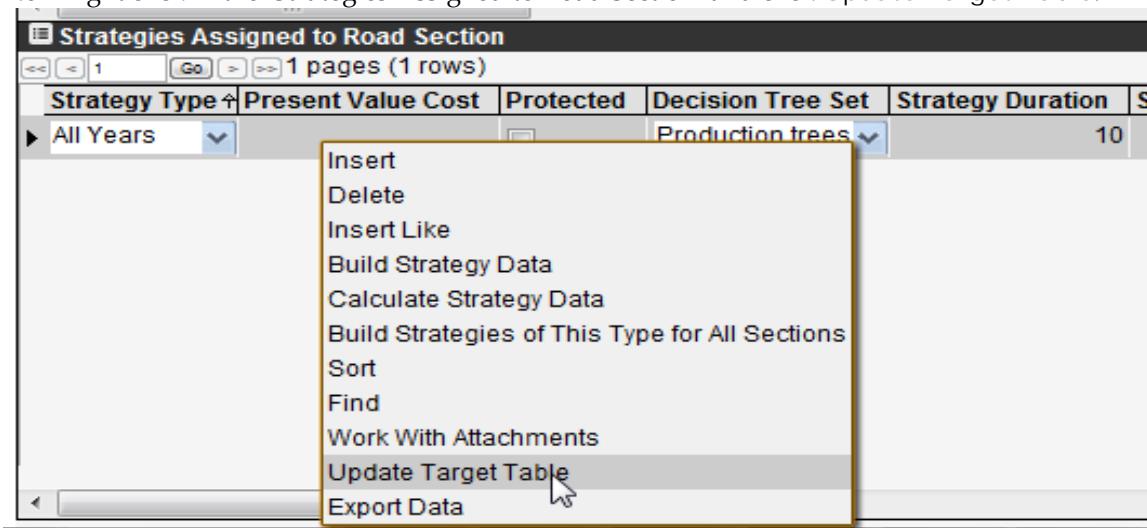
6. Now right click on the 1st row in 'Strategies Assigned to Road Section' pane and click on Build Strategy data (This command populates the Strategy Details pane with the computed treatments for the section based on the strategy funding parameters. Note: This will overwrite any manual changes that you made in the Strategy Details pane.) A pop up window opens and Strategy processed message appears.



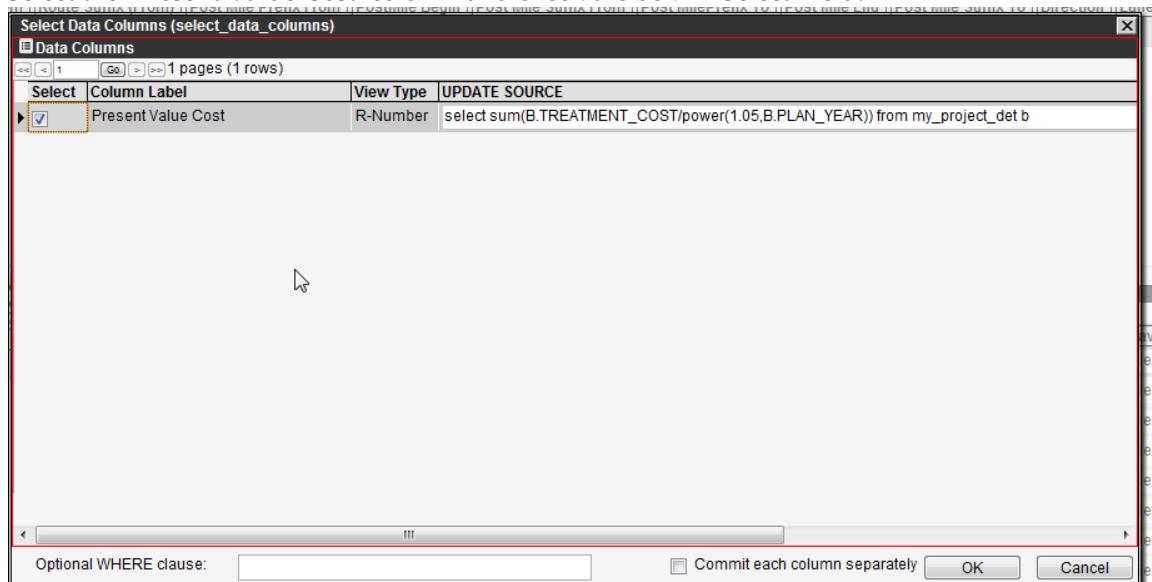
7. Close the popup window.
8. Strategy Details pane is populated. For the strategy selected in the Strategies pane, this pane provides the details of the strategy including what treatment in what year is recommended and the costs associated with that treatment.

Strategy Details					
Benefit	3rd Stage Cracking %	Faulting Value (in.)	Flexible Total Cracking Index	IRI	Cost
1185.91	0	0		100	
534.92	0	0	99.6251		
452.299	0	0	95.4236		
373.874	0	0	80.6014		
297.272	0	0	52.8767		
1479.07	0	0		100	
537.47	0	0	99.9817		
452.301	0	0	98.7603		

9. Now right click in the 'Strategies Assigned to Road Section' and click Update Target Table.



10. Select the 'Present Value Cost' column and check the box in 'Select' field.



11. Click OK in the dialogue box.

12. Dialogue box is closed and Value for 'Present Value Cost' is calculated in Strategies Assigned to Road Section pane.

9 REPORTING

9.1 Overview

The AgileAssets Pavement Analyst contains a considerable quantity of data – a large portion of which is imported (or manually entered) from other Caltrans data sources such as APDS Data Collection, Traffic Data, Construction History Data, TSN Data, and other Caltrans data. However, the primary reason for importing or entering data is to be able to report this data or other data generated from it using the system in some form or another since only then does it really become valuable information.

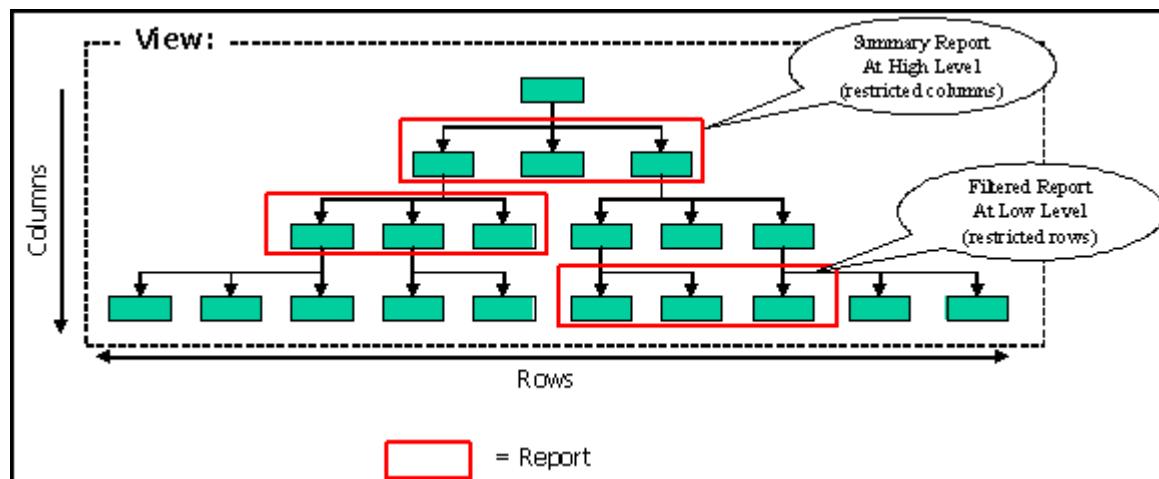
9.2 Report Source Data

Reports are based on what are called “views” (which are created by your System Administrator). These views are essentially various ways of organizing and relating the parameters and variables of the database system.

A report may be thought of as an excerpt of a particular view – certain columns of data are extracted from the view, sorted or filtered (or otherwise manipulated) as needed, and then formatted into a printable document. These kinds of reports may be tabular, or graphic as discussed below.

The important thing to remember when building reports is that a report should not be 1,000 pages long. If you wish to see specific information, you should try to query the database for just this information. If you follow the philosophy “I’ll get everything and find what I’m looking for once it gets here,” you will put a huge strain on the database (and response times will become very slow).

Focusing on what you really want to see can be done in two ways: either you can summarize your data by cutting down on the number of columns or you can set data filters so that you get fewer rows. As shown in the diagram below, for large views this may result in a number of different reports with different objectives: either high-level summary reports in which the columns are restricted or filtered detailed reports in which you restrict the rows (for instance to only a specific supervisor in your county).



9.3 Report Types

The Reports window provides commands for displaying lists of reports that exist for the selected module. This window provides extensive reporting capabilities. At the broadest level, it supports the following types of reports:

- ❖ Tabular reports – This type of ad-hoc report displays data (either detailed or aggregate) in rows and columns.
- ❖ Graph reports – This type of ad-hoc report displays data in a graphical format.
- ❖ GIS reports – This type of ad-hoc report displays data via a color-coded map.
- ❖ GIS Maps – This is a map composed of various layers assembled by a user.
- ❖ Jasper reports – This is a “canned” type of report built using open source software and then available for use within the Reports window.

This window organizes access to reports through a user-modifiable “folder” hierarchy that categorizes reports into:

- ❖ Private folders (folders containing reports that are available only to the creator of the report).
- ❖ Shared folders (folders containing reports that are available to those users that were provided access by the report’s creator).
- ❖ Public folders (folders containing reports that are available to all authorized users).

Reports are each created from a "view" of the database. These views are essentially various ways of organizing and relating the parameters and variables of the database, and serve as the basis for reports. A report may be thought of as an excerpt of a particular view – certain columns of data are extracted from the view, sorted or filtered (or otherwise manipulated) as needed, and then displayed on your computer. Any number of report views can be added to the system without software modification.

Note: Each module has its own set of reports and report views.

The image on the next page shows the reports window, which will look identical in each of the AgileAssets Pavement Analyst modules. The right pane shows the hierarchy structure of the categorized reports while the left pane shows the details relevant to the selected report within the system. The following image is a display of the window that can be accessed through the window: (System > Reports > Reports). Each module has a similar hierarchical structure to access this window.

Report	Report Type	Table Name
Tables and Comments-06.jrxml	Jasper	
Tables and Columns - Main.jrxml	Jasper	
List of System Jobs-24.jrxml	Jasper	
03 - List of Security Roles.jrxml	Jasper	
Security Roles and Access Definitions.jrxml	Jasper	
LN_Routes and Climate Regions	GIS Map	
Tables and Columns - Main.jrxml	Jasper	
Asset Types-05.jrxml	Jasper	
List of Users-1.jrxml	Jasper	
List of Security role and Users-3a.jrxml	Jasper	
Management Units-04.jrxml	Jasper	
List of Admin Units with assigned Users-04a.jrxml	Jasper	
GIS Themes-08.jrxml	Jasper	
Defined Finest Partitions-13.jrxml	Jasper	
PMS Columns Defined for Analysis-09.jrxml	Jasper	
Groovy Scripts by Type-10.jrxml	Jasper	
All Window with Associated menu and titles-12.jrxml	Jasper	
Defined Finest Partitions-13.jrxml	Jasper	
Defined Dynamic Segmentation-14.jrxml	Jasper	
List of System Defined Views and Comments-15.jrxml	Jasper	
Tables Views enabled for Reporting-16.jrxml	Jasper	
System Parameters-17.jrxml	Jasper	
List of Defined Columns-18.jrxml	Jasper	
System Menu Hierarchy-19.jrxml	Jasper	

9.4 Reports Management Window

When you click the Reports menu item, the application displays the Reports Management window as shown in the figure above. This window contains two panes: the Reports pane and the Report Details pane.

9.4.1 Reports Pane

The Reports pane shows a hierarchical structure that organizes the reports to which you have access. The principal divisions of this structure are: Public Reports, Shared Reports, and My Reports. These divisions are described more fully below:

- ❖ Public Reports -- This folder contains all reports that are shared amongst all users in your agency and for which you have sufficient security clearance. These reports are read-only. To modify a report for your own use, copy it to your My Reports folder by right-clicking the report and then clicking Copy Report. (Alternatively, you could display the configuration dialog box for the report [by using the right-click **Setup>Show Report** command, making the desired modifications, and then clicking the **Create Copy** button that is provided in the configuration dialog box.])

Note: The folder structure within the Public Reports folder as well as the names of the subfolders cannot be modified except by users with a security level of 5 - System Administrator or greater. (The names of public reports cannot be changed regardless of a user's security level.)

- ❖ Shared Reports -- This folder contains all reports shared specifically with you from another user and for which you have sufficient security clearance. The system inserts a subfolder in this folder for each user that shares a report with you. The shared report is then placed in this subfolder. Additionally, when the other user shares the report, he or she may select whether the report is read-only or may be edited.

Note 1: The security level of the report overrides the selection of read-only or read-write when sharing a report. For example, say a report is configured as read-only. If you then share this report and select read-write access, the shared report will still be read-only.

Note 2: The reports shown in the Shared Reports folder are not copies of the original report that a user shared. They are the original reports. This means that any changes you make to the report are reflected in the report shown in the My Reports folder of the user who shared the report (as well as any other users with which he or she shared the report).

Note 3: You cannot modify the folder structure within the Shared Reports folder nor can you edit the name of a folder or report. Also, even if a report was shared with read/write access, you cannot change the security level assigned to the report (as shown in the Right-to-See field).

My Reports -- This folder contains all reports to which only you have access. Tip: You may find it useful to create subfolders within this folder, one for each type of report (Standard, Graph, GIS, and/or Jasper).

9.4.2 Right-click Commands for Folders

When you right-click a folder, a shortcut menu is displayed. This menu shows the common commands along with the following special commands:

Insert Standard Report
Insert Graph Report
Insert GIS Map
Insert GIS Report
Insert Jasper Report
Insert Directory
Delete
Delete selected
Schedule report to be emailed
Find
Select This
Select All
Select Visible Items
Select Branches
Print...
Deselect This
Deselect All
Deselect Visible Items
Deselect Branches

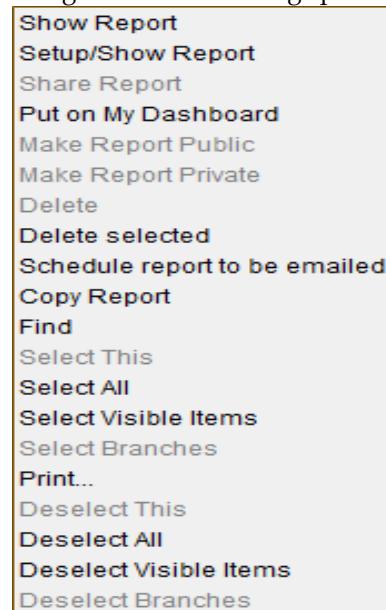
- ❖ **Insert Standard Report** -- This command is only available when you right-click the My Reports folder or one of its subfolders. It inserts a new Standard report within the folder you right-clicked.
- ❖ **Insert Graph Report** -- This command is only available when you right-click the My Reports folder or one of its subfolders. It inserts a new Graph report within the folder you right-clicked.
- ❖ **Insert GIS Report** -- This command is only available when you right-click the My Reports folder or one of its subfolders. It inserts a new GIS report within the folder you right-clicked.
- ❖ **Insert GIS Map** -- This command is only available when you right-click the My Reports folder or one of its subfolders. It inserts a new GIS map title within the folder you right-clicked.
- ❖ **Insert Jasper Report** -- This command is only available when you right-click the My Reports folder or one of its subfolders. It inserts a new Jasper Report within the folder you right-clicked
- ❖ **Insert Directory** -- This command is only available for the My Reports folder and its subfolders. (If you have sufficient authorization, it is also available for the Public folder and its subfolders. You cannot add folders to the Shared folder.) When available, this command inserts a new folder inside the folder you right-clicked. You may change the default name of the new folder by double-clicking the name and then typing the desired name.
- ❖ **Delete** -- This command is only available for folders that are empty (that is, that have no reports in them). When selected, it deletes the folder from the My Reports hierarchy.
- ❖ **Delete Selected** -- This command will only execute for folders that are empty. When selected, all folders that have a check mark in the square beside the folder name are deleted.
- ❖ **Schedule Report to be Emailed** -- This command allows you to send the selected report to other people as an email attachment. When you select this command, the system displays the Schedule Email window.

9.5 Displaying Existing Reports

In most cases, you will only need to view reports that have already been created. This section describes how to display the three types of reports.

9.5.1 Right-click Commands for Individual Tabular, Graph, and GIS Reports and GIS Maps

When you right-click a report name for a Standard, Graph, or GIS report (in other words, any report other than a Jasper Report), a shortcut menu is displayed. This menu shows the common commands along with the following special commands (The image below shows the possible right click options):

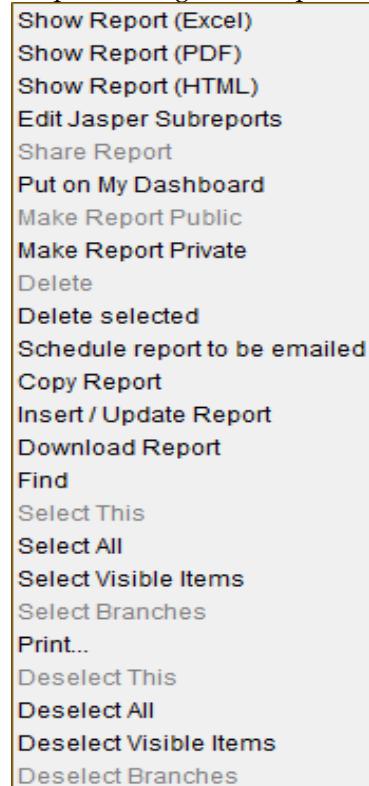


- ❖ **Show Report** -- This command is only available for Standard reports. It opens a new window and displays the report.
- ❖ **Setup>Show Report** -- This command displays the configuration dialog box for the report type of the report you right-clicked. For more information, click the link for a particular report type: GIS, Graph, or Standard. Other than Standard reports, you must display the configuration dialog box for a report to display the report.
- ❖ **Share Report** -- This command displays a dialog box so you may select the user or users with which you wish to share the report you right-clicked.
- ❖ **Put On My Dashboard** -- This command places the selected report on the dashboard. After selecting this command, a dialog box appears so you may select the quadrant in which the report will appear.
- ❖ **Make Report Public** -- This command is available for reports in your My Reports folder that are not currently public. When you select this command the system copies the report you right clicked to the Public folder. It may then be accessed by anyone in your agency.

- ❖ **Make Report Private** -- This command is only available for a report that you (that is, your User ID) made public. It removes the copy of the report from the Public folder. (It may be initiated from either the Public folder or your My Reports folder).
- ❖ **Delete** -- This command deletes the selected report from the My Reports hierarchy. (You cannot delete reports shown in the Shared or Public folders.)
- ❖ **Delete Selected** -- This command deletes all reports in the My Reports hierarchy that have a check mark in the square beside the report name. (You cannot delete reports shown in the Shared or Public folders.)
- ❖ **Copy Report** -- This command creates a copy of the report you right-clicked and places it in your My Reports hierarchy.

9.5.2 . Right-click Commands for Jasper Reports

When you right-click a report name for a JasperReport, the following special commands are added to the shortcut menu that is displayed by right-clicking the name of the JasperReport (The image below shows the possible right click options):



- ❖ **Show Report** -- This command is only available for Standard reports. It opens a new window and displays the report.
- ❖ **Setup/Show Report** -- This command displays the configuration dialog box for the report type of the report you right-clicked. For more information, click the link for a particular report type: GIS, Graph, or Standard. Other than Standard reports, you must display the configuration dialog box for a report to display the report.

- ❖ **Show Report (Excel)** – This command creates the report in a format readable by the Microsoft Excel application and, if this application is available, displays the report in Excel.
- ❖ **Show Report (HTML)** – This command opens a new browser window and displays the report.
- ❖ **Show Report (PDF)** – This command creates the report in a format readable by the Adobe Reader application and, if this application is available, displays the report.
- ❖ **Edit Jasper Subreports** – This command displays a new window that allows you to edit the subreports contained in the JasperReport you right-clicked.
- ❖ **Download Report** – This command starts a process to place the highlighted report on your computer. Once on your computer, you may use the appropriate JasperReports development tool (such as iReport) to modify the report template to suit your needs.

9.5.3 How to Display a Report

Each module has its own set of reports. For example, this means that there will be a different set of standard reports in the Roadway module than in the System module. For this tutorial, we will display a standard report from the Roadway module:

1. Navigate to the Reports window (Roadway > Reports > Reports). An example of this window is shown below.

Report	On Dashboard	Is Public	Shared	Comments
CH new equipment - today (filters yesterday)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Interfaces	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Basin Inventory	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Labor Interface Runs - Payroll Office	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Labor Daycard Exceptions - Payroll Office	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Dubois Equipment	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
CH new equipment - last week	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
CH new equipment - errors	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Utility Work Orders	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
State Engineer's Radio	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
General Equipment Inventory Report	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
CH fleet users	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Fleet work orders D3 Maintenance all crews	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
CH usage on equipment	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Road Equipment List	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
MATERIAL_INVENTORY_test	<input type="checkbox"/>	<input type="checkbox"/>		
▶ Test_Earlan	<input type="checkbox"/>	<input type="checkbox"/>		

This window shows existing reports and notes that are Public, Shared, or Private. (A checkmark in the Is Public column indicates that a report is available to all units.) This table also contains reports entitled "New Report from." These are templates for creating new reports from the table indicated in the Table Name column.

2. Point to the existing report you wish to view, right-click, and then click Show Report. The system opens a new browser window and then displays the selected report (using the most recent data from the database) in the new window.
3. Graph Reports, GIS Reports, and Jasper Reports are all available through this window using the same procedures. The column "Report Type" in the right pane will describe which kind of report was configured.

The screenshot shows the Agile Pavement Analyst software interface. On the left, there is a 'Reports - Tree View' sidebar with categories like Reports, My Reports, Public, Analytics, Dashboard Reports, KPIs, PaveM Reports, Pavement Deficiency Reports, Public Subdirectory_LN, Scenarios General, Testing, Functional Testing, and UAT Testing. Under 'UAT Testing', several reports are listed, including (R-03) Pavement History (GIS_CONSTR_HIST_LAYERS), (R-05) Distress Summary (GIS_PMS_CA_APCS_PROFILE), (R-07) Remaining Service Life (GIS_NETWORK_MASTER), (R-08) Condition Indices Summary (GIS_NETWORK_MASTER), (R-09) Construction History (GIS_CONSTRUCTION_HIST_VW), (R-09) Pavement Condition (GIS_NETWORK_MASTER), (R-09) Pavement Inventory (GIS_NETWORK_MASTER), (R-10) Treatment Recommendation (GIS_PMS_SCEN_ANALYSIS_WP_VIEW), (R-10) Condition-Percent Deficient (GIS_NETWORK_MASTER), (R-11) Funding Scenario Comparisons (RPT_DET_OPTIM_RESULTS), (R-12) Pavement Condition Attributes (GIS_NETWORK_MASTER), (R-13) Pavement Distress - Over time (GIS_NETWORK_MASTER), and (SR-02) Greenhouse Gas Report (PMS_ANALYSIS_SCENARIO_WP). On the right, there is a main pane titled 'Reports' showing a list of 61 rows. The columns are Report, Report Type, Table Name, and Public?. The 'Report Type' column highlights the different types of reports: Standard, Graph, GIS, and Jasper. A red box surrounds the 'Report Type' column header and the first few rows of the table.

Report	Report Type	Table Name	Public?
(SR-02) Greenhouse Gas Report (PMS_ANALYSIS_SCENARIO_WP)	Standard	PMS_ANALYSIS_SCENARIO_WP	✓
Spending Comparison - Preservation treatments	Graph	RPT_DET_OPTIM_RESULTS	✓
(M-02) Pavement Condition Report (GIS_PMS_CA_ATTRIBUTES)	GIS	GIS_PMS_CA_APCS_PROFILE	✓
(R-13) Pavement Distress - Over time (GIS_NETWORK_MASTER)	Graph	GIS_NETWORK_MASTER	✓
(R-09) Pavement Inventory (GIS_NETWORK_MASTER)	Graph	GIS_NETWORK_MASTER	✓
LN GIS Map	GIS Map		✓
KPI 1.jxml	Jasper		✓
(R-12) Pavement Condition Attributes (GIS_NETWORK_MASTER)	Graph	GIS_NETWORK_MASTER	✓
Scenario Performance Comparisons	Graph	RPT_DET_OPTIM_RESULTS	✓
Dashboard	Jasper		✓
LN Jasper Report - Adjustable_Panes.jxxml	Jasper		✓
Work Plan to Scenario Comparison	Jasper		✓
LN GIS Report - GIS_NETWORK_MASTER	GIS	GIS_NETWORK_MASTER	✓
(R-01) Pavement Inventory and Condition (GIS_NETWORK_MASTER)	Standard	GIS_NETWORK_MASTER	✓
(R-01) Construction History (GIS_CONSTRUCTION_HIST_VW)	Standard	GIS_CONSTRUCTION_HIST_VW	✓
(R-01) Treatment Recommendation (GIS_PMS_SCEN_ANALYSIS_WP)	Standard	GIS_PMS_SCEN_ANALYSIS_WP	✓
STIP Work Program Spending	Graph	GIS_PMS_MASTER_WP	✓
Number of Contracts to Be Approved	Standard	RPT_CONTRACT_DATA	✓
(O-07) Scenario Comparisons (RPT_DET_OPTIM_RESULTS)	Standard	RPT_DET_OPTIM_RESULTS	✓
(R-08) Condition Indices Summary (GIS_NETWORK_MASTER)	Standard	GIS_NETWORK_MASTER	✓
(R-03) Pavement History (GIS_CONSTR_HIST_LAYERS)	Standard	GIS_CONSTR_HIST_LAYERS	✓

9.6 How to Create a Report

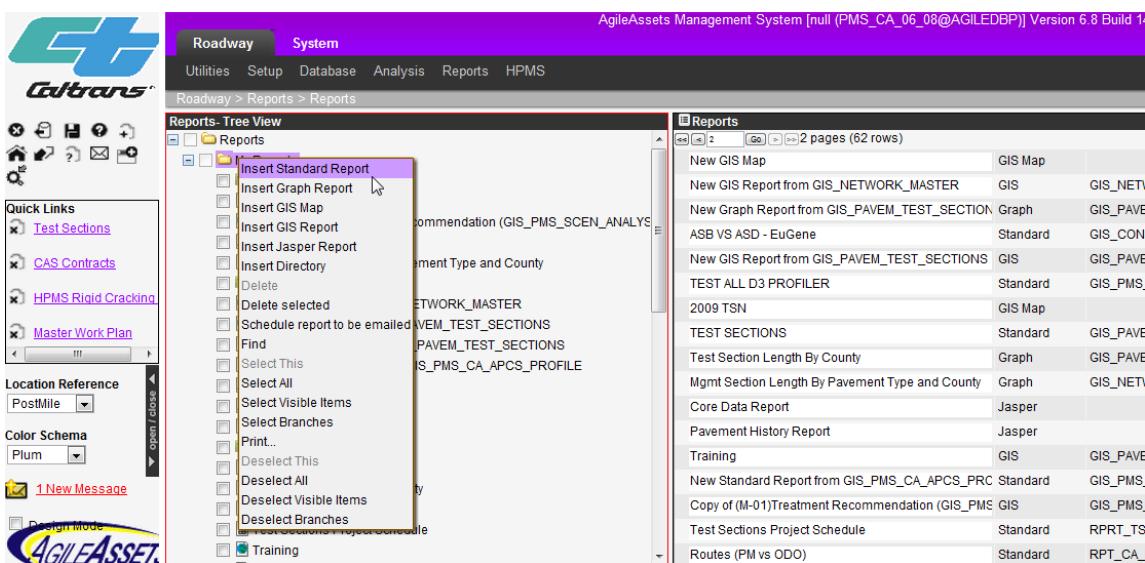
Reports are based on "views," which are various ways of relating the variables and parameters of the database. Some views are more conducive to one type of report than another, and so each type of report provides its own list of views. These appear in the Table Name column of each window.

The first, and most important, task in creating a report is to discover which view best presents the information you are seeking to report. Once you know this, you can select the view, manipulate the data as desired, and then display the new report. The following sections describe in more detail how you create each of the three types of reports.

9.6.1 How to Create a New Standard Report

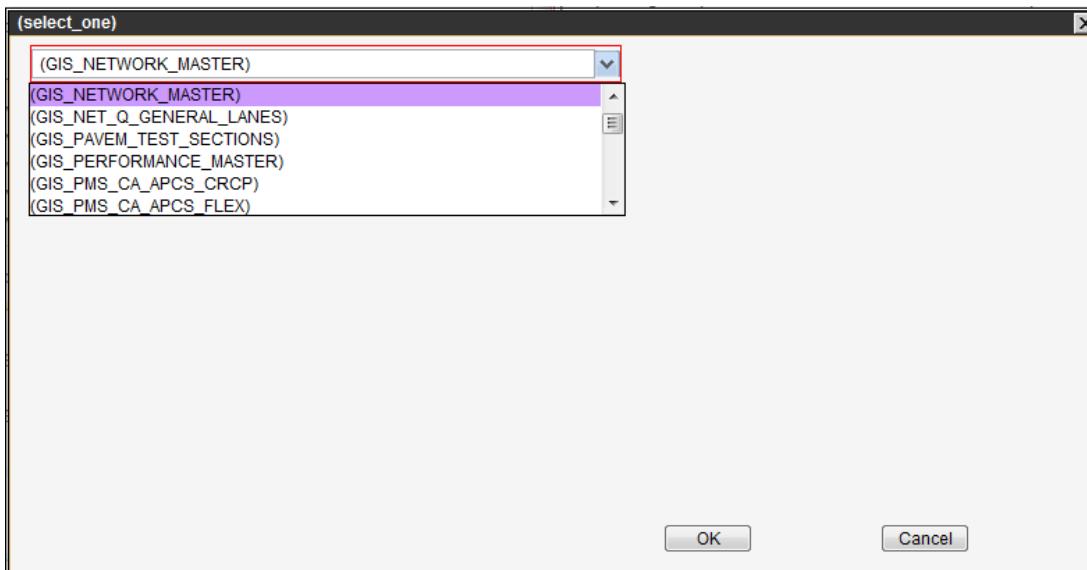
In this tutorial, we will create a new standard report in the Roadway module. Once you know the view that will serve as the basis of the report, follow these steps to create the report:

1. Navigate to the Roadway Reports window in the Roadway module (Roadway > Reports > Reports). An example of this window is shown below.
2. In the left-hand pane, right click on the My Reports folder then click Insert Standard Report.



A pop-up window will appear where you can select the table or view that the report will be generated from.

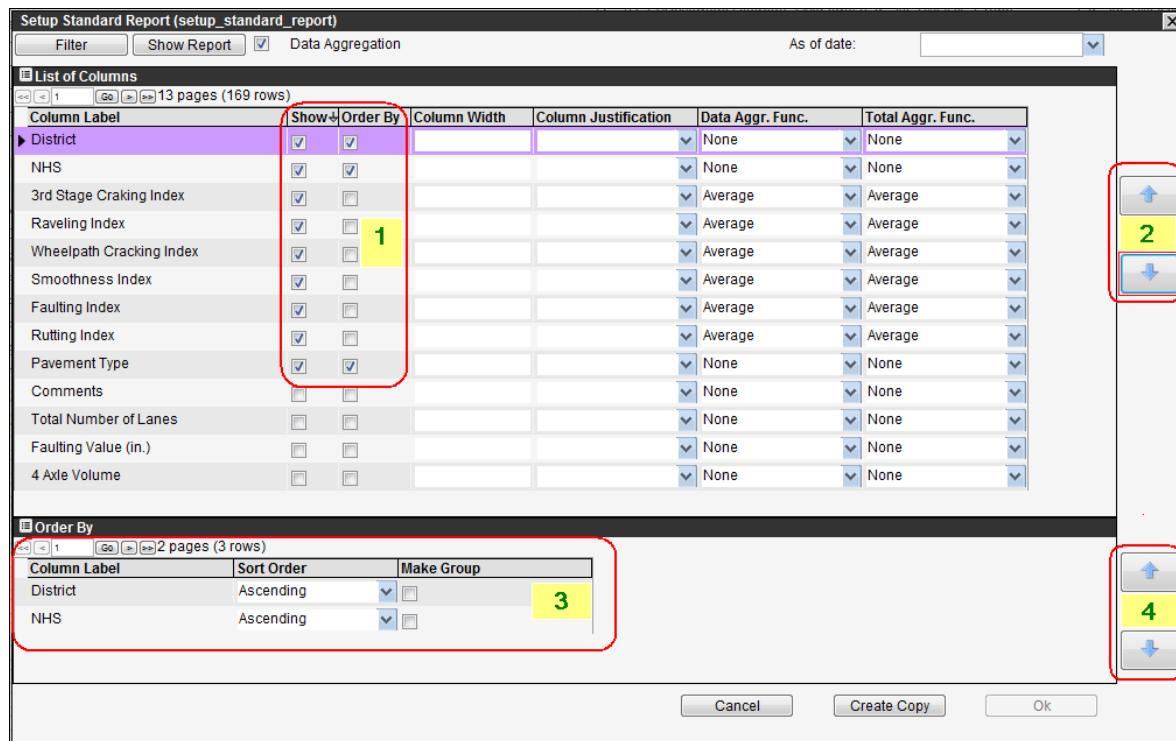
3. Select the desired table or view and click OK to add that report to the right-hand pane in the window.



4. The system highlights the selected row in both panes to show that it is selected. You may then give the report the desired name in either of these panes, or example in the Reports Tree View pane double-click on the name and change to the desired name.

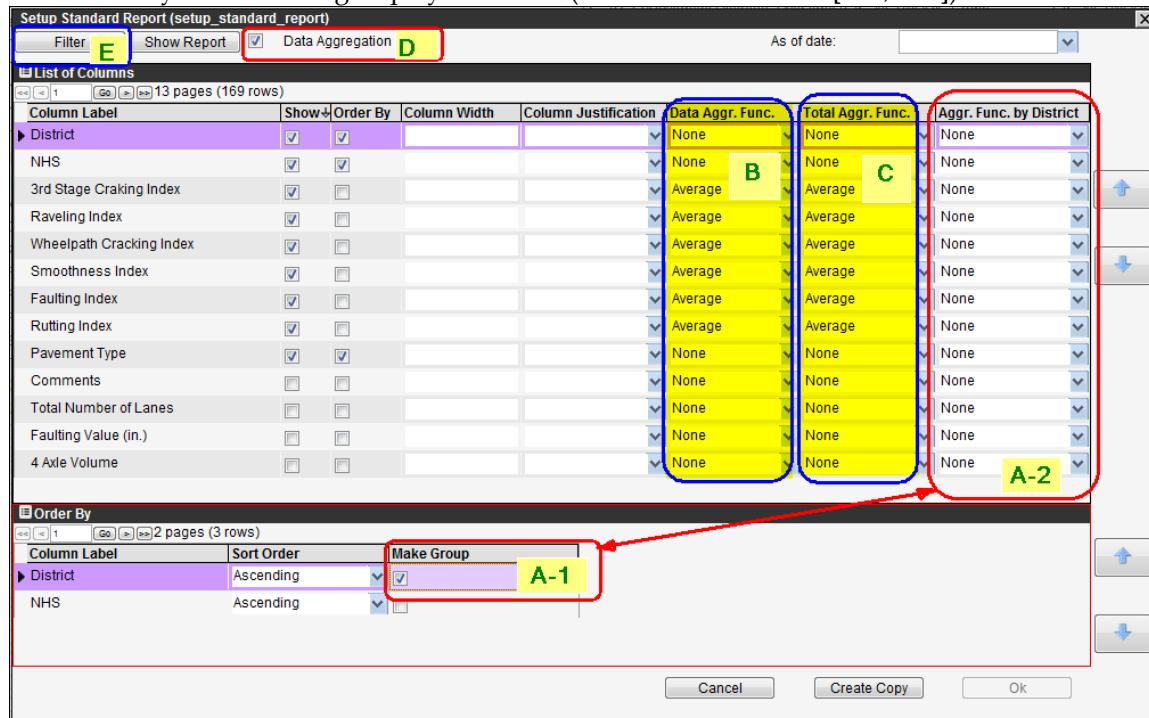
Name	Type	Status
New GIS Map	GIS Map	GIS_NETWORK
New GIS Report from GIS_NETWORK_MASTER	GIS	GIS_NETWORK
New Graph Report from GIS_PAVEM_TEST_SECTION	Graph	GIS_PAVEM
ASB VS ASD - EuGene	Standard	GIS_CONST
New GIS Report from GIS_PAVEM_TEST_SECTIONS	GIS	GIS_PAVEM
TEST ALL D3 PROFILER	Standard	GIS_PMS_C
2009 TSN	GIS Map	
TEST SECTIONS	Standard	GIS_PAVEM
Test Section Length By County	Graph	GIS_PAVEM
Mgmt Section Length By Pavement Type and County	Graph	GIS_NETWORK
Core Data Report	Jasper	
Pavement History Report	Jasper	
Training	GIS	GIS_PAVEM
New Standard Report from GIS_PMS_CA_APACS_PROFILE	Standard	GIS_PMS_C
Copy of (M-01)Treatment Recommendation (GIS_PMS_SCEN_ANALYSIS)	GIS	GIS_PMS_E
Test Sections Project Schedule	Standard	RPT_TST
Routes (PM vs ODO)	Standard	RPT_CA_R
report1.jxml	Jasper	
test	GIS Map	
TEST ALL D3 PROFILER		
Test Section Length By County		
TEST SECTIONS		
Test Sections Project Schedule		
Training		
New Standard Report from GIS_NETWORK_MASTER	Standard	GIS_NETWORK

5. Right click the report in the My Reports folder. Click the Setup/Show Report command. The system displays a pop-up window, which looks like the example below (the actual columns listed will differ depending on the selected table or view).



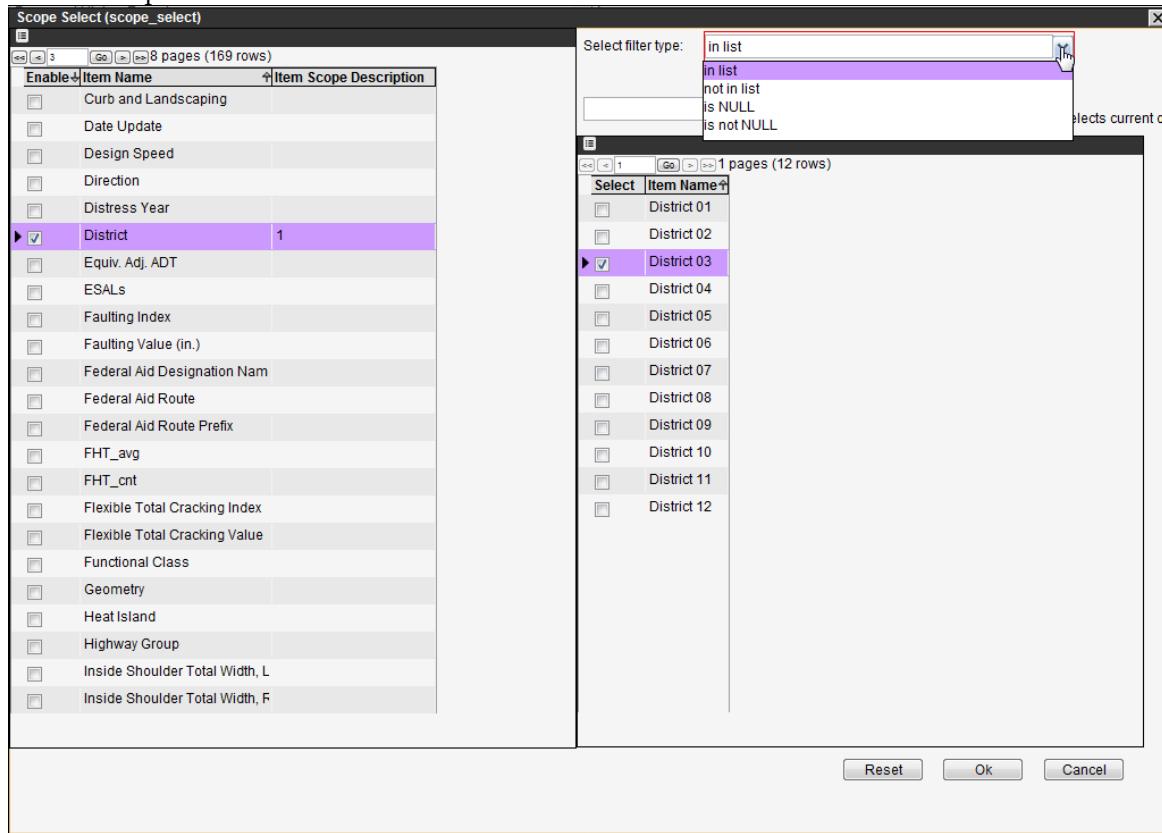
6. For the list of available fields shown in the Column Label column, select the ones that you would like to appear in the report by clicking the checkbox in the Show column for each desired field. A checkmark appears in each checkbox to denote that it is selected (see screenshot above [1]).
7. For the selected columns, decide on the order they should appear across the page. The field in the top-most row will be listed first (left-most column in report); the second selected row will be the next column (moving to the right); and so on. To change the order, click on a row to select it and then use the blue up or down arrows directly to the right of the pane (see screenshot above [2]) to move it to the desired position.
8. Optionally, select the columns by which the data will be ordered. For example, for a report on network master indices, you might select District, NHS and Pavement Type as three of the report columns. You could then have this report ordered by District, NHS and Pavement Type by clicking the checkbox in the Order By column for each column. When you select a column for ordering, it will appear in the lower pane (see screenshot above [3]).
9. When you select multiple columns for ordering, the lower pane allows you to select which column is the primary (first column to order by), which is the secondary, and so on. The column listed first (top-most) is the primary order; the next row down is the secondary order; and so on. You may change this order by clicking on a row and then using the green up or down arrows directly to the right of the pane to move it to the desired position (see screenshot above [4]).
10. In the lower pane is a column entitled Make Group. This column allows you to optionally summarize the column. When you click the checkbox, a new column is added to the upper pane to allow you to indicate what mathematical function will be used to summarize the numeric data.

When an aggregation type is selected, the report will "break" after the last row of the group and the aggregation value will be inserted beneath the column. This essentially allows you to insert "subtotals" into the report. Note that you do not need to select the Data Aggregation checkbox to aggregate data for a group (see screenshot below [D]). However, by selecting this checkbox, the application will automatically select numerical columns as columns to "aggregate by" columns and text-entry columns as "group by" columns (see screenshot below [A-1, A-2]).



11. In the upper pane, for columns showing numeric data, you may optionally aggregate the data by selecting an aggregation function from the drop-down list found in the Data Aggr. Func. Column. By using an aggregation function, database records are summarized into single instances for each non-numeric value (or combination) that is in the report. By default, the numeric values are summarized to a single value (Total). Note that the Data Aggregation checkbox is automatically selected when you select an aggregation function from the drop-down list (see screenshot above [B]).
12. Optionally, you may further summarize numeric data at the end of the report. This is accomplished by selecting an aggregation function from the drop-down list found in the Total Aggr. Func. column (see screenshot above [C]). When set to a value other than None, this column inserts a summary value for all records at the end of the report beneath the column being summarized. (You do not need to select the Data Aggregation checkbox to aggregate the total for a column.)

13. Optionally, you may restrict the data in the report by using the Filter button see (screenshot above [E]). For example, you could show particular Districts rather than all Districts by using this button. After clicking the button, the system displays the Filter dialog box, which appears similar to the example shown below.



The left side of the Filter dialog box lists all columns in the table or view. The right side shows the data that is available for the column selected in the left pane. To filter a column, select the column in the left pane. Then, in the right pane, select the filter type from the dropdown list. The right-pane will then populate with data. Here, select the values to filter by (i.e. those items that you would like to appear in the report). (If the right pane shows a hierarchy of possible select options, point to the desired item, right-click, and then click the appropriate selection command from the shortcut menu that is displayed. If a list is shown, click on each item – or use SHIFT+CLICK to select multiple, adjacent items or CTRL+CLICK to select multiple, non-adjacent items.)

After the scoping process is complete, click OK to close the Filter dialog box.

14. You have now configured all the parameters for the report. To display the report, click the Show Report button. The system opens a new window and displays your report.
15. Examine the report to see if it displays the information properly. Since the report is in a separate window, you may simply click the other browser window (the one showing the Standard Reports window) to activate it and then make the desired changes. When you again click the Show Report button, the report is updated in its browser window. In this way, you can alternate between the two windows to "fine tune" the look of the report.
16. When the report is as desired, overwrite the text in the Report Name field with the name of the report. Then right-click and click Save Report from the shortcut menu that is displayed.

The report is now created. Note that you may modify a report in a similar way as you create a report. You select the report to be modified in the Reports tab and then right-click and choose Copy Report. The report has now been copied and saved under the "My Reports" folder as a private report.

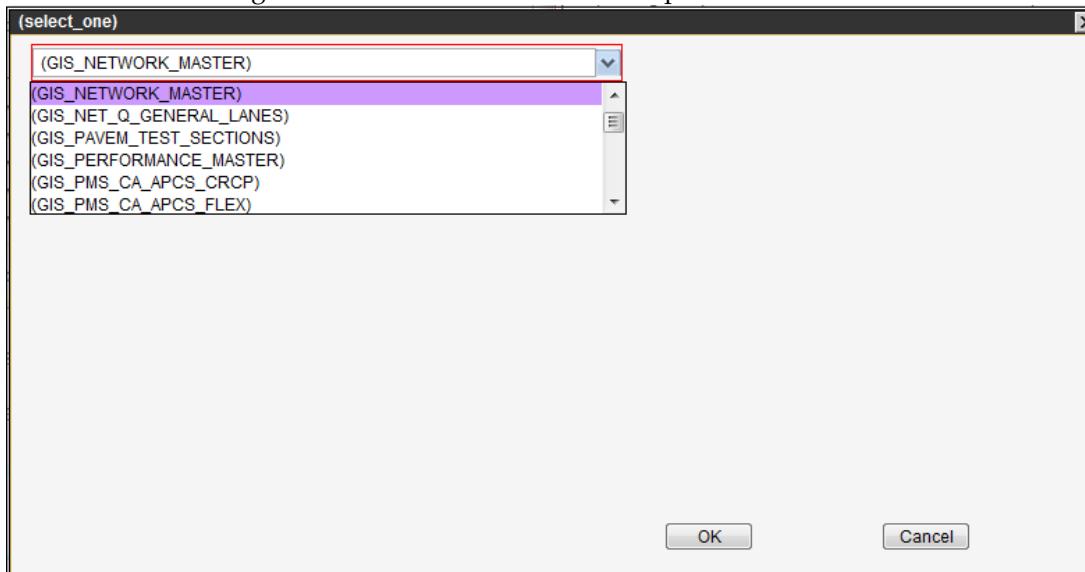
NOTE: to change the name of one of your reports, simply double left-click on the report name in the Reports tab. This allows you to directly edit the Title. You can only edit the titles of your own reports.

If you wish to print the report, use the browser print command (File > Print). If the report needs further formatting before printing, press CTRL+A to select the entire report, press CTRL+C to copy it to the clipboard, and then paste it into Microsoft Word or Microsoft Excel (components of the Microsoft Office Suite Software). You may then format it as desired using the features of MS Office, and then print it.

9.6.2 How to Create a New Graph Report

Each module contains its own set of reports. In this tutorial, we will create a new graph report in the Roadway module. Once you know the view that will serve as the basis of the report, follow these steps to create the report:

1. Navigate to the Reports window (Roadway > Reports > Reports). In the right hand pane, right click on the My Reports folder then click Insert Graph Report. This process is carried out just as done for a standard report.
2. In the pop-up window, find the name of the view that will serve as the basis of the report and then click the row showing this view. Click OK to add this report to the window.



3. The system highlights the selected row in both panes to show that it is selected. You may then give the report the desired name in either of these panes, or example in the Reports Tree View pane double-click on the name and change to the desired name.

The screenshot shows the software's main window with two main panes. The left pane, titled 'Reports - Tree View', displays a hierarchical list of reports. One item, 'Pavement Condition (GIS_NETWORK_MASTER)', is highlighted with a purple selection bar. The right pane, titled 'Reports', lists various reports with their names, types, and associated GIS layers. The same 'Pavement Condition (GIS_NETWORK_MASTER)' report is selected here, highlighted with a purple selection bar. Both panes have a toolbar at the top with icons for zooming and navigating.

4. Right click the report in the Reports pane. Click the Setup/Show Report command. The system displays a pop-up window, which looks like the example below (the actual columns listed will differ depending on the selected view).

The screenshot shows a 'Setup Graph Report' dialog box. It has tabs for 'Setup', 'Graph', and 'Data'. The 'Setup' tab is active. It includes a 'Filter' button and a dropdown 'As of date:' field. The main area contains a table with columns: Graph Type, Category, Values, Colored by, Cond/Distr/Weight by, Aggregation, Accumulation, Percent or Value, Present by, From Value, To Value, and Number of D. A dropdown menu in the 'Graph Type' column is open, showing options: General, Conditional, Distribution, Cumulative, and Summary. The 'General' option is selected. Below the table is a scrollable list of categories: District, Equiv. Adj. ADT, ESALs, Faulting Index, Faulting Value (in.), Federal Aid Designation Name, and Federal Aid Route. At the bottom are 'Cancel', 'Create Copy', and 'Ok' buttons.

5. In the Graph Type column, click the arrow to display the drop-down list and then click the type of graph you want to use. The following graph types are available:

- General – This graph type plots any X-axis variable against a user-defined summarization of a Y-axis value. This graph differs from the other graph types in that you can define how the Y axis is summarized.
- Conditional – This graph type displays values only if the values pass a specified criterion.
- Distribution – This graph type shows summarized values of one variable plotted against another variable. It is usually displayed as a bar chart.
- Cumulative – This type of graph is utilized for building frequency or probability density, or cumulative probability density functions, for selected variables.

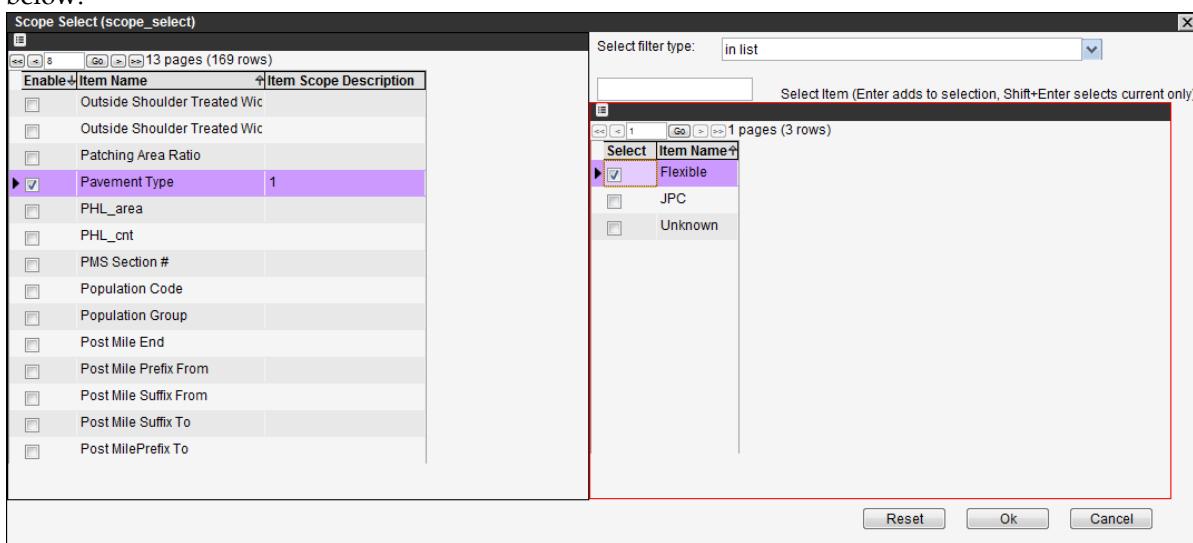
- Weighted Average – This type of graph plots any X-axis variable against a weighted average of a Y-axis value. This graph is similar to the General type of graph, with two exceptions: (1) the aggregation function is always "average"; and (2) it is a weighted average, not a simple average, and so needs a "weighting" variable.

When you select a graph type, the system modifies the columns in the table to support the type of graph selected.

6. Complete the remaining columns in the table as appropriate.

Graph Type	Category	Values	Colored by	Cond/Ditr/Weght by	Aggregation	Accumulation
General	District	IRI AVG	County		Average	

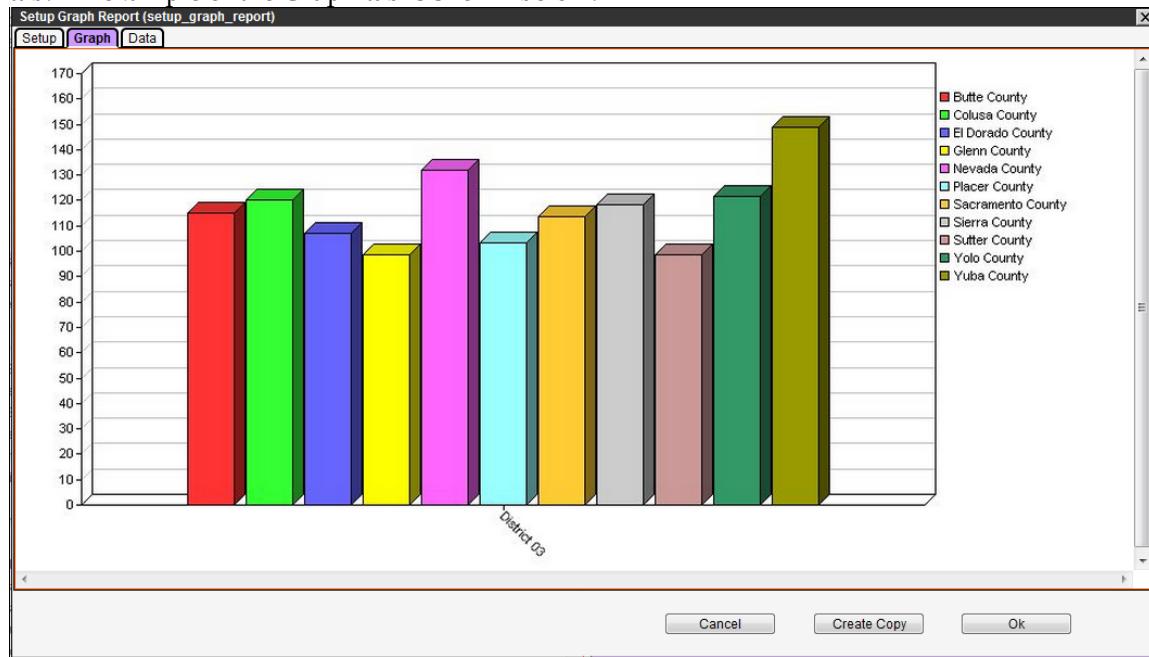
7. Optionally, you may restrict the data in the report by using the Filter button. For example, you could show particular radio sites rather than all radio sites by using this button. After clicking the button, the system displays the Filter dialog box, which appears similar to the example shown below.



The left side of the Filter dialog box lists all columns in the view. The right side shows the data that is available for the column selected in the left pane. To filter a column, select the checkbox that appears next to the name of the column. Then, in the right pane, select the items that you would like to appear in the report. (If the right pane shows a hierarchy of possible select options, point to the desired item, right-click, and then click the appropriate selection command from the shortcut menu that is displayed. If a list is shown, click on each item – or use SHIFT+CLICK to select multiple, adjacent items or CTRL+CLICK to select multiple, non-adjacent items).

After the scoping process is complete, click OK to close the Filter dialog box.

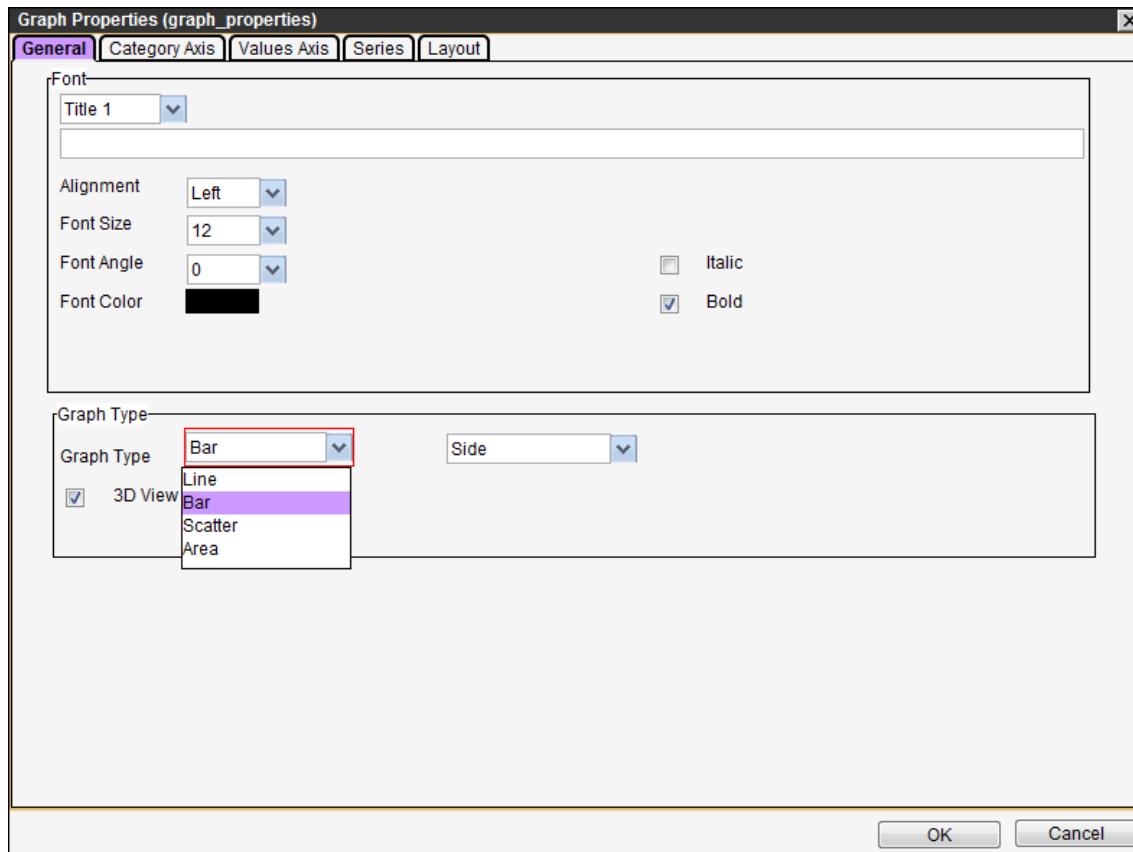
8. You have now configured all the parameters for the graph. To display the graph, click the Graph tab. An example of the Graph tab is shown below.



9. Optionally you may display the Data tab which shows the data used to building the graph.

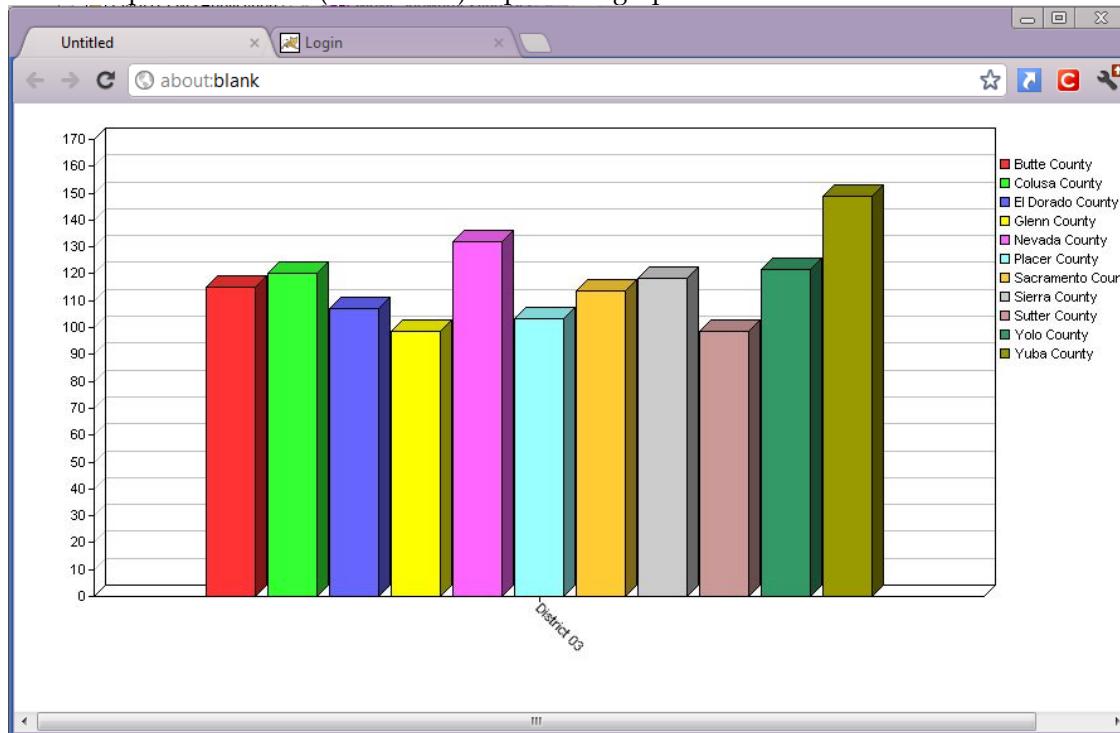
Butte County	115.02
Colusa County	120.11
El Dorado County	106.88
Glenn County	98.61
Nevada County	132.05
Placer County	103.3
Sacramento County	113.83
Sierra County	118.57
Sutter County	98.72
Yolo County	121.75
Yuba County	148.99

10. If you wish to modify the appearance of the graph, right-click on the graph and then click Change Graph Report Properties. The system displays a dialog box similar to the following, which you use to modify the appearance of the graph.



11. Make the desired changes and then click OK. The system closes the dialog box and re-draws the map utilizing the new parameters you specified.

12. If you wish to print the graph, right-click on the graph and then click Open in Browser. The system displays the graph (and only the graph) in a new window. You may then use the browser's print command (File > Print) to print the graph.



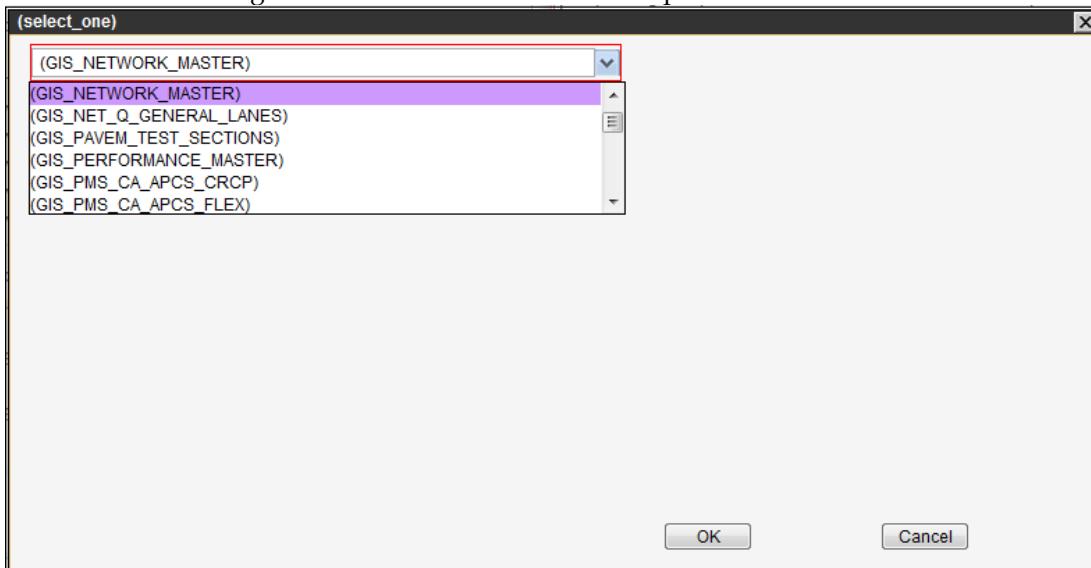
The graph report is now created. Note that you may modify a report in a similar way as you create a report. You select the report to be modified in the Reports tab and then right-click and choose Copy Report. The report has now been copied and saved under the "My Reports" folder as a private report.

9.6.3 How to Create a New GIS Report

Each module contains its own set of reports. In this tutorial, we will create a new GIS report in the Roadway module. Once you know the view that will serve as the basis of the report, follow these steps to create the report:

1. Navigate to the Reports window (Roadway > Reports > Reports). In the left hand pane, right click on the My Reports folder then click Insert GIS Report. This process is carried out just as done for a standard report.

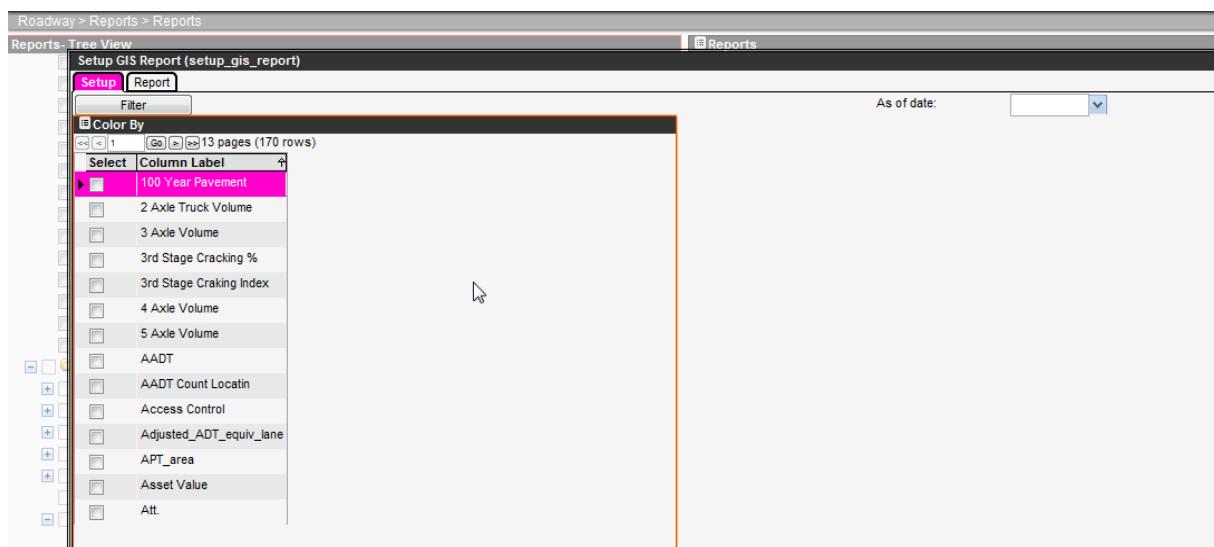
2. In the pop-up window, find the name of the view that will serve as the basis of the report and then click the row showing this view. Click OK to add this report to the window.



3. The system highlights the selected row in both panes to show that it is selected. You may then give the report the desired name in either of these panes. For example in the Reports Tree View pane double-click on the name and change to the desired name.

Report Name	Type	Status
LN GIS Report - GIS_NETWORK_MASTER	GIS	<input checked="" type="checkbox"/>
(R-01) Pavement Inventory and Condition (GIS_NETW	Standard	<input type="checkbox"/>
(R-01) Construction History (GIS_CONSTRUCTION_L	Standard	<input type="checkbox"/>
(R-01)Treatment Recommendation (GIS_PMS_SCEN	Standard	<input type="checkbox"/>
STIP Work Program Spending	Graph	<input type="checkbox"/>
Number of Contracts to Be Approved	Standard	<input type="checkbox"/>
(O-07)Scenario Comparisons(RPT_DET_OPTIM_RES	Standard	<input type="checkbox"/>
(R-08) Condition Indices Summary (GIS_NETWORK_I	Standard	<input type="checkbox"/>
(R-03) Pavement History (GIS_CONSTR_HIST_LAYER	Standard	<input type="checkbox"/>
LN Std Report - NETWORK_MASTER	Standard	<input type="checkbox"/>
(R-09) Pavement Condition (GIS_NETWORK_MASTER)	Graph	<input type="checkbox"/>
Pavement Condition (GIS_NETWORK_MASTER)	Graph	<input checked="" type="checkbox"/>
(R-10)Condition-Percent Deficient (GIS_NETWORK_N	Graph	<input type="checkbox"/>

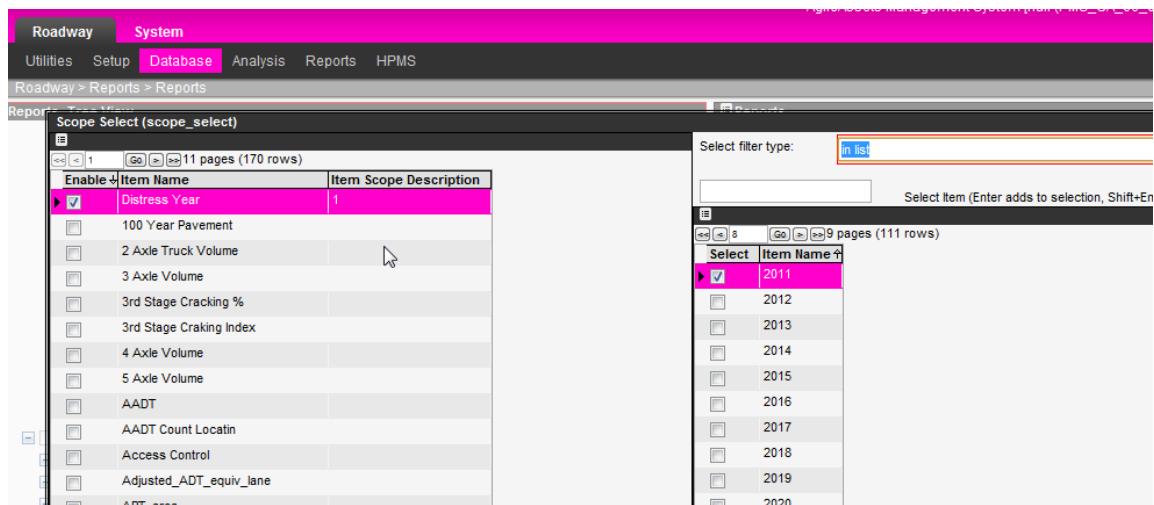
4. Right click the report in the Reports- Tree View pane. Click the Setup>Show Report command. The system displays a pop-up window, which looks like the example below (the actual columns listed will differ depending on the selected view).



5. Click the Filter button and filter the data. For example filter by Distress Year (2011) if the view selected was GIS_NETWORK_MASTER and click Ok button

The left side of the Filter dialog box lists all columns in the view. The right side shows the data that is available for the column selected in the left pane. To filter a column, select the checkbox that appears next to the name of the column. Then, in the right pane, select the items that you would like to appear in the report. (If the right pane shows a hierarchy of possible select options, point to the desired item, right-click, and then click the appropriate selection command from the shortcut menu that is displayed. If a list is shown, click on each item — or use SHIFT+CLICK to select multiple, adjacent items or CTRL+CLICK to select multiple, non-adjacent items).

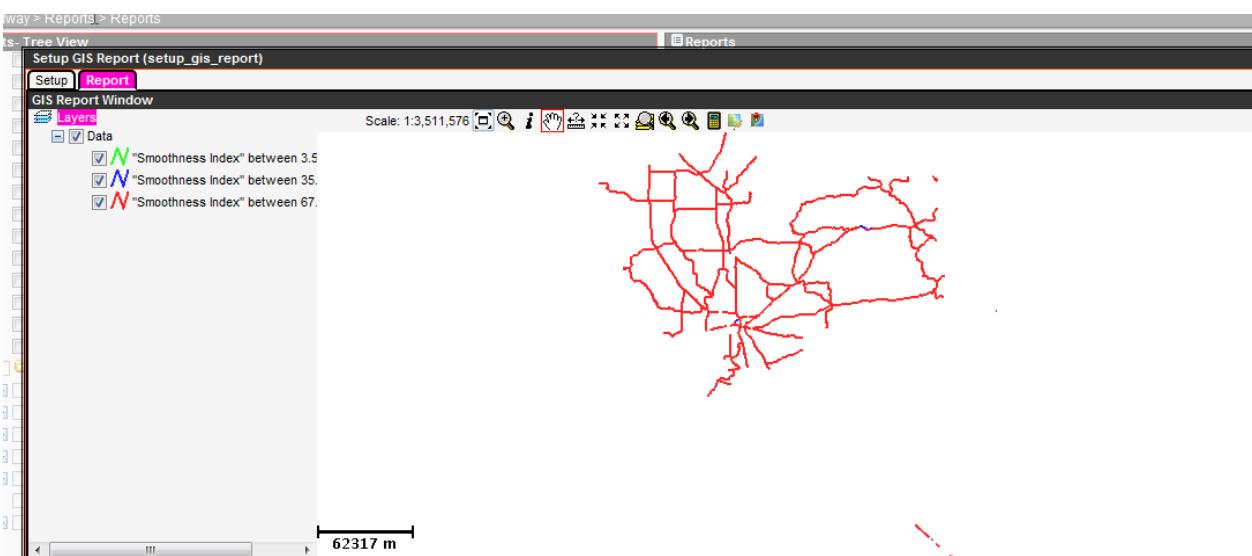
After the scoping process is complete, click OK to close the Filter dialog box.



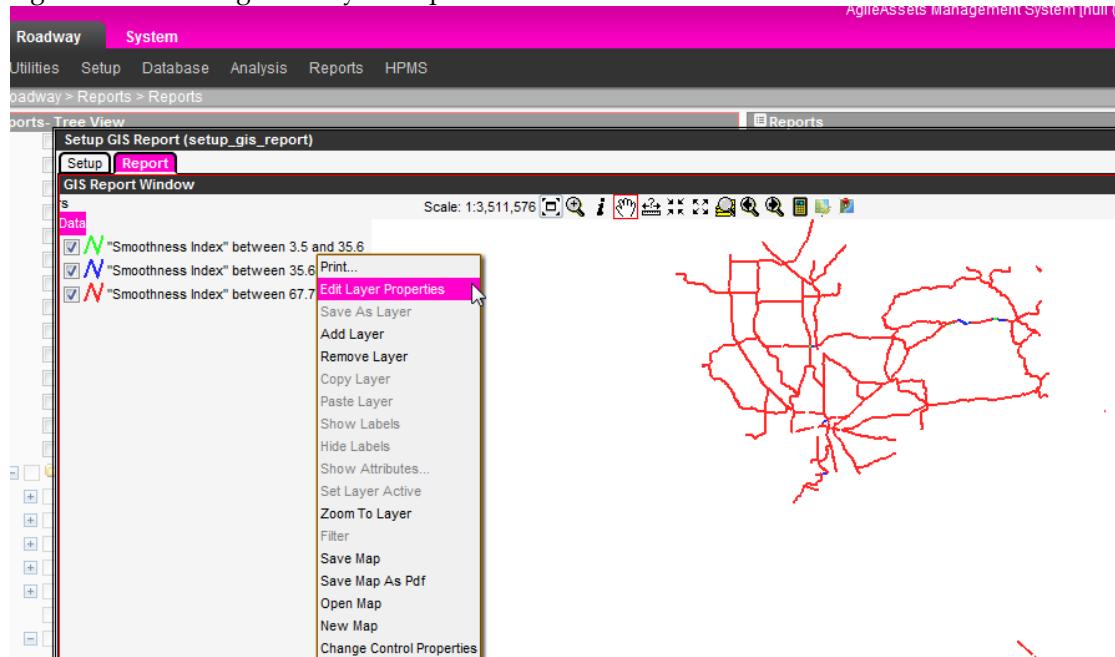
- Select one Color By Column (Select Smoothness Index for example if GIS_NETWORK_MASTER view was selected)



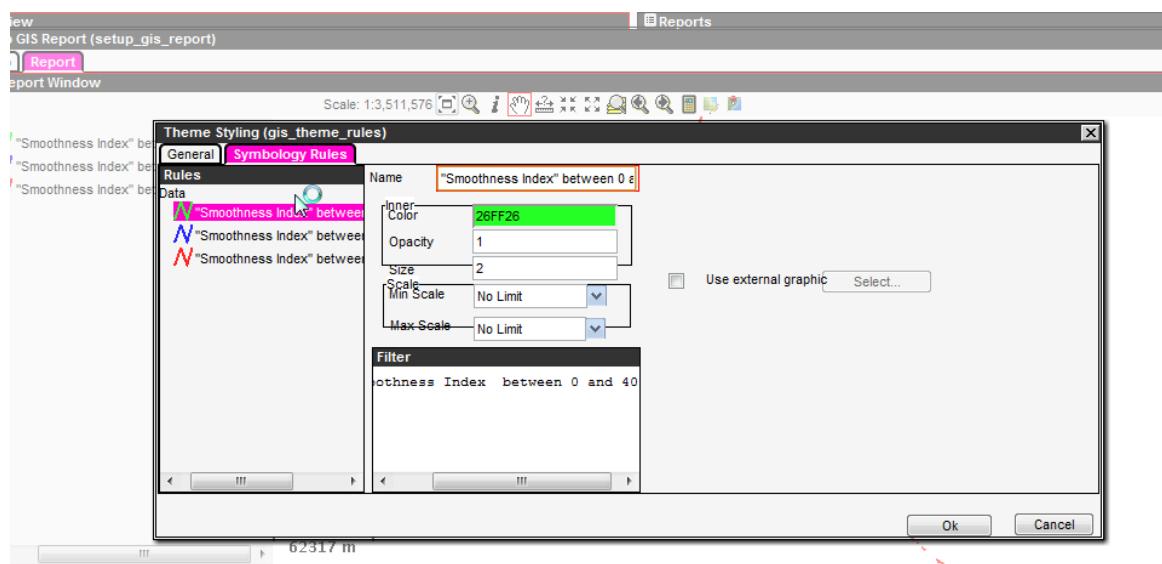
- Click on the Report Tab. GIS Map is displayed



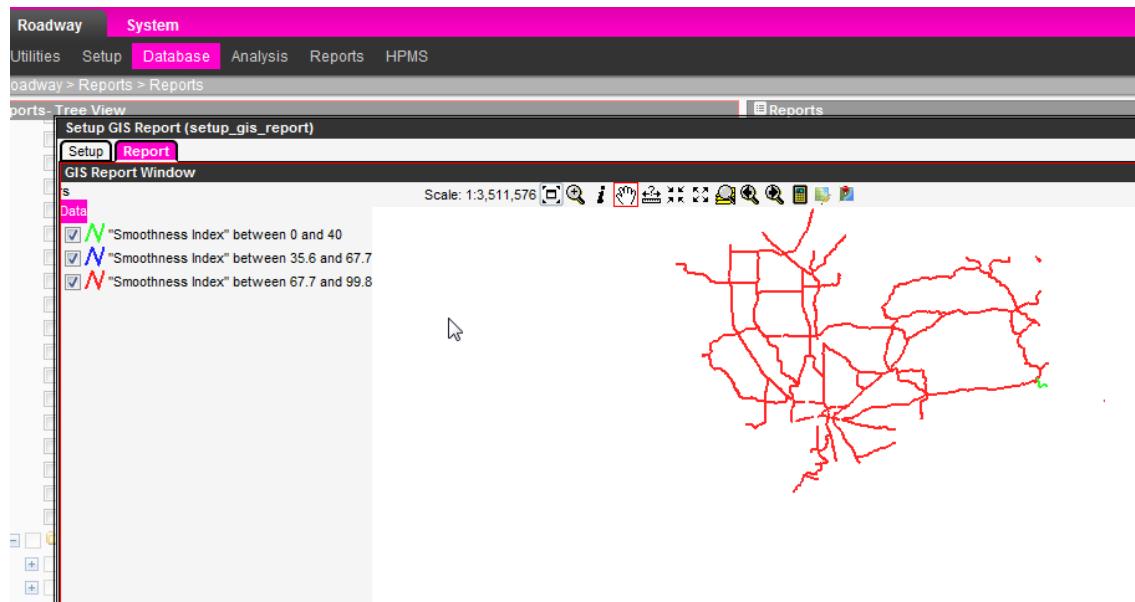
8. Optionally one can edit the default ranges of the feature displayed by right clicking on the legend and selecting Edit Layer Properties



9. The system displays a dialog box similar to the following, which you use to modify the appearance of the map. Select the Symbology Rules tab and click on the legend which you would like to change. Change the range and Name as desired. One can change the color property of the feature also as desired by clicking the Color column



10. Make the desired changes and then click OK. The system closes the dialog box and re-draws the map utilizing the new parameters you specified. In the following picture the range has been changed to 0-40 from the system generated default one



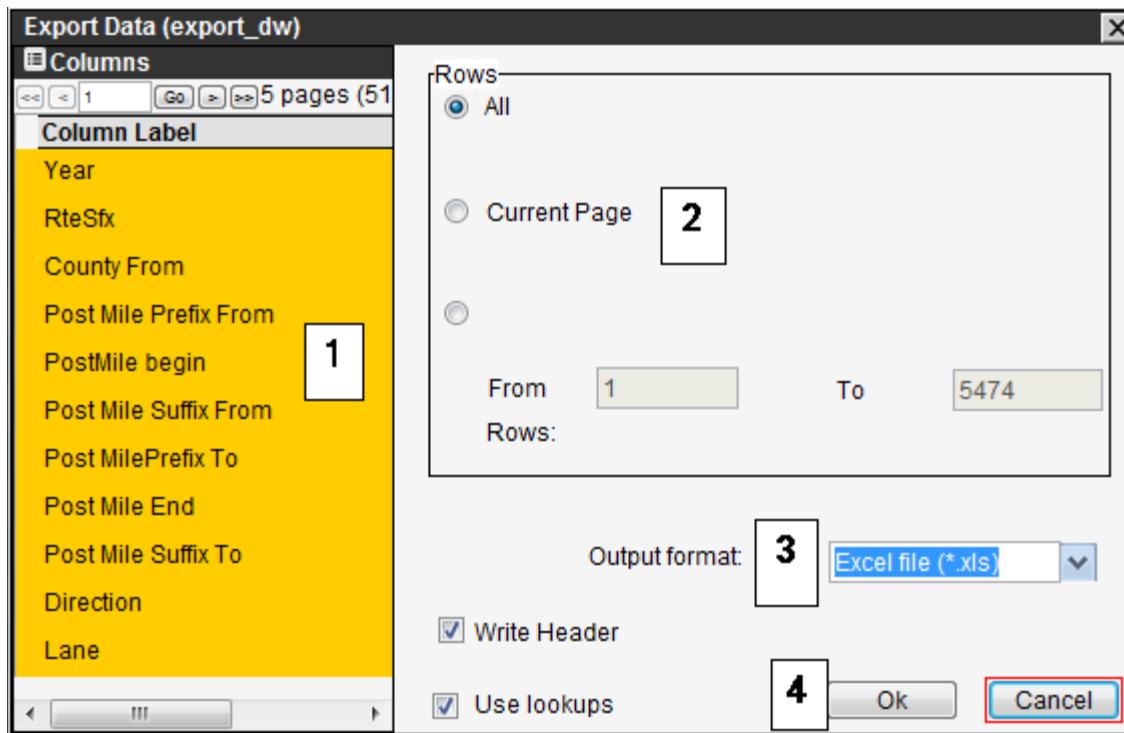
11. The GIS report is now created. Note that you may modify a report in a similar way as you create a report. You select the report to be modified in the Reports tab and then right-click and choose Copy Report. The report has now been copied and saved under the "My Reports" folder as a private report.

Exporting Data

The data shown in Standard and Graph reports may be exported to an external file. You may also use similar techniques to export data from tables shown in windows and panes. This section describes how to save data from a report or window to a separate file.

To prepare for exporting data, you need to display a data table in its own window. The means for doing this are described below:

- ❖ Standard reports — standard reports are displayed in a separate browser window once the right-click Show Report command is selected, so no preparation beyond displaying the report is needed.
- ❖ Graph reports — select the desired graph in the Reports pane and then right-click and choose Setup/Show Report to display the data table that underlies the graph. Then point to the table, right-click, and click Open in Browser. This command displays the graph data in a new window, and it is now ready to be exported.
- ❖ Data in a table in a window or pane — after displaying the window that shows the desired data table, point to the table, right-click, and click Export Data. This command displays the a new window where the user can select the data criteria, as shown below:

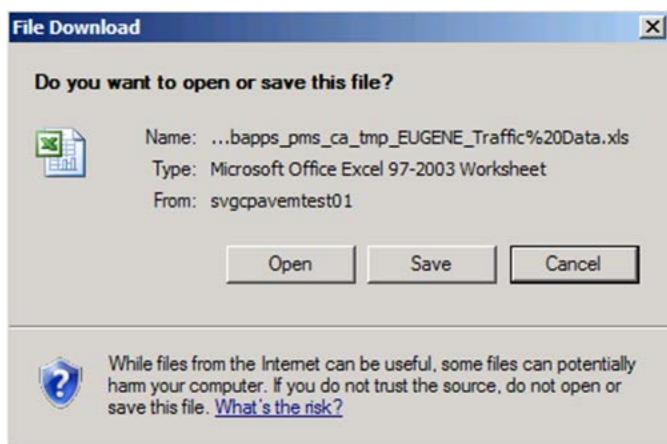


1. In the columns pane, select all the columns you want to export (by default, all the columns are selected) by clicking on the columns you want (hold CTRL for multiple selection, or select the first one and hold SHIFT and click on the last one to select successive columns).
2. In the Rows pane, select what you want to export:

- If you want to export all the data in the pane, select All.
 - If you want to export only the current page of data, select Current Pane.
 - If you want to select a range of rows, select Rows and precise the "From" and "To" values.
3. Select your output format (Excel, Comma Separated or HTML).
 4. Click on OK.
 5. You may now save the file to the desired location and manipulate the data as desired using Microsoft Excel or a similar program.

The steps for saving are a function of your browser as well as your browser settings for handling downloaded files. If the file download dialog box comes up, click Save on the dialog box, and choose the necessary place to save the file.

Example using I.E.7 (Caltrans Standard Browser)

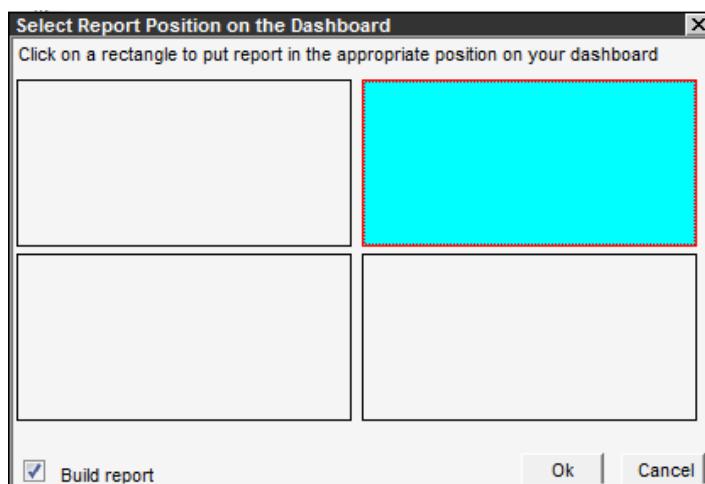


9.7 Dashboard

The “dashboard” is the window displayed when you sign into the system or access a module tab. Any report may be placed on the dashboard, which will hold up to four reports. The reports are reduced in size, but any report may be enlarged by double-clicking the title bar of the report.

To place a report on a module’s dashboard, follow these steps:

1. Navigate to the window that shows the name of the report that you wish to put on the dashboard.
2. Right-click the name of the desired report and then click Put on My Dashboard. The system displays a dialog box so you may select where on the dashboard the report should appear. An example of this dialog box is shown below.



Note: In this example the dashboard already contains one report in the upper left quadrant. If you select this quadrant, the existing report will be removed from the dashboard and the new report inserted in its place.

3. Click the quadrant in which the report will be displayed. The system highlights the quadrant to show that it is selected.
4. Unless the report contains a large amount of information and will take a long time to generate, leave the Build Report check box selected. (Clearing the check box will cause the report to not appear on the dashboard immediately; instead, it will be generated and placed on the dashboard when the system job "Build Dashboard Reports" is run. Typically, this job is run each evening when more time is available for generating reports.)
5. Click OK to close the dialog box. The report will now appear on the module’s dashboard. Shown below is a typical dashboard with reports.

District	NH3	3rd Stage Craking Index	Raveling Index	Wheelpath Cracking Index	Smoothness Index	Faulting Index
District 02	<input type="checkbox"/>			90	100.0	
District 02	<input checked="" type="checkbox"/>					
District 03	<input type="checkbox"/>			69	88.3	91.5
District 03	<input type="checkbox"/>	96.0				91.0
District 03	<input type="checkbox"/>			89	82.8	77.2
District 03	<input checked="" type="checkbox"/>			59	94.3	95.0
District 03	<input checked="" type="checkbox"/>	92.8	100		100.0	90.5
District 03	<input checked="" type="checkbox"/>			75	91.9	85.3
				Average for all: 94.4	Average for all: 80	Average for all: 92.9
						Average for all: 88.4
						Average for all: 9

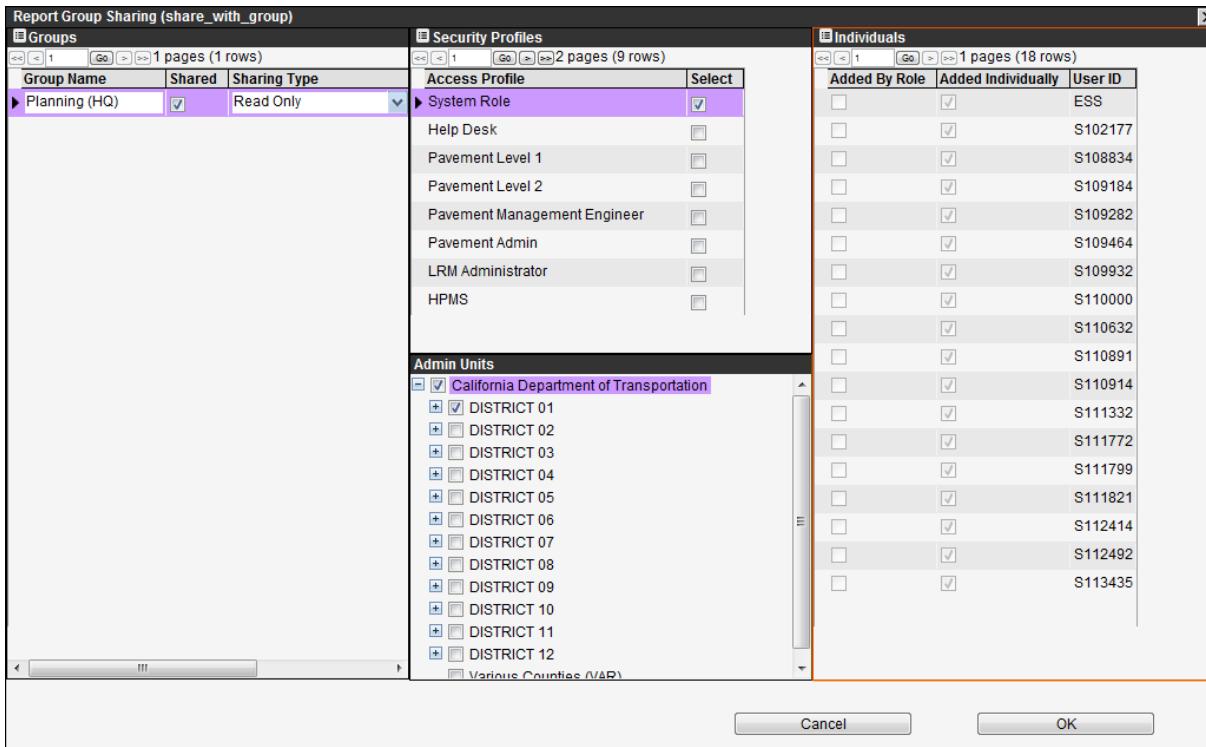
The dashboard also provides two commands that are found on the shortcut menu that is displayed by right-clicking a displayed report. The commands are:

- ❖ Delete Report – This command removes the report from the dashboard.
- ❖ Refresh Report – This command re-generates the report with the most current data in the database. Only this command or the system job “Build Dashboard Reports” will refresh the data in a report shown here.

9.8 Report Sharing

9.8.1 Share Report Window

The Share Report window is displayed by right-clicking one of your own reports in the left pane and then clicking Share Report on the shortcut menu. This window shows all share groups that you have configured and allows you to configure with whom you share a report.



A report is shared by assigning a Sharing Type to one or more "share groups." A share group is a collection of users that are defined by a common security profile and/or administrative unit. (The application also provides the ability to add individual users that are not included, but should be, by specifying security profiles and/or administrative units.) Each user has the ability to set preferred share groups. The procedure for creating share groups and how to use share groups to share a report with certain users will be explained later in this tutorial.

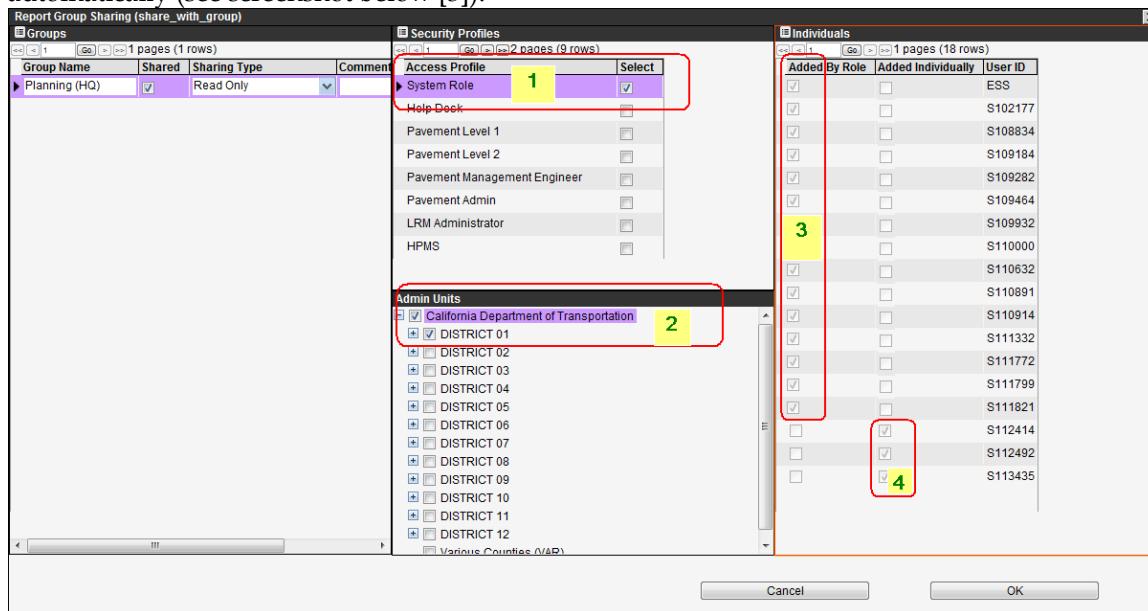
The left pane (Groups) shows your share groups. For the share group selected in the Groups pane, the middle two panes (Security Profiles and Administrative Units) show the security profiles and administrative units included for the selected share group. The pane on the right side (Individuals) shows the users that are included in this share group. Users are automatically added to this pane by the selection of security profiles and/or administrative units. Additionally, individual users may be added manually and these users are indicated by a check mark in the Added Individually check box.

9.8.2 How to Create a Share Group

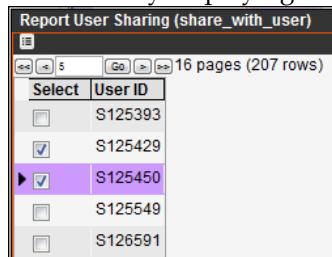
Note: Do not assign a Sharing Type when creating a share group. Assigning a Sharing Type causes the report to be shared.

A share group determines which users have access to a report. To create a share group, perform the following steps:

1. Display the Share Report window by right-clicking a report in the My Reports section of the hierarchy in the left pane and then clicking Share Report.
2. In the Groups pane (see screenshot on previous page, left pane) of the Share Report window, right-click and then click Insert. The system adds a new record to the pane.
3. In the new record, provide a name for the group by entering it in the Group Name column.
4. Leave the Sharing Type column blank.
5. If you would like to include any additional information about the share group, enter that information in the Comments column.
6. Specify what users are in this share group. This is accomplished by selecting one or more security profiles (or none) as well as one or more administrative units (or none) ((see screenshot below [1] and [2] respectively). As you select a security profile and/or administrative unit, the system adds the users with the selected security profile and access to selected administrative units automatically (see screenshot below [3]).



7. If users are not shown in the Individuals pane that should be, you may add them directly by right-clicking the Individuals pane and then clicking Insert. The system responds to this command by displaying a list of all users in a new window.



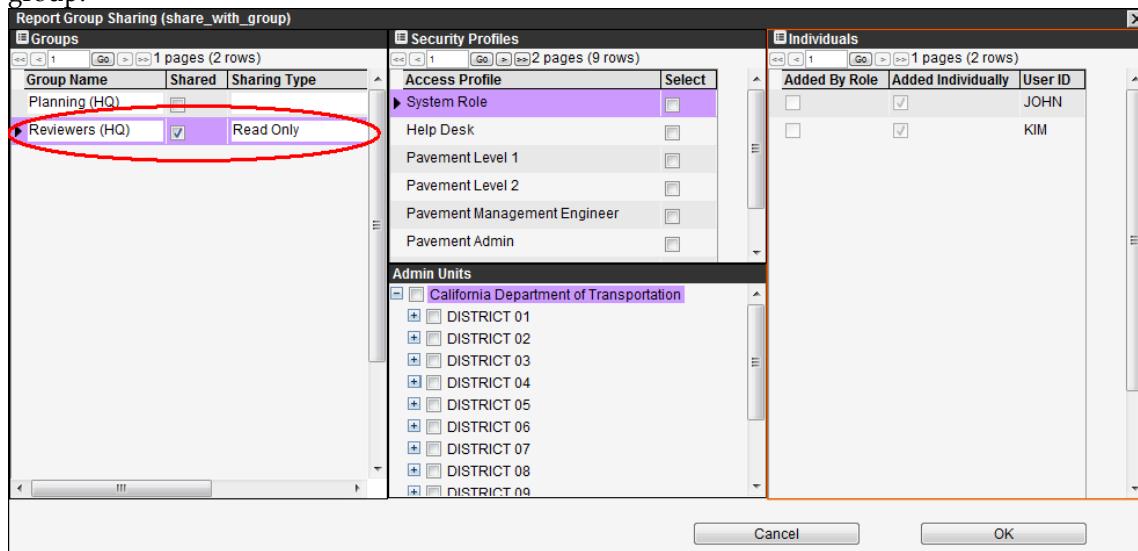
8. Click the check box for each user you would like to be included in the group and then click the OK button to close the window. The selected user(s) will then be shown in the Individuals pane of the window with the Added Individually check box checked (see screenshot above [4]).

9. If users are shown in the Individuals pane that should not be, right-click the record for the user and then click Delete. The system will then remove the user from the Individuals pane.
10. When the share group is fully configured, click the OK button to close the Share Report window.

9.8.3 How to Share a Report

To share a report with specific users, follow these steps:

1. Display the Reports Management window.
2. In the My Reports area of the report hierarchy, right-click the report you wish to share and then click Share Report. The system displays the Share Report window.
3. In the Groups pane, select with whom you wish to share the report by setting the Sharing Type column to the desired value (either read-only or read/write) for the appropriate share group. The system places a check mark in the Shared check box to denote that the report is shared with this group.

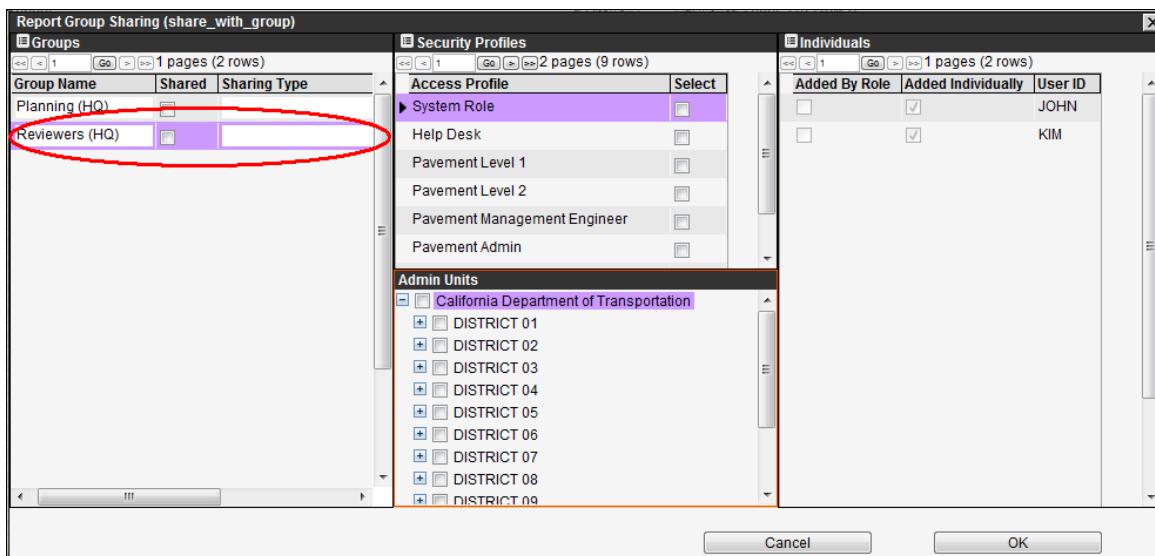


4. Repeat step 3 for any additional share groups.
5. Click the OK button. The shared report will now appear in the Shared folder of each user with which you shared the report.

9.8.4 How to Stop Sharing a Report

To discontinue sharing a report with a user (or users), follow these steps should be followed:

1. Display the Reports Management window.
2. In the My Reports area of the report hierarchy, right-click the report that you shared and then click Share Report. The system displays a dialog box.
3. In the dialog box, find the Group Name containing those users you no longer want to share the report. For the record showing this group name, click the value shown in the Sharing Type column to select it and then press the Delete key on the keyboard. The field is cleared.

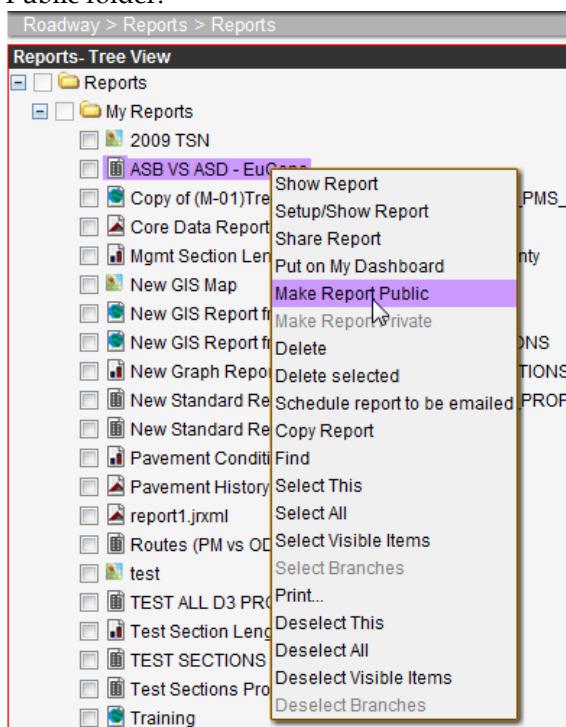


4. Repeat step 3 for any additional groups.
5. Click the OK button. The shared report will now be removed from the Shared folder of each user.

9.8.5 How to Make a Report Public

To make a report public (that is, available to all Caltrans users), follow these steps:

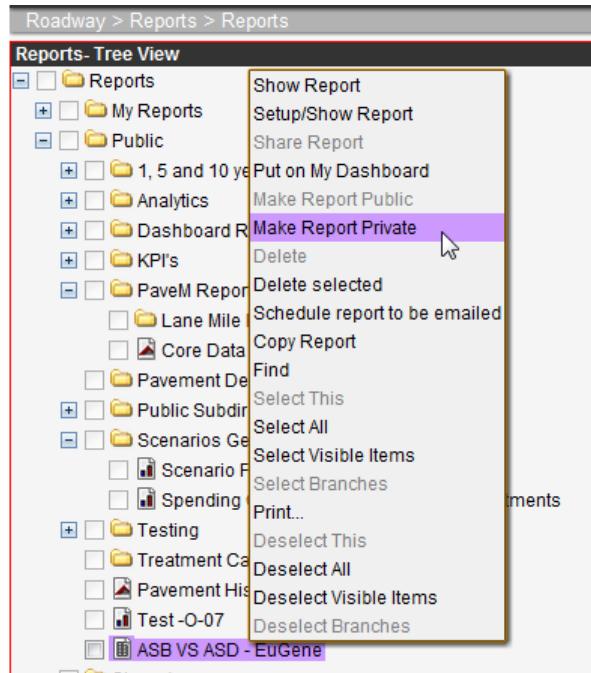
1. Display the Reports Management window.
2. In the My Reports area of the report hierarchy, right-click the report you wish to make public and then click Make Report Public. The system places a copy of the report you right-clicked in the Public folder.



9.8.6 How to Make a Report Private

To remove a report from the public area, you must be the user that initially made the report public. Provided you are this user, you may make the report private from either the Public folder or your My Reports folder. To make a report private again, follow these steps:

1. Display the Reports Management window.
2. In either the Public or My Reports area of the report hierarchy, right-click the report you wish to make private and then click Make Report Private. The system removes the copy of the report shown in the Public folder.



9.8.7 PaveM Reports/Views Lists

The tables below contain lists of reports/views available in the PaveM system. These lists are expected to continue to group as additional reports/views are added as needs are identified.

Caltrans PaveM Tabular/GIS /Graph Report Views/Tables Available for Reporting

REPORT TABLE / VIEW NAME	DESCRIPTION	MODULE
GIS_CONSTRUCTION_HIST_VW	Construction History Data	System
GIS_CONSTRUCTION_HIST_VW	Construction History Data	Roadway
GIS_CONSTR_ASB_VS_ASD	Report comparing As Built construction history with As Design construction history	Roadway
GIS_CONSTR_HIST_LAYERS	Construction History Layer Data	Roadway
GIS_NETWORK_MASTER	Network Master File Data	Roadway
GIS_NET_Q_GENERAL_LANES	Road Segments Number of Lanes	Roadway
GIS_PAVEM_TEST_SECTIONS	PaveM Test Sections / Research Projects	Roadway
GIS_PERFORMANCE_MASTER	Performance Master File Data	Roadway
GIS_PMS_CA_APACS_CRCP	APCS CRPC Data	Roadway
GIS_PMS_CA_APACS_FLEX	Flexible APCS Data	Roadway

GIS_PMS_CA_APACS_JPCP	APCS JPCP Data	Roadway
GIS_PMS_CA_APACS_PROFILE	APCS Profile	System
GIS_PMS_CA_APACS_PROFILE	APCS Profile	Roadway
GIS_PMS_CA_CORE	Detailed Core Data	Roadway
GIS_PMS_CA_GPR	Detailed GPR Data	Roadway
GIS_PMS_CA_HPMS_COUPLETS	HPMS Couplets	Roadway
GIS_PMS_CA_NHS	Caltrans NHS Sections	Roadway
GIS_PMS_CA_OTM_TASAS_HIGHWAYS	TSN Highways Log	Roadway
GIS_PMS_CA_PMIB_IRI	PMIB IRI Data	Roadway
GIS_PMS_CA_PMIB_MSL	PMIB MSL Data	Roadway
GIS_PMS_CA_PMIB_RT1A	PMIB RT1A Data	Roadway
GIS_PMS_CA_PONTIS_BRIDGES	PONTIS Bridge Data	Roadway
GIS_PMS_CA_PRSM	PRSM Data	Roadway
GIS_PMS_CA_TRAFFIC	Traffic Data	Roadway
GIS_PMS_MASTER_WP	Master Work Plan Data	Roadway
GIS_PMS_SCEN_ANALYSIS_WP_VIEW	Scenario Analysis Recommended Work Plans	Roadway
GIS_P_CULVERT_INVENTORY	Culverts Data	Roadway
GIS_P_CULVERT_SYS_INVENTORY	Culverts System Data	Roadway
IMPORT_CONFIG_LOG	Data Imports Configured in the PaveM System	System
NETWORK_MASTER	Network Master File Data	Roadway
PERFORMANCE_MASTER	Performance Master File Data	Roadway
PMS_NO_LOC_CONTRACTS	List of Construction History Contracts without Location data	Roadway
PMS_TCPLAN_NO_LOC	Construction History (contract descriptive data)	Roadway
REPORT_SYSTEM_AUDIT	Audit reporting view for fields marked for auditing by system administrator.	System
REPORT_VIEWS	Detailed data on all the columns used in all views in the PaveM system	System
RPRT_TST_SECTIONS_PROJ	Test Sections Research Projects Data	Roadway
RPT_CA_ROUTES	List of Caltrans Routes	Roadway
RPT_CULVERT_END_TREATM	Culverts End Treatment Data	Roadway
RPT_CULVERT_GIS_PRECISION	Culverts GIS Data	Roadway
RPT_CULVERT_INSPECTION	Culvert Inspection Data	Roadway
RPT_CULV_ENDTR_ASSESSMENT	Culvert End Treatment Assessment	Roadway
RPT_DET_OPTIM_RESULTS	Detailed Results of Scenario Analysis	System
RPT_DET_OPTIM_RESULTS	Detailed Results of Scenario Analysis	Roadway
RPT_PMS_CA_CTC_VOTES		Roadway
RPT_PMS_CA_CTIPS		Roadway
RPT_PMS_CA_TRAFFIC	Traffic Data	Roadway
RPT_P_CULVERT_INVENTORY	Culverts Data	Roadway
RPT_P_CULVERT_SYS_INVENTORY	Culverts System Data	Roadway
SETUP_NETWORK_LINES	This table has the list of routes and tells their starting and ending mile points.	Roadway

SETUP_USER_TABLE	This table has list of "Users" who has access to the system	System
SYSTEM_LOG	Log of all USER IDs along with the start date/time, the end date/time and the admin unit logged in to, for each successful login by that USER ID	System

Caltrans PaveM Jasper Reports

REPORT TABLE / VIEW NAME	DESCRIPTION	MODULE
Core Data Report	Report of core data (contractor submitted core data) including contractor and project information, location information, layer details and photographs of core.	Roadway
List of Admin Units with assigned Users-04a.jrxml	Shows the list of Admin Units and the User corresponding to the admin unit.	System
GIS Themes-08.jrxml	All the GIS Themes (along with corresponding data such as Type, Size, Data Source etc) is shown in this report	System
PMS Columns Defined for Analysis-09.jrxml	List of PMS Columns defined for Analysis (Report based on Setup PMS Columns window) Roadway > Utilities > Setup PMS Columns	System
Groovy Scripts by Type-10.jrxml	Lists all the Groovy Script IDs, corresponding Names and Groovy Text	System
All Window with Associated menu and titles-12.jrxml	List of all windows, their menus (how to navigate to them) and menu titles.	System
Defined Dynamic Segmentation-14.jrxml	List of Dynamic segmentation names that are created in the system(Report based on > Setup Dynamic Segmentation window) System > LRS & GIS > Linear Network Tools > Table Methods > Setup Dynamic Segmentation	
List of System Defined Views and Comments-15.jrxml	Shows the list of System Defined Views.	System
Tables Views enabled for Reporting-16.jrxml	Lists the Table/Views enabled for reporting along with the Module in which it is being used and the Name of the Person Created By.	System
System Parameters-17.jrxml	Reports the Current System Parameter settings.	System
List of Defined Columns-18.jrxml	Lists all the Defined Columns in the system, their corresponding IDs and the View Type of the Column(T-list, String, Date, Number)	System
System Menu Hierarchy-19.jrxml	Lists all the Menu Names, in a hierarchy, along with their IDs and Parent IDs. Shows the report grouped by the Module in which	System

	the menus are present.	
Measurement Units-22.jrxml	A list of Measurement Units present in the system.	System
List of System Jobs-24.jrxml	Lists the System Jobs	System
List of Imports-25.jrxml	List of all the imports made to date and the corresponding details such as Table Name, Procedure Name.	System
List of Imports with Batch Information-27.jrxml	Import listing and the details about the batch files uploaded for converting into the system understandable format.	System
Defined System Archives-28.jrxml	List of Defined System Archive Names and the corresponding Table Names.	System
List of Defined System Archives-29.jrxml	Defined system IDs and corresponding Names	System
03 - List of Security Roles.jrxml	Shows the list of Security Roles and the corresponding Users.	System
Asset Types-05.jrxml	Shows the list of Asset Type Name and the corresponding Inventory Table Name for that Asset Type along with the Module in which the Asset is being used.	System
System Window's Object Definitions-31.jrxml	Lists the Window ID then corresponding Window Name then the list of corresponding Object IDs and Object Names. The list is as per Window Names	System
Details of Defined System Archives-30.jrxml	A combination of 'Defined System Archives' and 'List of Defined System Archives' reports.	System
System Window's Object Definitions and Associated Columns-32.jrxml	Similar to report 'System Windows's Object Definitions' along with the details about the associated columns for the window objects	System
List of Security Roles-3.jrxml	Shows the list of Security Roles and the corresponding Users.	System
List of Text Resources-20.jrxml	Shows a list of text resources that are being used by the system in case of errors/bugs/warnings	System
List of Imports with Staging Tables-26.jrxml	List of all the imports made till date and the details of the Columns present in the import. This gives the information about the buffer table used for the import.	System