TELSTRA CORPORATION LIMITED

Telstra's Efficient Access Model

User Guide

3 March 2008

Contents

1 Introduction

The intention of this document is to provide a "how-to" guide to the user of the TEA Cost Model (The Model). The Model has been designed for the purpose of estimating the efficient cost of the unconditioned local loop service (ULLS).

2 System Requirements

The Model has the following system requirements:

Minimum Required	**Recommended**
Pentium 4 Processor or AMD equivalent	For better performance, a Dual or Quad Core processor is highly recommended
at least 1 GB RAM	3 GB RAM recommended
1 GB free HDD space	
Microsoft Windows XP Professional with full administration rights	In order to take advantage of Dual or Quad Core capabilities if available in computer, Windows Vista is recommended
.NET 1.1 Framework (should be part of the Windows installation)	
The latest MDAC (Microsoft Data Access Components, also part of a Windows installation)	
Microsoft Excel 2003 or newer	In order to take advantage of the Dual or Quad Core capabilities, Excel 2007 or newer is recommended
CD/DVD drive	
	Microsoft Access 2003 is not necessary to run The Model, but is required if the database is to be viewed

3 Overview

The Model consists of a user-interface which accesses and runs the three underlying modules.

There are the two Engineering modules, one for the distribution network and one for the main network, each of which relies on a set of inputs that can be accessed and revised from the user interface. The output of these modules is the volume of plant, labour and equipment required to deploy the efficient access network. This output feeds into the Cost Calculation Module which generates the model outputs.

The Cost Calculation Module calculates the total investment cost associated with the efficient access network by applying composite fully loaded costs to the plant and equipment volumes produced by the engineering modules. The annual and monthly costs associated with this network are then determined in the Annual Cost Summary worksheet by applying capital cost, direct and indirect expense and indirect investment factors to the investments produced by the module.

All of the modules are MS Excel-based and can be easily accessed and audited. The engineering modules rely on base data extracted, translated and loaded from Telstra's' Cable Plant records for each of Telstra's Band 2 ESAs. These are the same data sources that Telstra uses in planning is own network.

For more information about the methodology used in The Model, refer to the **TEA Model Documentation** (see ***Chapter 14. References***).

4 Conventions Used In This User Guide

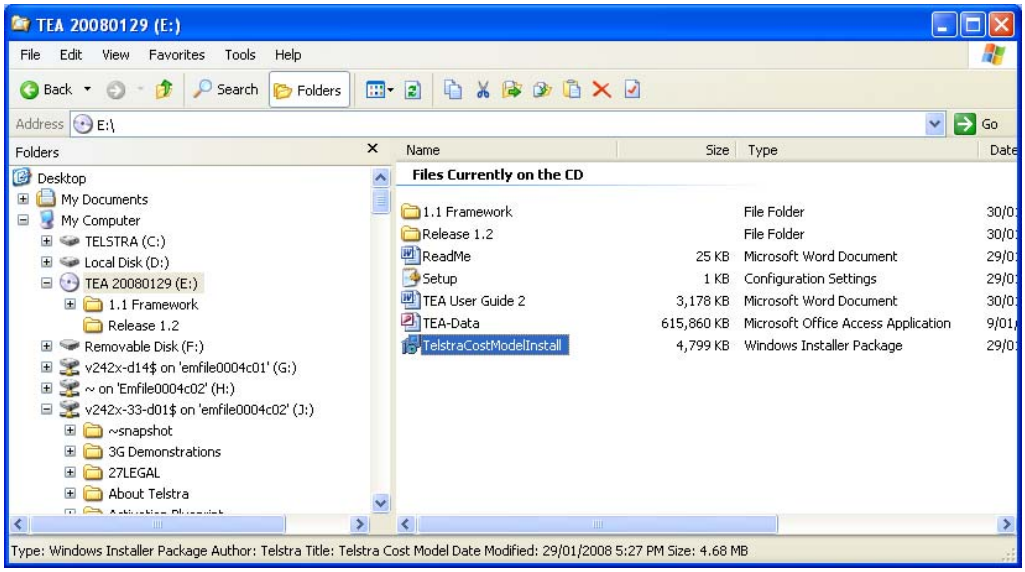
Bold text	An element of The Model e.g. **TEA-Data.mdb** or **Telstra Model Inputs**, or the Operating System e.g. **the Start menu**
Bold Italic text	A reference to another chapter of this user guide e.g. "See ***Chapters 7 to 9*** for more information"
	This picture highlights the following text as important information that you need to take note of.

5 Installation

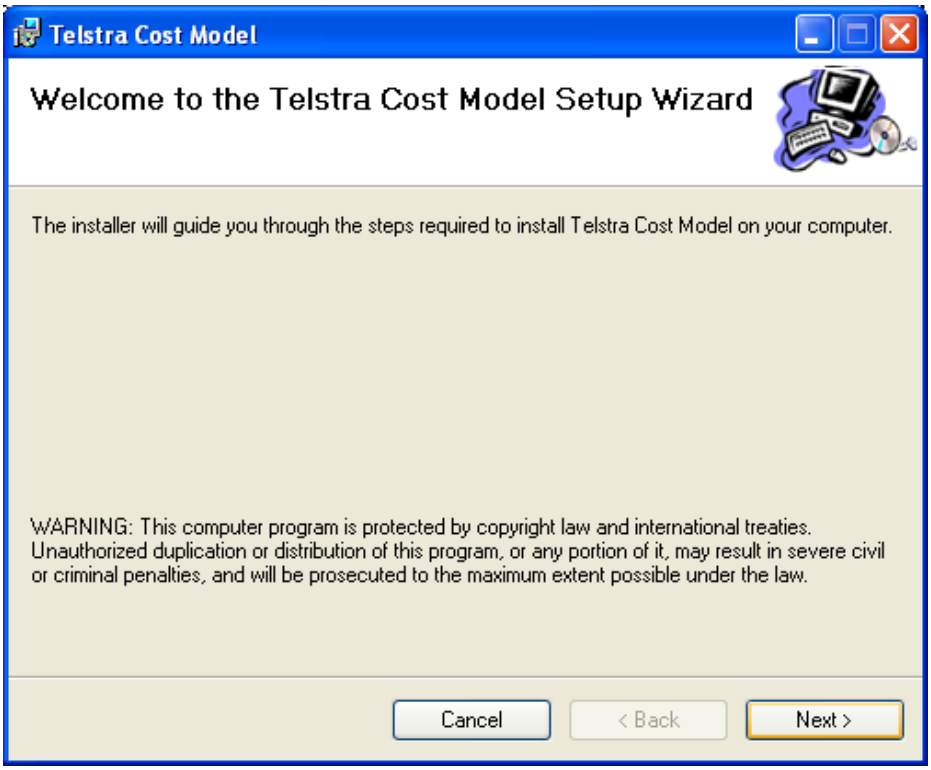
If a previous version of The Model has been installed on a machine you should uninstall it prior to beginning installation of the new Model. See ***Section 5.2*** for the instructions to uninstall the previous version of the Model.

5.1 Installing The Model

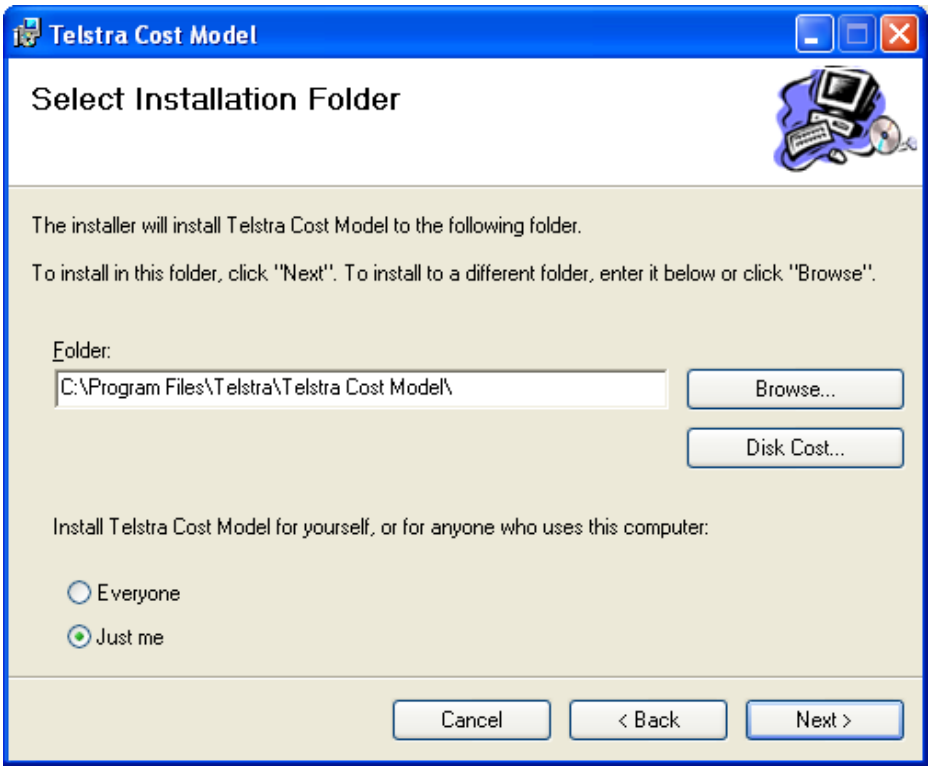
1 Insert the Telstra Cost Model Disk into your CD/DVD drive.



2 In **Explorer**, run the file **TelstraCostModelInstall.msi** by double-clicking on it.



3 The setup Wizard will start and guide you through the installation. Click **Next** to continue.



4 You will be prompted to identify the location of the folder where The Model will be installed.

Navigate to the folder where you want The Model installed by clicking on the **Browse** button.

It is recommended that you choose the default location:
C:\Program Files\Telstra\Telstra Cost Model

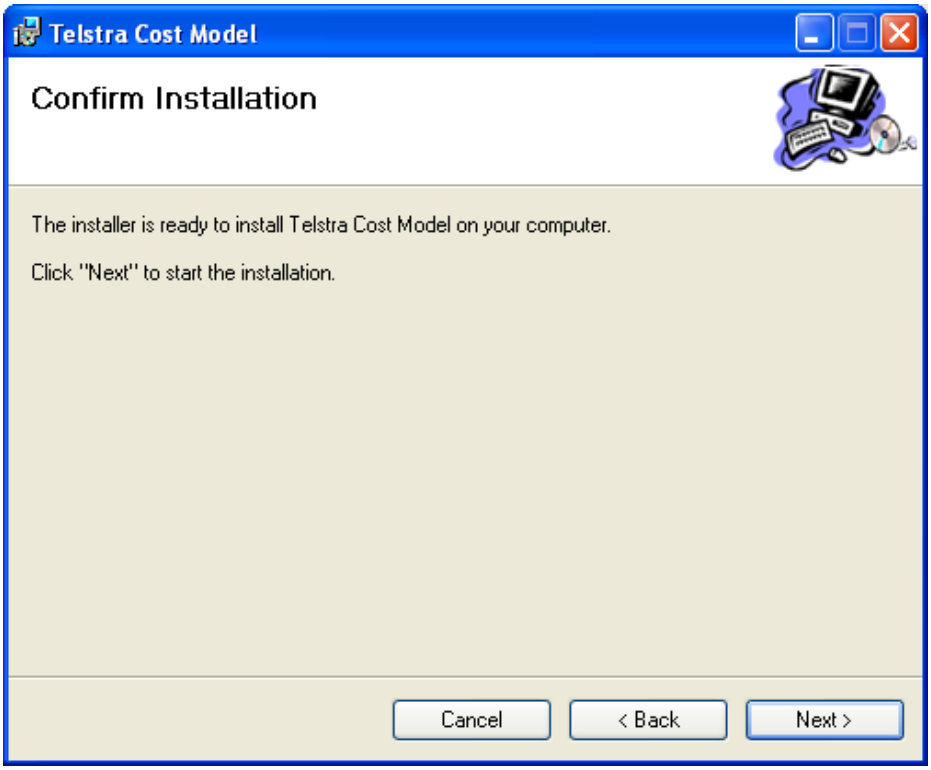
In this document it is assumed that The Model is located in the default folder.

Clicking on the **Disk Cost** button will allow you to ascertain if there is sufficient space for the files by bringing up a list of the current drives and available space on each.

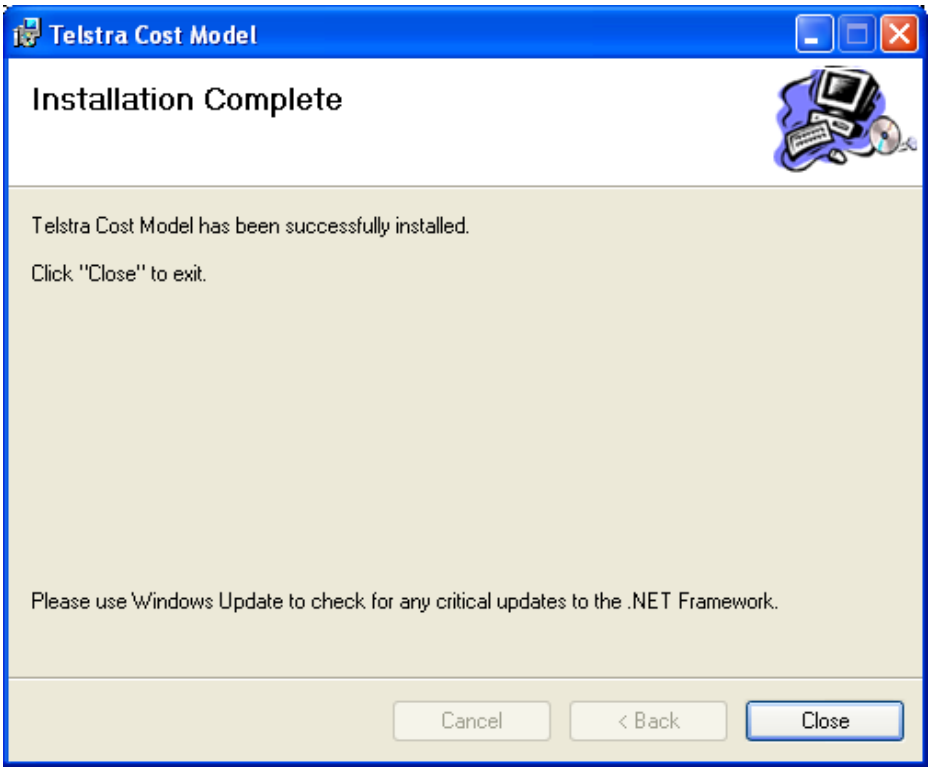
Assuming the correct security settings on the computer, clicking on the **Just Me** selector will prevent anyone else operating the computer from gaining access the Model. Selecting to install for **Everyone** will provide any user with access to the model.

The Model requires less than 30MB HDD space. The underlying database requires just over 600MB of space and must be saved in the same folder as the model. It is therefore recommended that the drive have at least 1GB of available space to install the model.

5 Click **Next**

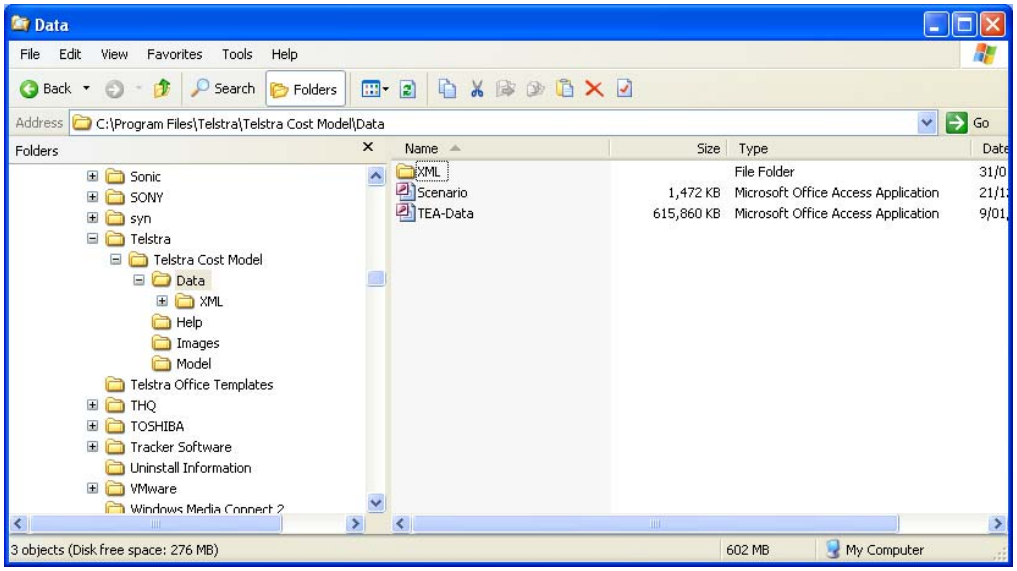


6 Click **Next** to confirm and start the installation



7 After The Model has installed, Click **Close**.

8 Copy the file **TEA-Data.mdb** from the **Telstra Cost Model Disk** to the **Data** folder where The Model has been installed – for the default installation this would be **C:\Program Files\Telstra\Telstra Cost Model\Data.**

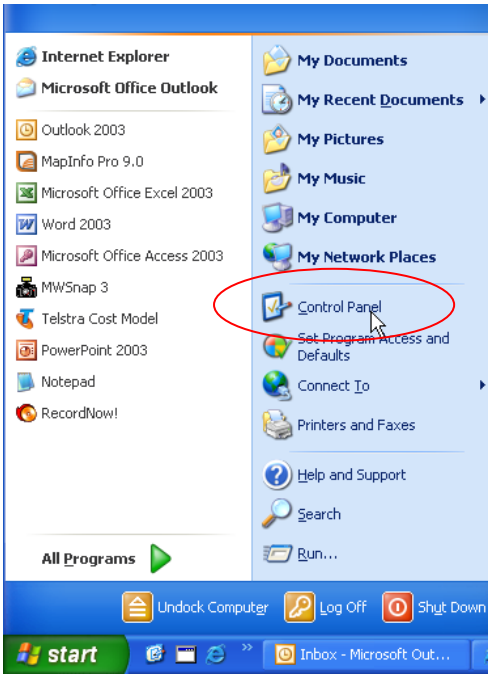


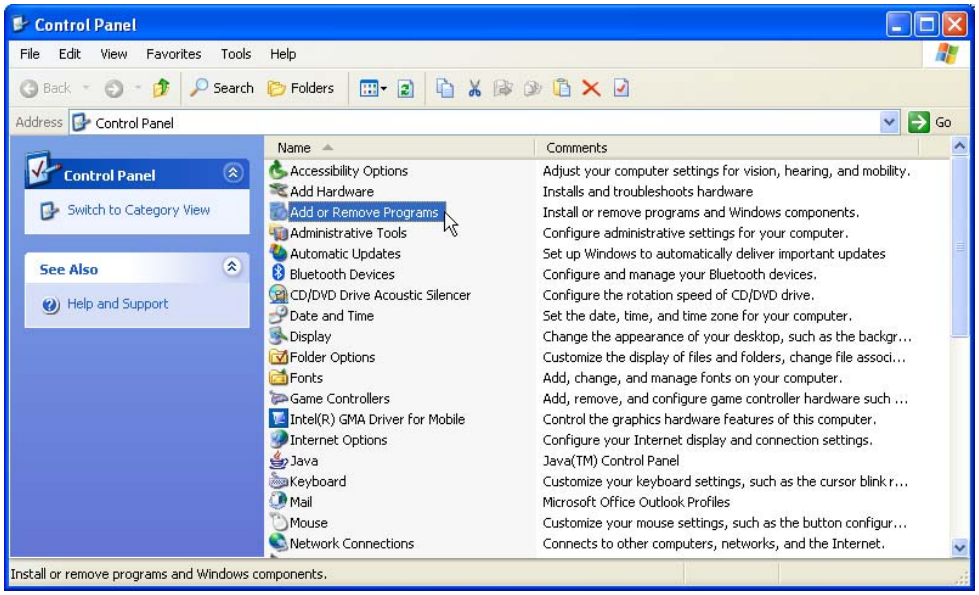
The Telstra Cost Model install is now complete.

If there is an error opening The Model, you might need to install the **.Net 1.1 Framework**. From the **Telstra Cost Model Disk**, navigate to the **1.1 Framework** folder. Double-click the file **dotnetfx.exe** and follow the instructions for installation. If necessary, a Service Pack release for the **.Net 1.1 Framework** is also included on the disk.

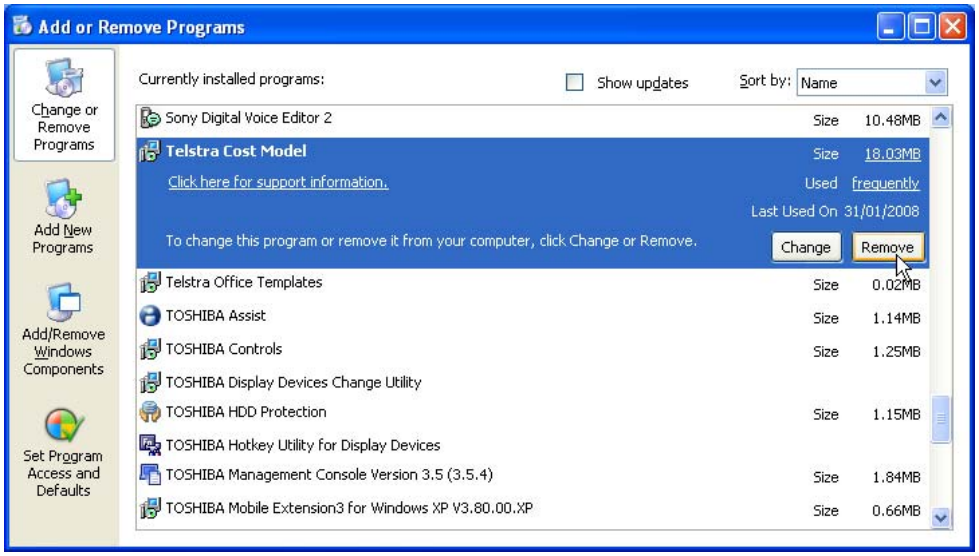
5.2 Uninstalling The Model

1 Open the **Control Panel** – this can be found on the right-hand side of the **Start Menu**.





2 Select **Add or Remove Programs**



3 Click on the **Telstra Cost Model** program and then click on the **Remove button.**

4 A dialog box will appear asking for confirmation – Click on **Yes.**

5 The underlying sub directories should also be removed by deleting the folder where The Model was installed (i.e. delete the folder **C:\Program Files\Telstra\Telstra Cost Model**)

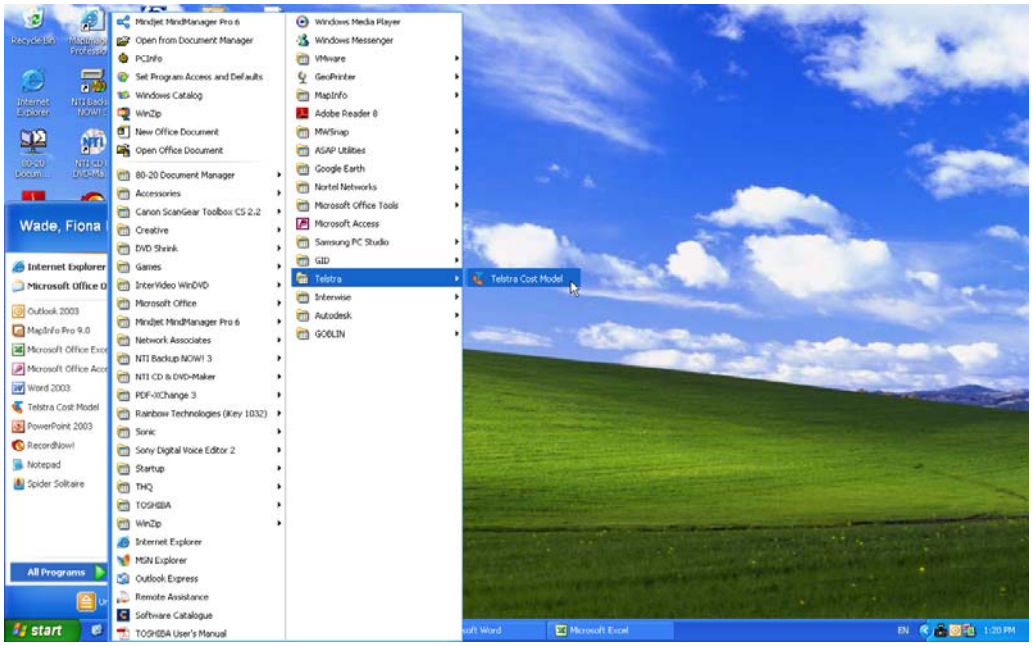
6 Getting Started

6.1 Open The Model

There are three methods of starting The Model.

1 Installation of The Model as described previously will result in an icon being placed on your Windows desktop. Double-clicking on this icon will open The Model.

2 During the installation process, an item is placed on your program list under the Start menu.

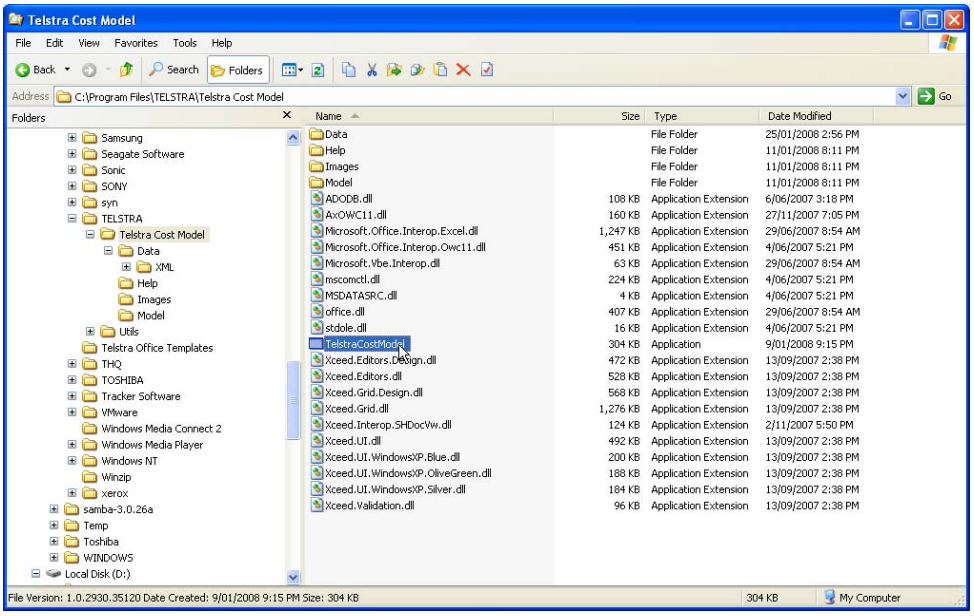


Select the **Start** menu, then **All Programs**, then **Telstra**, then **Telstra Cost Model** to open The Model this way.

3 The Model can be run directly from the executable file.

Open **Windows Explorer** and navigate to the folder **C:\Program Files\TELSTRA\Telstra Cost Model**.

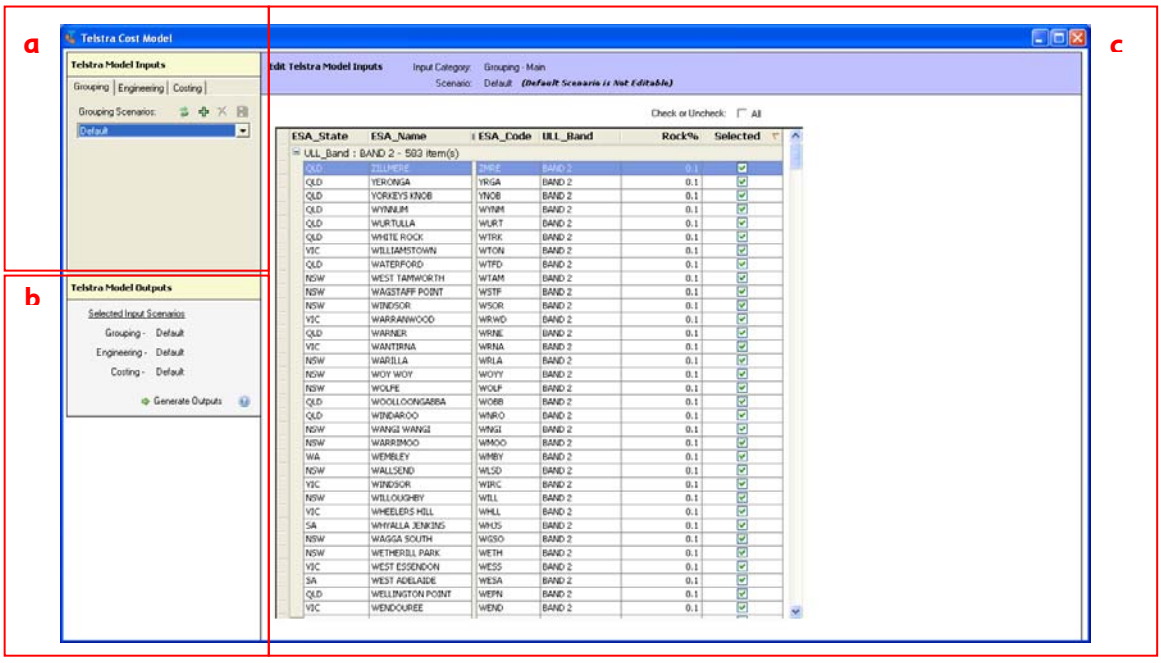
This is the default location. If you installed The Model to another folder you will need to navigate to that folder.



Double-click on the file **TelstraCostModel.exe** to open The Model.

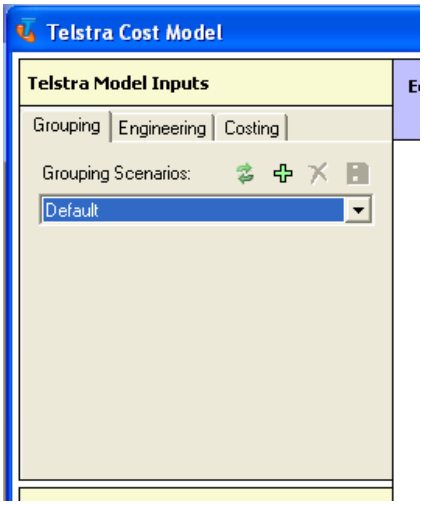
6.2 The Model Screen

The Model has a simple, interactive display. When you run The Model the following initial screen will appear.



There are three basic sections on this screen: a) **Telstra Model Inputs**; b) **Telstra Model Outputs**; and c) **Edit Telstra Model Inputs**.

a) The **Telstra Model Inputs** section allows you to develop various costing scenarios by accessing and revising the inputs for the various modules of The Model.

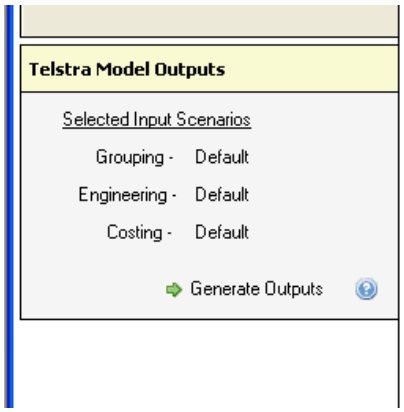


There are three tabs in this section that provide the capability to navigate between the various input sheets for The Model.

There are also buttons that allow you to create a new scenario (), save the scenario (), delete the scenario () and access previously saved input scenarios (drop-down box).

Chapters 7 to 9 provide more information on how to use each of the capabilities available in this section of the user interface.

b) The **Telstra Model Outputs** sections' primary function is to generate outputs once the input scenarios are selected.



This section identifies the scenarios that have been selected and provides a button to start the process of generating results.

Once the results are processed through the various modules you will be transported to the Annual Cost Summary sheet in the Cost Calculation Module to review the results.

The Help button takes you to a brief Help screen.

Chapter 10 provides more detail on this section of the user interface.

c) The **Edit Telstra Model Inputs** section identifies the scenario which is currently being worked on.

It also identifies the category of inputs that are accessible on the current screen.

The input categories that can be accessed from the user interface are:

1) **Grouping - Main** which allow you to select the ESAs to process;

2) **Engineering - Main** which provides access to the inputs for the Main Engineering Module;

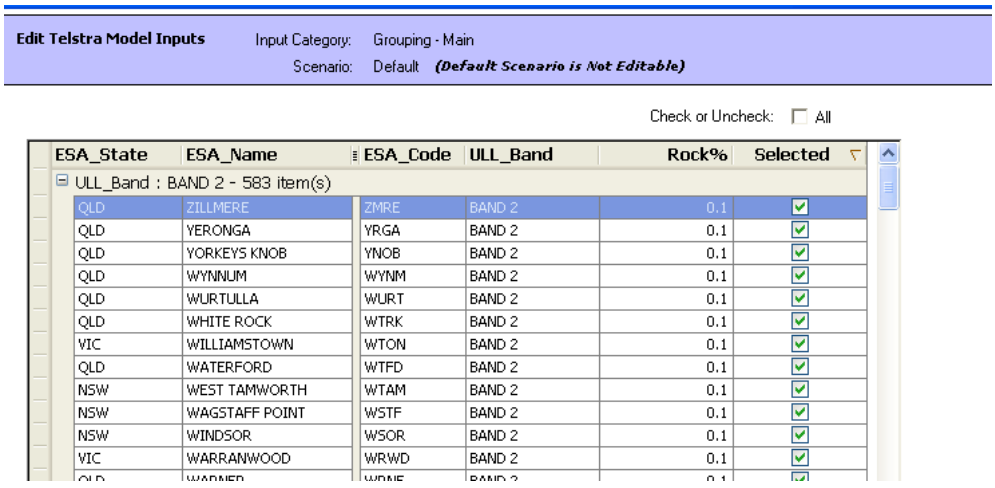
3) **Engineering - Distribution** which provides access to the inputs for the Distribution Engineering Module;

4) **Costing - Main** which provides access to the main network unit cost inputs for the Cost Calculation Module.

5) **Costing – Input Ratios** which provides access to the conduit and trench placement ratio inputs for the Cost Calculation Module.

6) **Costing – Capital Costs** which provides access to the capital costing inputs for the Cost calculation Module.

Each input section allows you to identify those inputs which are currently used under the selected scenario and provides the capability for you to change those inputs.



The above picture identifies the screen for reviewing and editing the Grouping Scenario. As shown above this is the first screen you will see when accessing The Model.

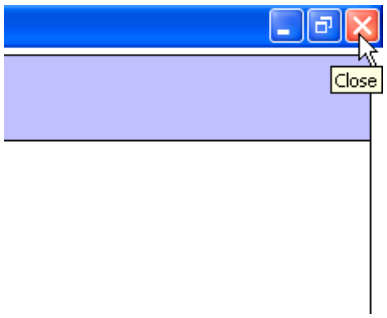
Chapters 7 to 9 provide a more detailed explanation of how these screens can be accessed and edited.

Appendix A provides a more detailed description of the inputs in each category.

6.3 Close The Model

To close The Model click on the **Close Window** button at the top-right corner of The Model window.

Ensure that you save any scenario changes you wish to retain prior to exiting The Model.



7 The Grouping Scenario Tab

The Grouping Scenario tab is the initial tab that you see when entering the Model. There are two basic functions that can be performed in this section of the user interface:

You can **select the ESA or group of ESAs** to run in the current scenario; and

You can **adjust by ESA the percentage of rock** that will be encountered when constructing new facilities.

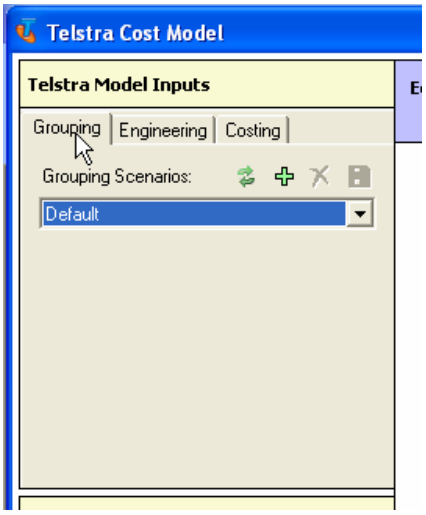
You can select one ESA or any combination of ESAs for the current Model run. You must however select at least one for The Model to operate. Each of these functions is explained in more detail below.

If a large group of ESAs is selected and the scenario also includes changes to the engineering module (i.e. main or distribution assumptions) The Model will need a considerable amount of time to process the data. Sensitivity testing for the impact of changes to engineering inputs can be done efficiently by running the distribution or main engineering input changes on a single or small sample of ESAs. Once the final list of engineering inputs has been determined then they can be run for all ESAs.

Changes to the costing assumptions can be run reasonably quickly for all ESAs.

7.1 Select a Grouping Scenario

1 To set up or access a grouping scenario the **Grouping tab** must be open.



When you first open The Model you will be directed to this sheet.

If you have moved to an alternative tab in The Model you can return to the **Grouping tab** by selecting it.

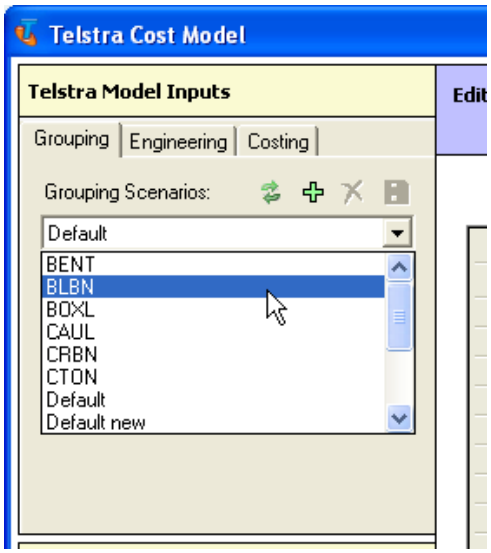
Once in the **Grouping Tab** you have two options;

1) select a previously saved Grouping scenario; or

2) create a new Grouping scenario.

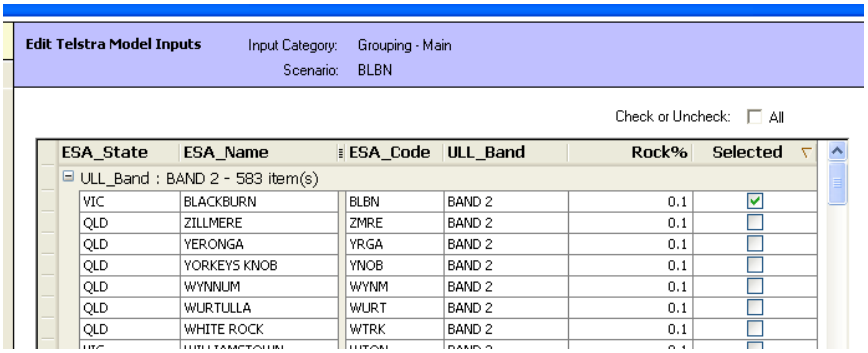
a) Select a saved Grouping Scenario.

1 Once a grouping scenario has been saved you can gain access to it from the **drop-down box** under **Grouping Scenarios**. The desired scenario can be accessed by simply highlighting and selecting it in the drop-down box.



The **Grouping - Main** window will refresh to reflect the selected Grouping Scenario.

See below.

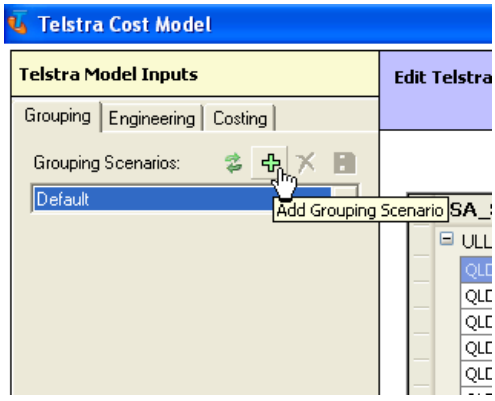


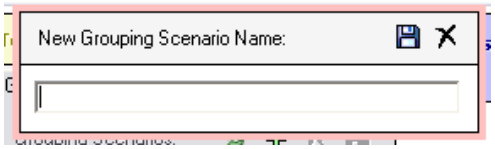
b) Create a new Grouping Scenario.

1. In each tab, the first step in creating a new inputs scenario is to click on the **Add Grouping Scenario** icon

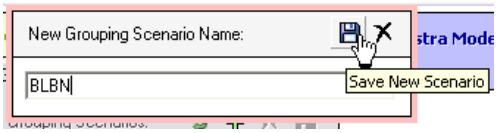
A warning will appear if you try to adjust the default scenario without having clicked this icon.

Once the icon is selected a dialog box will appear for you to enter the name of the scenario.





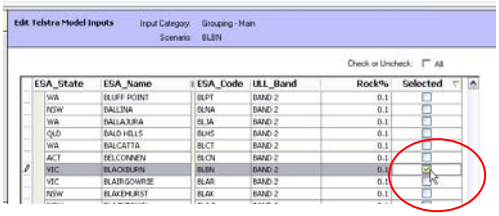
2. Enter a name for the scenario and click on the **Save New Scenario** icon to save the name.



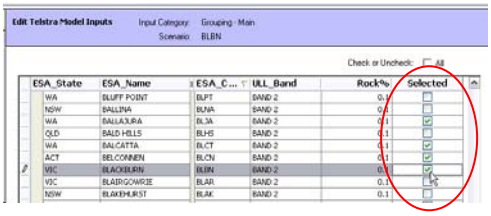
3. The default scenario has all ESAs selected. To deselect all ESAs, click on the **check box** marked "All" above the "Selected" column. Click on the box until it is blank to deselect all exchanges.

4. Select one, several or all ESAs

- To select an ESA in the main window click on the check box in the "Selected" column corresponding to the desired ESA name then press Enter.

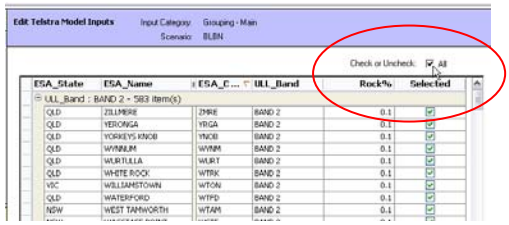


- To select more than one ESA, select the check box for each corresponding ESA name. Press Enter after making the last selection.



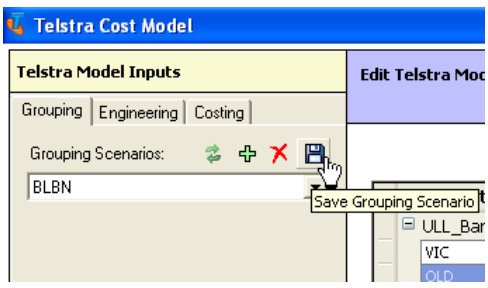
After pressing Enter the selected ESAs may disappear from the view. Once the selection has been made the list will be re-sorted with the selected ESAs appearing at the top of the list. See **Chapter 7.5 Sort the ESA List** for a discussion of the sort function.

- To select all ESAs, click on the check box marked "All" above the "Selected" column.



When you enter The Model under the default scenario all ESAs will be automatically selected.

5. Save the scenario by clicking on the **Save Grouping Scenario** icon.

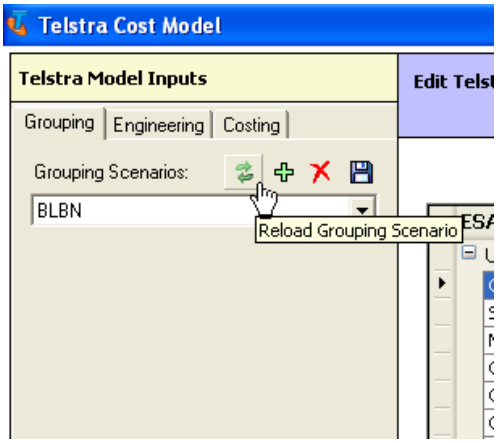


See ***Appendix A*** for a description of the variables on the Grouping input category page.

7.2 Discard Edits to a Grouping Scenario

If you have made changes to a Grouping Scenario that you do not wish to retain you can revert to the saved Grouping Scenario, discarding any edits since the scenario was last saved.

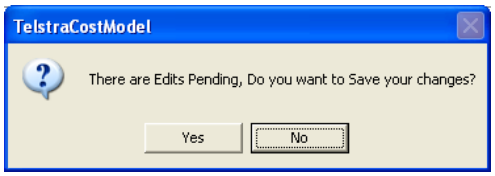
1 Click on the **Reload Grouping Scenario** icon.



2 A dialog box will appear asking you if the recent edits should be saved.

Click on **No** to revert to the last saved version of the current Grouping Scenario.

The **Grouping Main** window will revert to the last saved values for the Grouping Scenario.

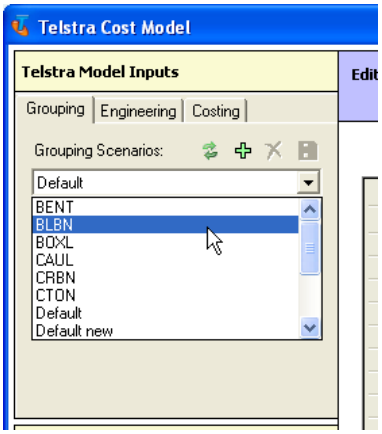


If you click on **Yes** to save the edits this has the same result as clicking on the **Save Grouping Scenario** icon, and the new grouping will replace the previously saved scenario.

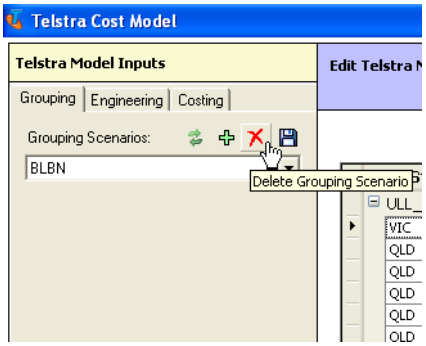
7.3 Delete a Grouping Scenario

If a Grouping Scenario listed in the drop-down box is no longer required, it can be permanently deleted.

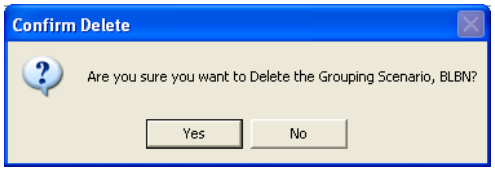
1 Select the Grouping Scenario to be deleted from the **drop-down box**.



2 Click on the **Delete Grouping Scenario** icon to delete the selected Grouping Scenario.



3 You will be prompted by a dialog box to confirm the deletion.



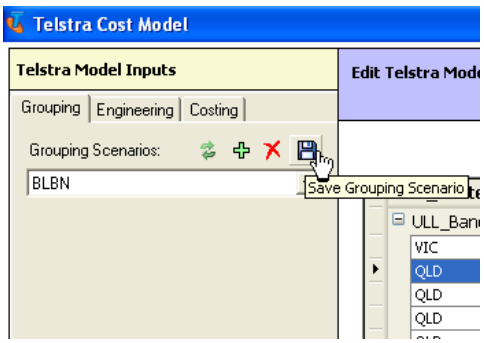
4 Click on **Yes** to delete the Grouping Scenario. The **Grouping Main** window will revert to the data for the Grouping Scenario identified at the top of the drop-down list.

5 Click on **No** to cancel the deletion of the Grouping Scenario. The **Grouping Main** window will retain the data for the selected scenario.

7.4 Save a Grouping Scenario

At any time during editing of the Grouping Scenario, the current data may be saved.

1 Saving a file is simply done by clicking on the **Save Grouping Scenario** icon at any time during the editing process.



The revised scenario will replace the previously saved scenario that you were editing.

If you wish to edit an existing scenario while retaining that scenario for future reference, you **must** save the new scenario prior to making any edits.

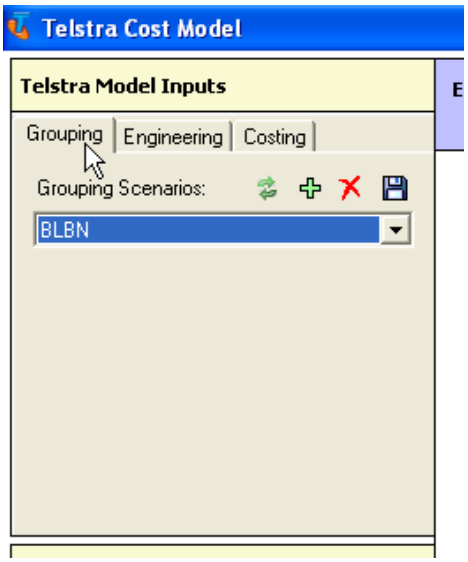
First you must select the scenario you wish to revise from the drop-down box. Once it is selected click on the **Add Grouping Scenario** icon to initiate a new scenario. Name the new scenario and begin your edits. If a new scenario is not initiated prior to any editing any attempt to save the current edits will over-write the original scenario.

If you have not saved the Grouping Scenario, and attempt to navigate to another tab (e.g. to the **Engineering** tab), you will be prompted to save (or not) the scenario. If you do not save the scenario you will lose any edits made.

7.5 Sort the ESA list

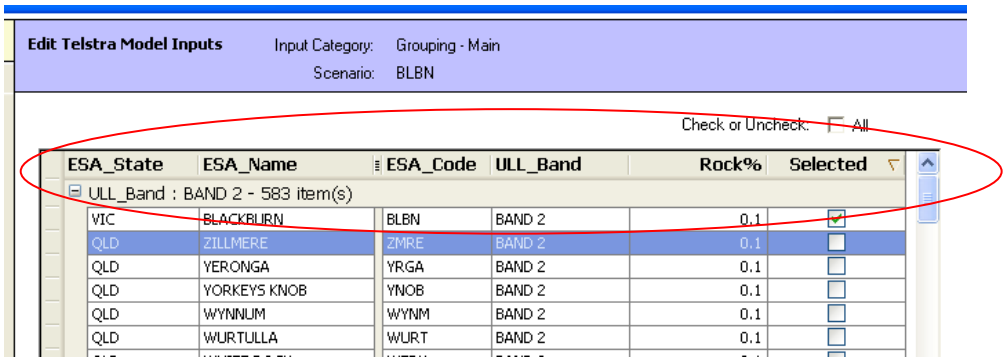
Sorting the ESA list has no impact on the order of calculation, but can be a useful aid in identifying and analysing ESAs for various potential Grouping Scenarios.

1 Select the **Grouping** tab under **Telstra Model Inputs**.

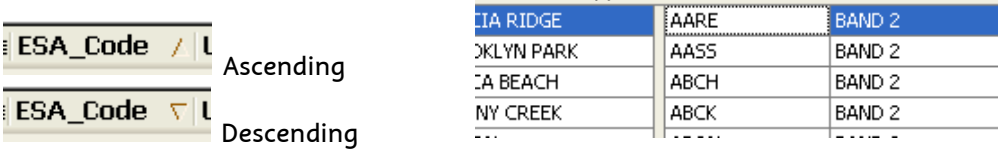


The ESAs are in descending order (z to a) based on their ESA Code. However, if a group of ESAs is selected they will move to the top of the list where the selected ESAs will again be sorted by descending order.

2 To change the sort order, click on any of the headings for the columns.



3 A small triangle will appear to the right of the selected heading denoting the sort order.



Ascending

Descending

Not sorted


Sorting by descending Selected will bring the selected ESAs to the top of the list.

There is another function that can be performed from the Grouping Tab. The percent rocky placement can be revised. These functions will be discussed in more detail in ***Appendix A***.

8 The Engineering Scenario Tab

The Engineering Scenario tab provides you with the ability to create scenarios with revised engineering rules and parameters. There are two input categories that can be accessed under this tab:

Engineering Main; and

Engineering Distribution.

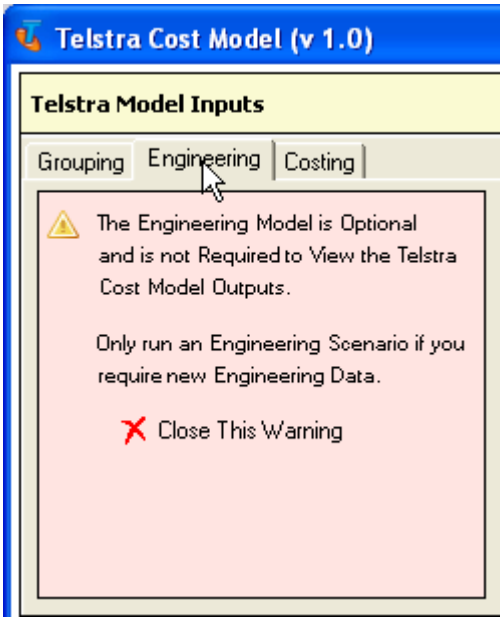
These sheets provide the general plant criteria and dimensioning rules used to determine the types, sizes and quantities of the network facilities required to deploy a new efficient access network. The Engineering - Main sheet contains the provisioning criteria and rules for designing a main network. The Engineering – Distribution sheet contains the provisioning criteria and rules for designing a distribution network.

Changes to engineering rules require a significant time to process for a large grouping of ESAs. Sensitivity testing for the impact of changes to engineering inputs can be done efficiently by running the input changes on a single or small sample of ESAs. Once the final list of engineering inputs revisions has been decided, all ESAs can be run with the new inputs.

8.1 Select an Engineering Scenario

To set up or access an Engineering scenario the **Engineering tab** must be open.

If you are in an alternative tab in The Model you can return to the **Engineering tab** by selecting it.



When you first enter the Engineering Tab a warning will appear informing you that it is not necessary to run the engineering models every time you wish to generate outputs. Running these modules can take a significant amount of time. Click on the **Close This Warning** icon to proceed.

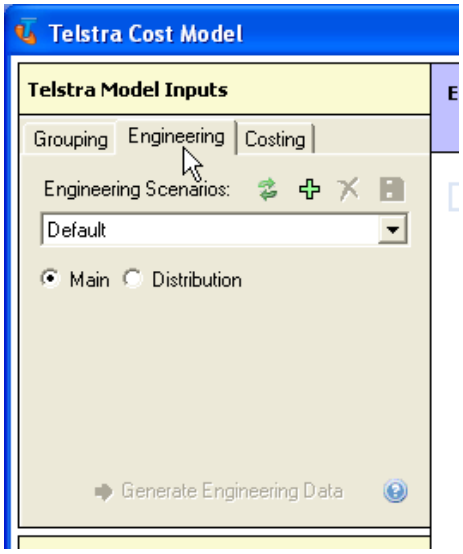
This warning only appears the first time you select the **Engineering** tab during a work session.

Once you have closed the warning the following screen appears.

Once in the **Engineering Tab** you have two options;

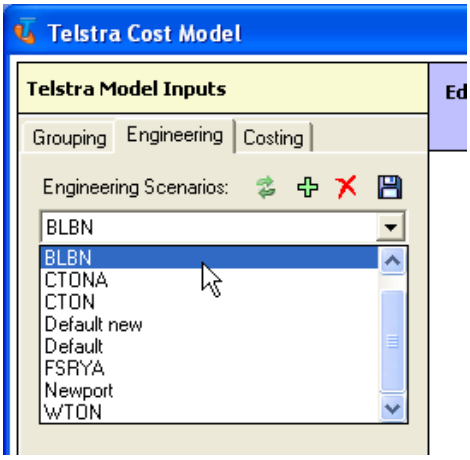
1) select a previously saved Engineering scenario; or

2) create a new Engineering scenario.



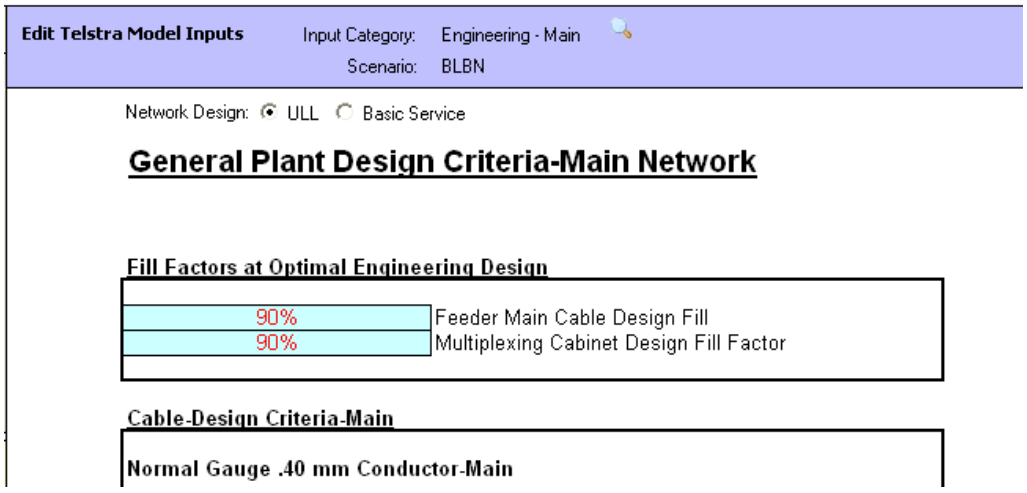
a) Select a saved Engineering Scenario.

1 Once an Engineering scenario has been saved you can gain access to it from the **drop-down box** under **Engineering Scenarios**. The desired scenario can be accessed by simply highlighting and selecting it in the drop-down box.



The **Engineering - Main** window will refresh to reflect the selected Engineering Scenario.

See below.

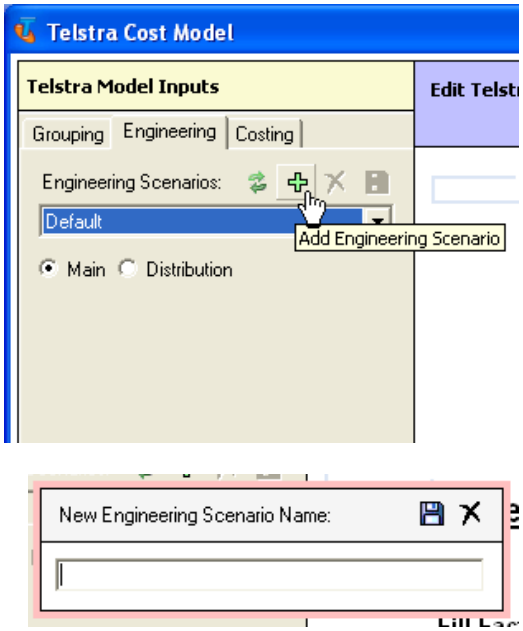


b) Create a new Engineering Scenario.

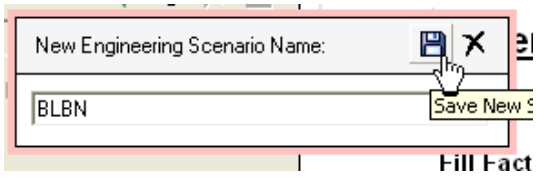
1 In each tab, the first step in creating a new inputs scenario is to click on the **Add Engineering Scenario** icon.

A warning will appear if you try to adjust the default scenario without having clicked this icon. The warning will let you know that you cannot edit the default scenario.

Once the icon is selected a dialog box will appear for you to enter the name of the scenario.



2 Enter a name for the scenario and click on the **Save New Scenario** icon to save the name.

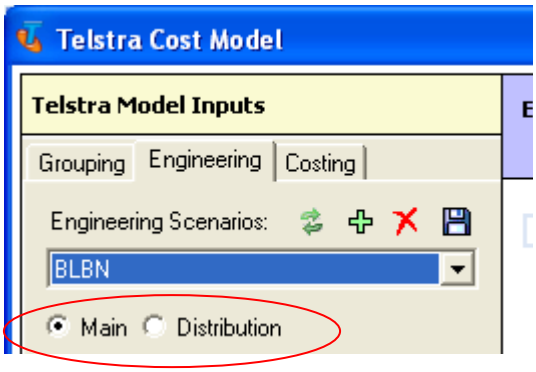


There are two engineering scenario input sheets (i.e. Main and Distribution).

The **Main** and **Distribution** selectors are directly below the drop-down **Engineering Scenario** box.

Selecting one or the other will populate the **main window** with the relevant input sheets for the Main or Distribution networks.

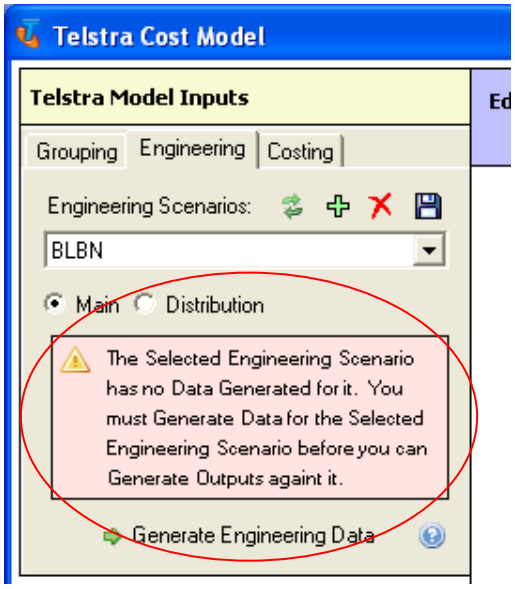
By simply clicking these two buttons you can easily navigate between sheets but any edits will be lost if they are not saved. You will be prompted to save any edits before moving.



An alert box under the **Main** and **Distribution** selectors will appear after saving an Engineering Scenario. This alert notifies you that the pending edits have not been processed through the model to generate the new data. Data must be generated and transferred to the cost module in order to generate results from the new scenario.

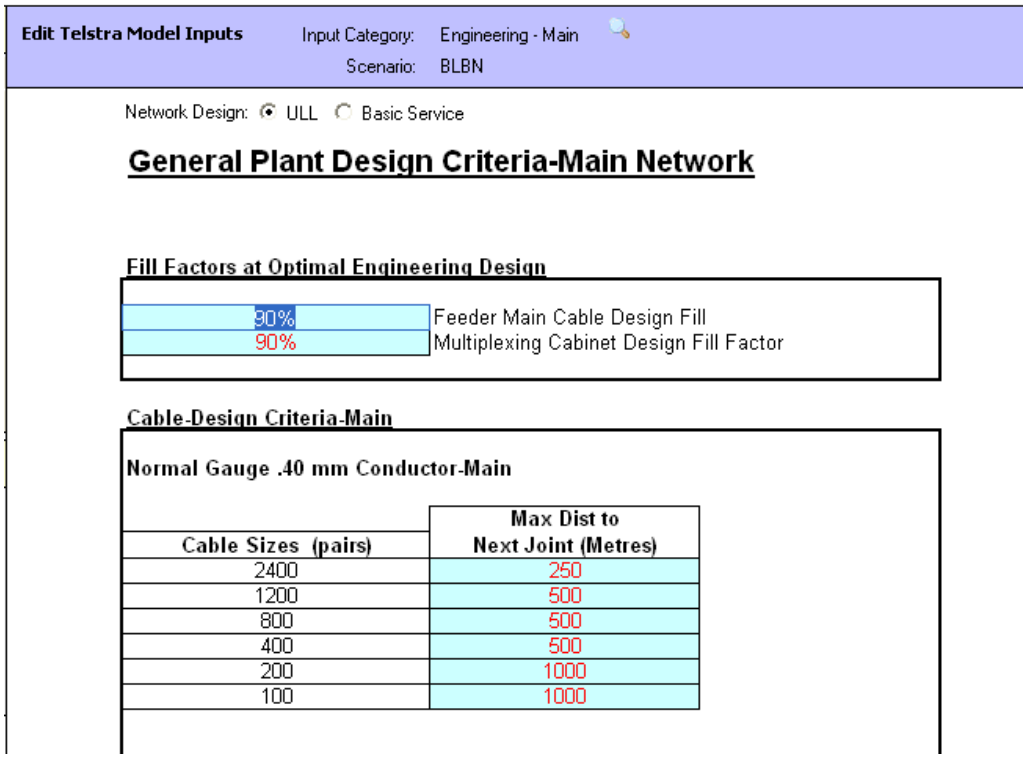
Make any required changes to the variables before generating the Engineering Data.

Any new engineering scenario will take a significant time to process if a large number of ESAs have been selected.

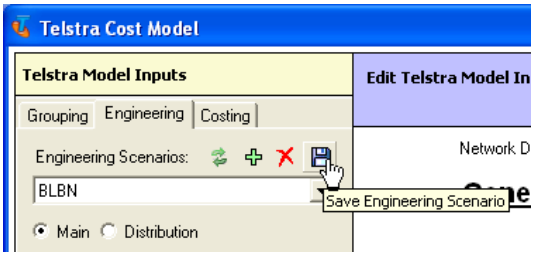


3 Changes to the inputs in either the **Engineering – Main** or **Engineering – Distribution** sheets can be made by simply highlighting the selected input box and entering the revised value.

User adjustable inputs are highlighted in red font with blue background.

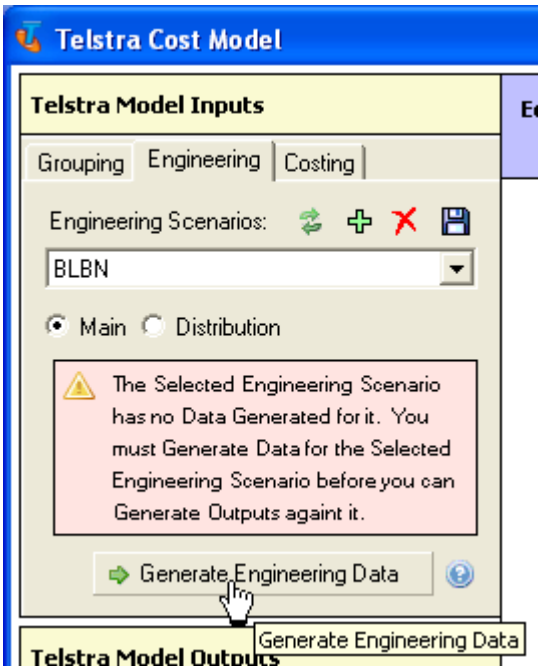


4 Once the edits are completed they should be saved by clicking on the **Save Engineering Scenario** icon.

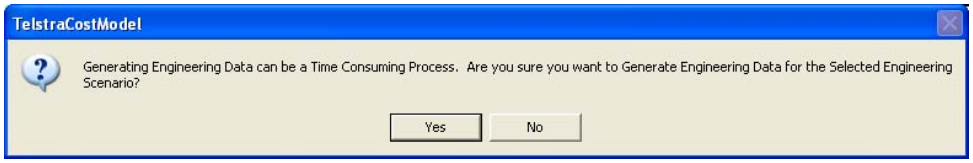


See ***Appendix A*** for a description of the variables on the Engineering input category pages.

5 To process the new scenario click on **Generate Engineering Data**.

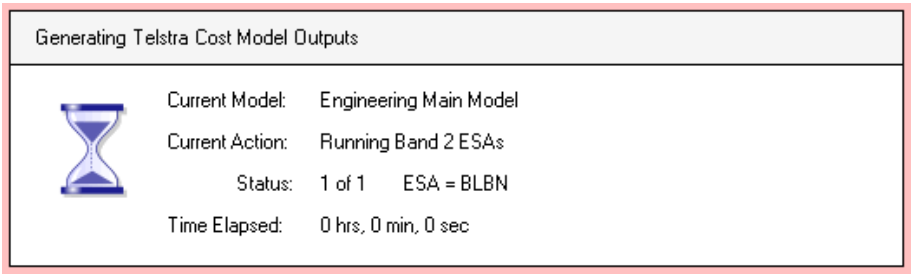


6 A dialog box will appear once **Generate Engineering Data** has been selected. If you are certain that this is the scenario that needs to be processed click on **Yes** in the resulting dialog box to proceed. If you are not sure that you want to take the time necessary to process the data at this time click on **No** to cancel.

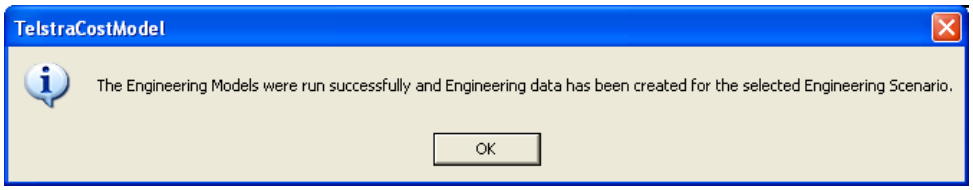


7 If you click **No** you will cancel the Data Generation, and will be returned to The Model screen.

8 If you click **Yes** to proceed, a message box will appear informing you of the progress. You may now get a cup of tea. Or two.



9 A dialog box will appear informing you when the data generation has completed. Click on **OK**.

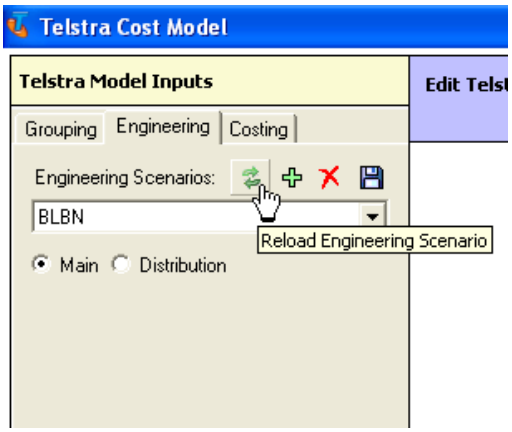


If any changes are made to the selected Engineering Scenario after generating the Engineering Data, you will need to repeat the above process for generating data.

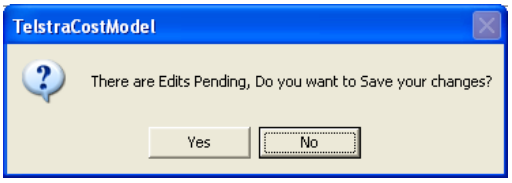
8.2 Discard Edits to an Engineering Scenario

If you have made changes to an Engineering Scenario that you do not wish to retain, you can revert to the saved Engineering Scenario, discarding any edits since the scenario was last saved.

1 Click on the **Reload Engineering Scenario** icon.



2 A dialog box will appear asking you if the recent edits should be saved.



Click on **No** to revert to the last saved version of the current Engineering Scenario.

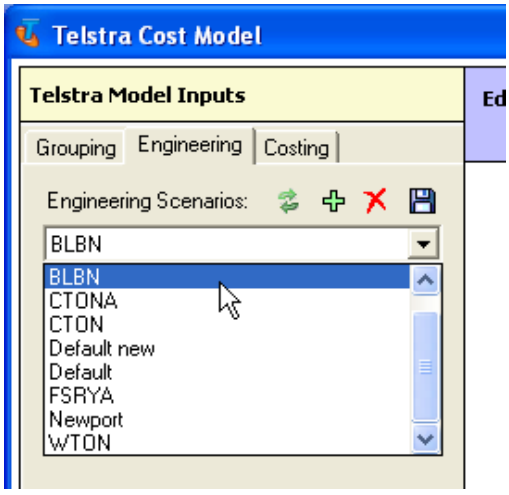
The **main window** will revert to the original values for the Engineering Scenario.

If you click on **Yes** to save the edits this has the same result as clicking on the **Save Engineering Scenario** icon, the new edits will replace the previously saved scenario.

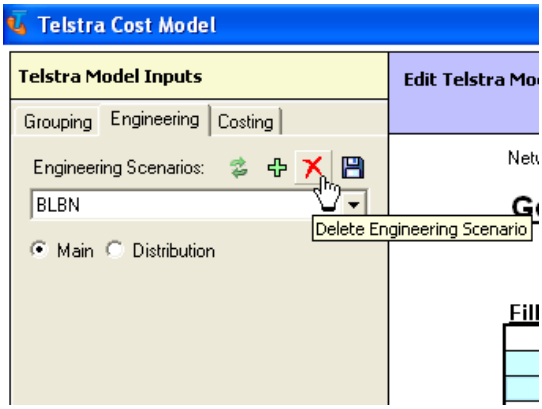
8.3 Delete an Engineering Scenario

If an Engineering Scenario listed in the drop-down box is no longer required, it can be permanently deleted.

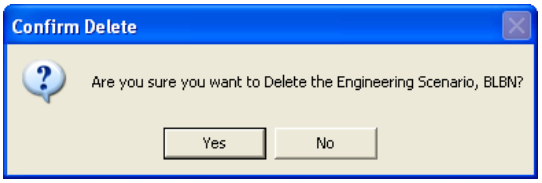
1 Select the Engineering Scenario to be deleted from the **drop-down box**.



2 Click on the **Delete Engineering Scenario** icon to delete the selected Engineering Scenario.



3 You will be prompted by a dialog box to confirm the deletion.



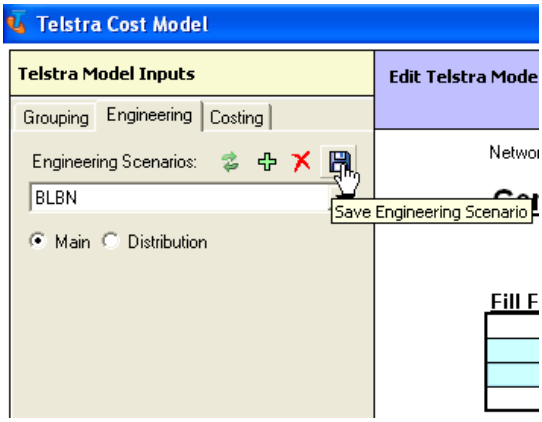
4 Click on **Yes** to delete the Engineering Scenario. The **main window** will revert to the data for the Engineering Scenario identified at the top of the drop-down list.

5 Click on **No** to cancel the deletion of the Engineering Scenario. The **main window** will retain the data for the selected scenario.

8.4 Save an Engineering Scenario

At any time during editing of the Engineering Scenario, the current data may be saved.

1 Saving a scenario is simply done by clicking on the **Save Engineering Scenario** icon at any time during the editing process.



The revised scenario will replace the previously saved scenario that you were editing.

If you wish to edit an existing scenario while retaining that scenario for future reference, you **must** save the new scenario prior to making any edits.

First you must select the scenario you wish to revise from the drop-down box. Once it is selected click on the **Add Engineering Scenario** icon to initiate a new scenario. Name the new scenario and begin your edits. If a new scenario is not initiated prior to any editing any attempt to save the edits will over-write the original scenario.

If you have not saved the Engineering Scenario, and attempt to navigate to another tab (e.g. to the **Costing** tab), you will be prompted to save (or not) the scenario. If you do not save the scenario you will lose any edits made.

8.5 Operating Engineering Modules Separately

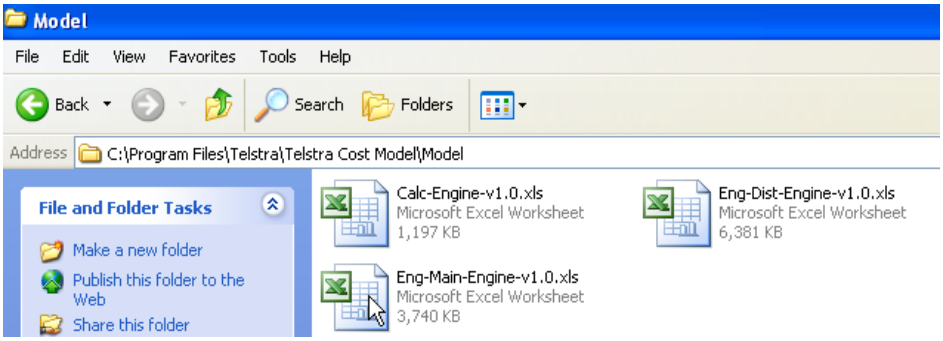
Each of the engineering modules can be operated separately to recreate the detail engineering data for any exchange. This provides you with the capability to review the data

for each exchange. To run the models separately you must open the models. There are two methods for accessing the engineering modules to operate them from outside the front end.

You can access the engineering modules by using windows to navigate to the file in which they reside on your computer.

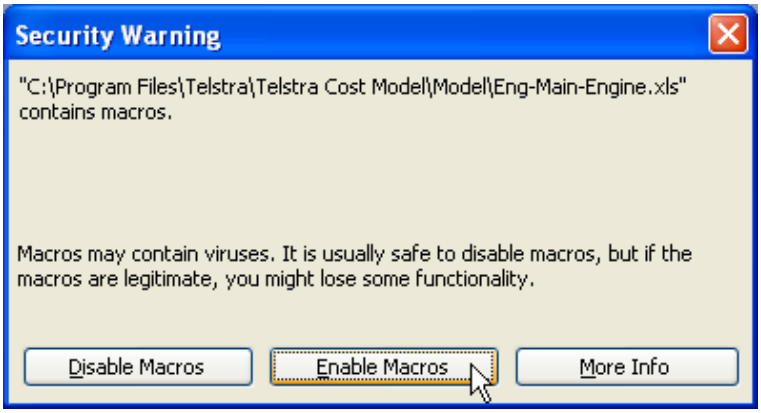
1. In Windows Explorer navigate to the folder C:\Program Files\TELSTRA\Telstra Cost Model\Model

This is the default location. If you installed The Model to another folder you will need to navigate to that folder.



2. Open the module you wish to run by double clicking on the selected file. The name of the file identifies the module and version number (i.e. Engineering-Main-Engine-v1.0 or Engineering-Dist-Engine-v1.0).

For the purposes of this discussion we will use the main engineering module. The steps for running the distribution module are virtually identical to the steps for running the main module.



3. When you open the workbook press the **Enable Macros** button in the popup screen.
You are now in the main engineering module.

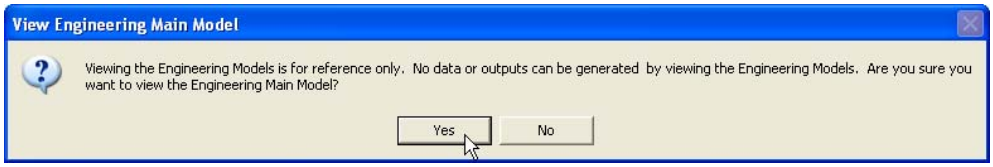
You can also access the individual engineering modules from the user interface.

1. Access the user interface page for the engineering module you wish to access.

2. Click on the **hour glass** icon next to the **Engineering – Main** title in the **Edit Telstra Model Inputs** section of the worksheet.

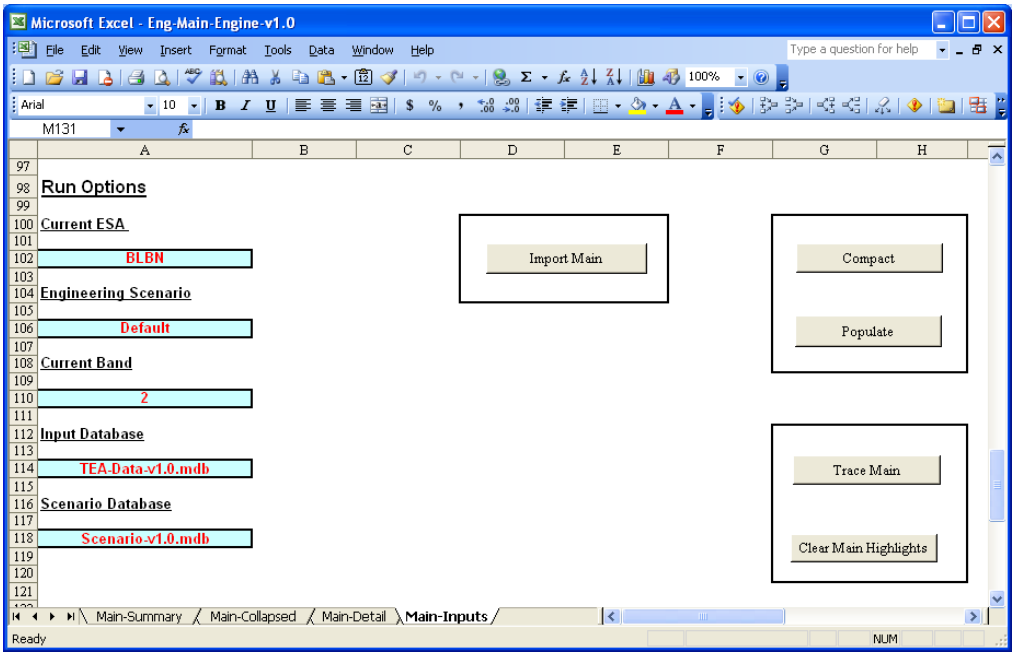
The following warning will appear on the screen. This warning lets you know that data generated from changes to inputs made directly into the engineering main or distribution modules will not flow to the Cost calculation module in order to generate outputs (i.e. investment and annual costs).

If you wish to generate outputs you must operate the model through the front end.



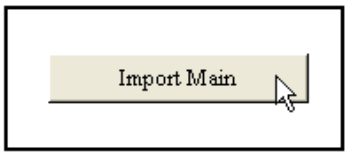
3. Click on the Yes button to enter the Main Engineering Module.
You are now in the main engineering module.

4. Select the ***Main - Inputs*** tab and scroll down to the bottom of the worksheet.



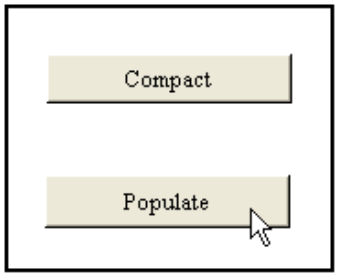
5. In the box labelled **Current ESA** type the four letter ESA code for the ESA that you wish to run and press Enter.

6. Click on the button labelled **Import Main**.



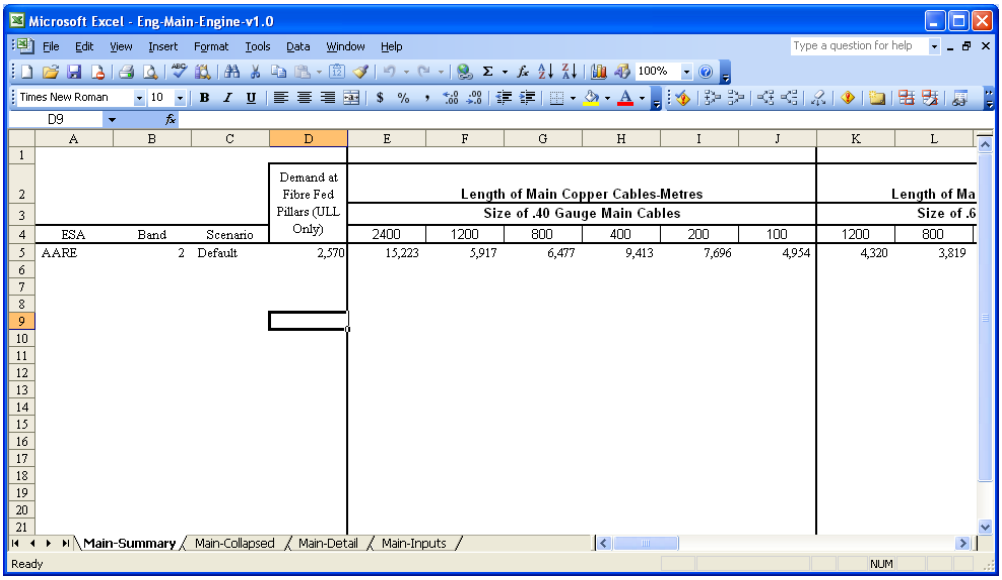
The base data sections of the **Main – Detail** and **Main – Collapsed** worksheets are now populated with the data for the selected ESA (AARE).

7. At this point the base data in the **Main Module** has been populated with the data from the AARE ESA. To calculate the results for the ESA you need to click on the **Populate** button at the bottom of the **Main - Inputs** worksheet.



The **Populate** button creates results. The **Compact** button removes all the calculations in the spreadsheet except for the first two rows. This function makes it easier to make changes to and save the model by speeding up the processes.

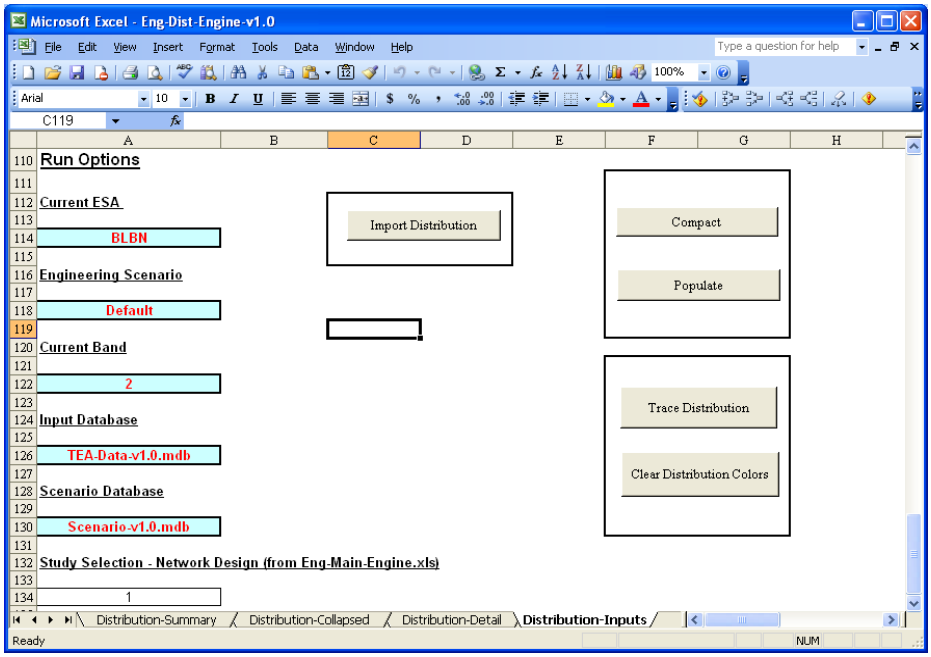
The **Main - Summary** worksheet is now populated with the totals of each type of equipment required for the selected scenario.



The **Main-Detail** and **Main-Collapsed** worksheets will identify the detailed calculations of the quantities for each component of the network required to provide access services for the selected exchange.

8. To run the **Distribution Module** for an ESA you would follow the same steps as you did in producing results with the Main Module.

- Open the **Eng-Dist-Engine-v1.0.xls** file.
- In the **Distribution Inputs Module** worksheet type the four letter ESA code for the ESA that you wish to run in the box labelled **Current ESA**.
- Click on the button labelled **Import Distribution**.
- Click on the **Populate** button.



9 The Costing Scenario Tab

The Costing Scenario tab provides you with the ability to create scenarios with revised costing rules and parameters. There are three input categories that can be accessed under this tab:

Costing **Main**;

Costing **Input Ratios**; and

Costing **Capital Costs**.

These sheets provide the unit costs, input ratios and capital cost factors used to determine the total cost of the network facilities required to deploy a new efficient access network. The **Costing - Main** sheet contains the unloaded unit costs for each component of plant identified by the Engineering Modules. The **Costing – Input Ratios** sheet contains the ratios used in developing the composite weighted costs for each type of conduit, pit and manhole construction activity. The **Costing – Capital Costs** sheet contains the capital cost factors, depreciation lives, the O&M factors and indirect expense and support asset factors used to convert the investments cost produced by the model into annual and monthly operating costs.

Processing changes to the costing inputs require a minimal amount of time. Sensitivity testing for the impact of changes to these variables can be processed for large groupings of ESAs in a relatively short time if there are no changes to the underlying engineering scenarios.

9.1 Select a Costing Scenario

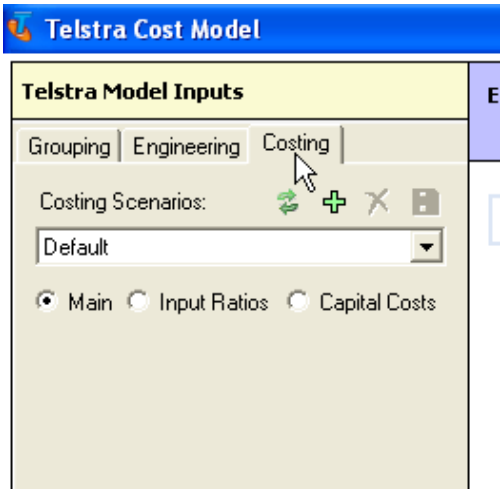
To set up or access a Costing scenario the **Costing tab** must be open.

If you are in an alternative tab in The Model you can return to the **Costing tab** by selecting it.

Once in the **Costing Tab** you have two options;

1) select a previously saved Costing scenario; or

2) create a new Costing scenario.

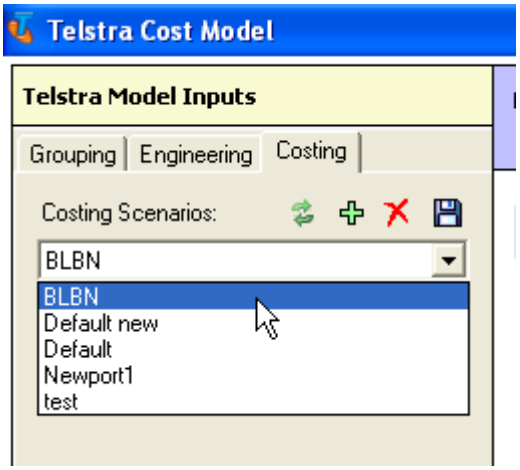


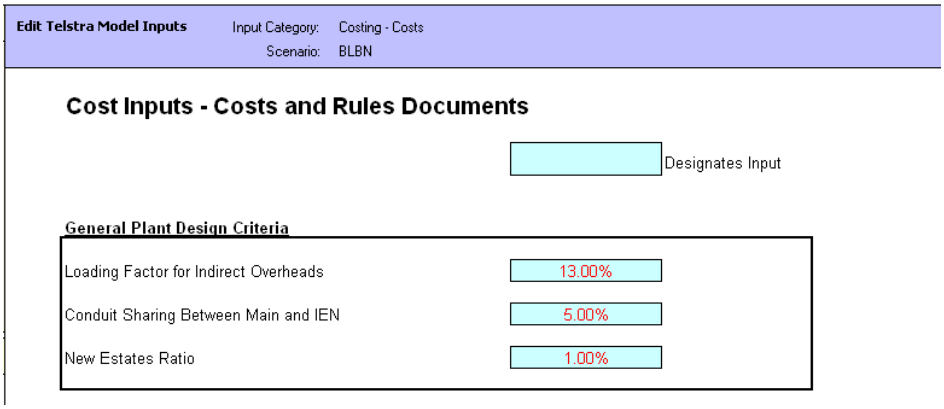
a) Select a saved Costing Scenario.

1 Once a Costing scenario has been saved you can gain access to it from the **drop-down box** under **Costing Scenarios**. The desired scenario can be accessed by simply highlighting and selecting it in the drop-down box.

The **Costing - Main** window will refresh to reflect the selected Costing Scenario.

See below.



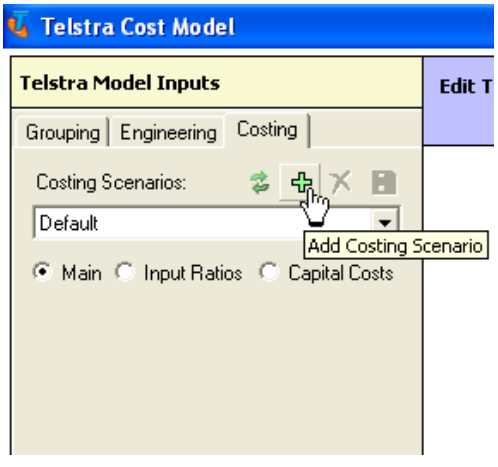


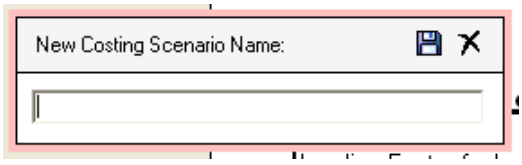
b) Create a new Costing Scenario.

1 In each tab, the first step in creating a new inputs scenario is to click on the **Add Costing Scenario** icon.

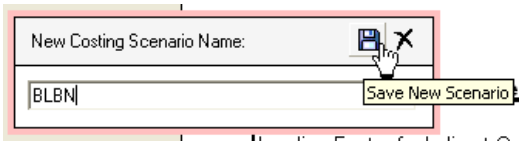
A warning will appear if you try to adjust the default scenario without having clicked this icon.

Once the icon is selected a dialog box will appear for you to enter the name of the scenario.





2 Enter a name for the scenario and click on the **Save New Scenario** icon to save the name.

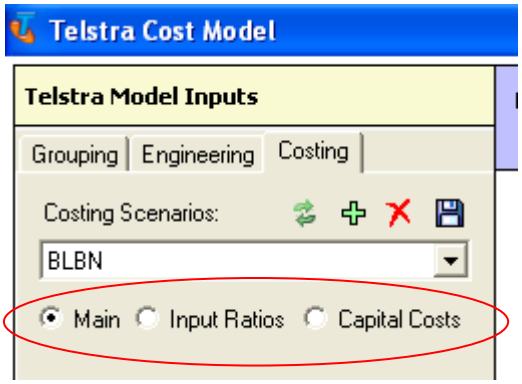


There are three costing scenarios input sheets:

Main-which has all the prices and plant dimensioning rules used to price out the new facilities;

Input Ratios-which contain the ratios used to develop composite placement costs for manholes, pits and conduits; and

Capital Costs-which contain the capital cost inputs, depreciation lives and direct and indirect expense and investment factors required calculate monthly and annual operating costs from investment costs.



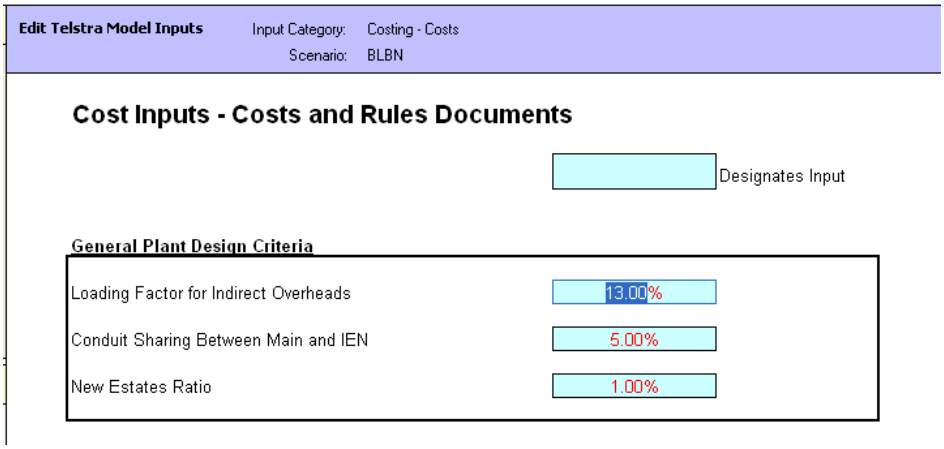
The **Main**, **Input Ratios** and **Capital Costs** selectors are directly under the drop-down **Costing Scenario** box.

Selecting one of these will populate the **main window** with the relevant input sheets for the **Main** network unit costs, the **Input Ratios** for conduit and trench placement, or the **Capital Cost** calculation variables.

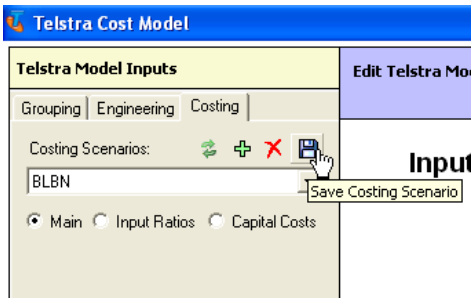
By simply clicking these buttons you can easily navigate between these input sheets but any inputs will be lost if they are not saved. You will be prompted to save any edits before moving.

3 Changes to the **Costing – Main, Costing – Input Ratios** and **Costing – Capital Costs** can be made by simply highlighting the selected input box and entering the revised value.

User adjustable inputs are highlighted in red font with blue background.



4 Once the edits are completed they should be saved by clicking on the **Save Costing Scenario** icon.

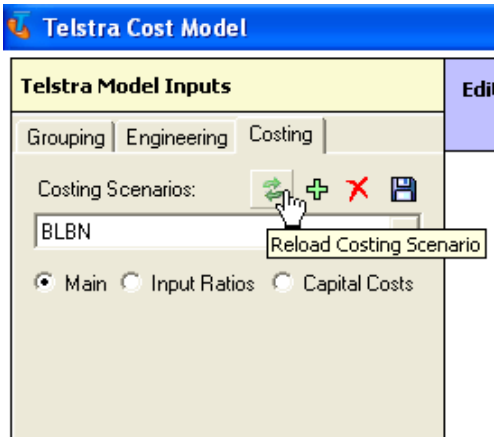


See ***Appendix A*** for a list of the variables on the Costing input category pages.

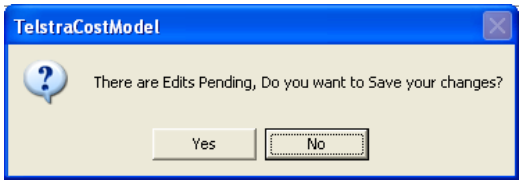
9.2 Discard Edits to a Costing Scenario

If you have made changes to a Costing Scenario that you do not wish to retain, you can revert to the saved Costing Scenario, discarding any edits since the scenario was last saved.

1 Click on the **Reload Costing Scenario** icon.



2 A dialog box will appear asking you if the recent edits should be saved.



Click on **No** to revert to the last saved version of the current Costing Scenario.

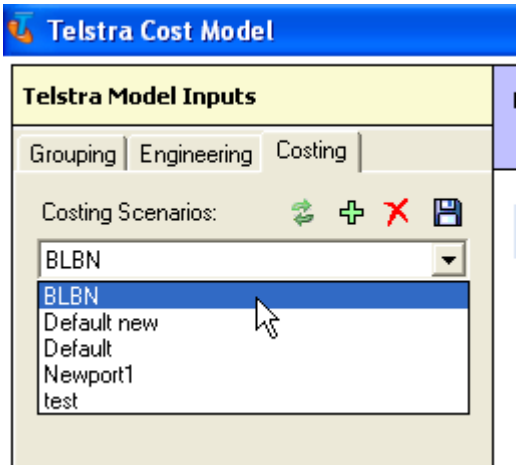
The **main window** will revert to the original values for the Costing Scenario.

If you click on **Yes** to save the edits this has the same result as clicking on the **Save Costing Scenario** icon, the new edits will replace the previously saved scenario.

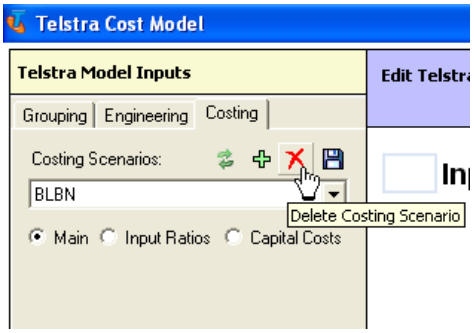
9.3 Delete a Costing Scenario

If a Costing Scenario listed in the drop-down box is no longer required, it can be permanently deleted.

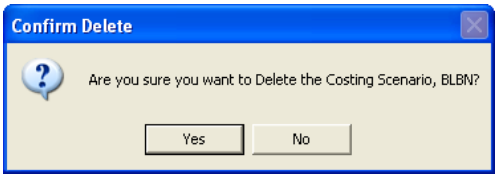
1 Select the Costing Scenario to be deleted from the **drop-down box**.



2 Click on the **Delete Costing Scenario** icon to delete the selected Costing Scenario.



3 You will be prompted by a dialog box to confirm the deletion.



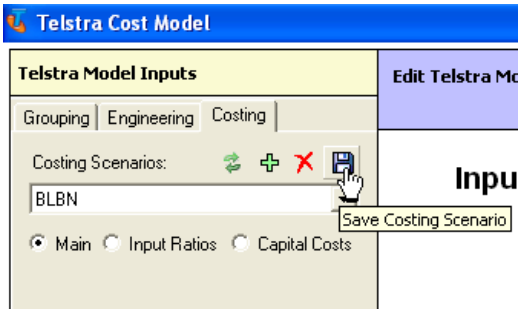
4 Click on **Yes** to delete the Costing Scenario. The **main window** will revert to the data for the Costing Scenario identified at the top of the drop-down list.

5 Click on **No** to cancel the deletion of the Costing Scenario. The **main window** will retain the data for the selected scenario.

9.4 Save a Costing Scenario

At any time during editing of the Costing Scenario, the current data may be saved.

1 Saving a scenario is simply done by clicking on the **Save Costing Scenario** icon at any time during the editing process.



The revised scenario will replace the previously saved scenario that you were editing.

If you wish to edit an existing scenario while retaining that scenario for future reference, you **must** save the new scenario prior to making any edits.

First you must select the scenario you wish to revise from the drop-down box. Once it is selected click on the **Add Costing Scenario** icon to initiate a new scenario. Name the new scenario and begin your edits. If a new scenario is not initiated prior to any editing any attempt to save the edits will over-write the original scenario.

If you have not saved the Costing Scenario, and attempt to navigate to another tab (e.g. to the **Grouping** tab), you will be prompted to save (or not) the scenario. If you do not save the scenario you will lose any edits made.

10 Create the Output Costing Spreadsheet

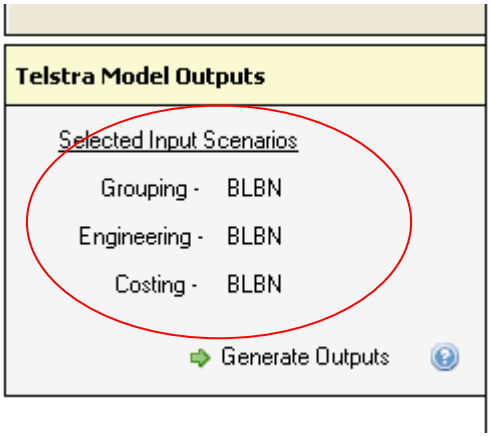
Once all of the scenarios have been finalized, and the engineering scenarios have been processed to generate outputs, the investment and cost outputs need to be calculated and saved in the **Cost Calculation Module** Excel worksheets.

If you have not made any changes to the engineering scenarios, you should not reprocess the engineering data. Processing the engineering data takes a significant amount of time.

The Cost Calculation spreadsheets apply the input costs and ratios to the plant and equipment volumes, produced by the engineering modules, to calculate the total investment, annual costs and monthly costs associated with the efficient access network.

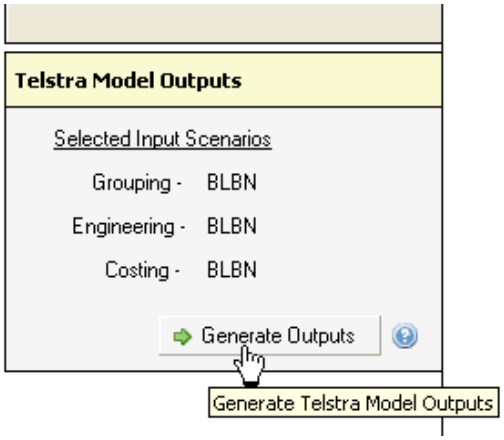
See ***Chapter 11*** for more detail on the output created.

The **Telstra Model Outputs** section of the user interface identifies the list of the currently selected Grouping, Engineering and Costing scenarios.

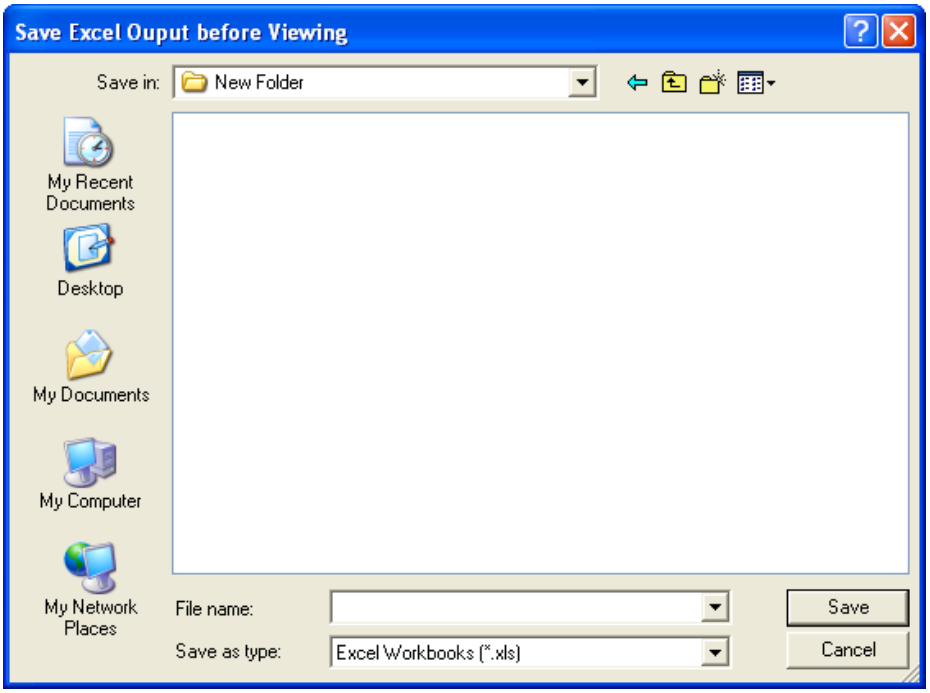


1 Before proceeding, ensure that the identified scenarios are the ones you wish to process.

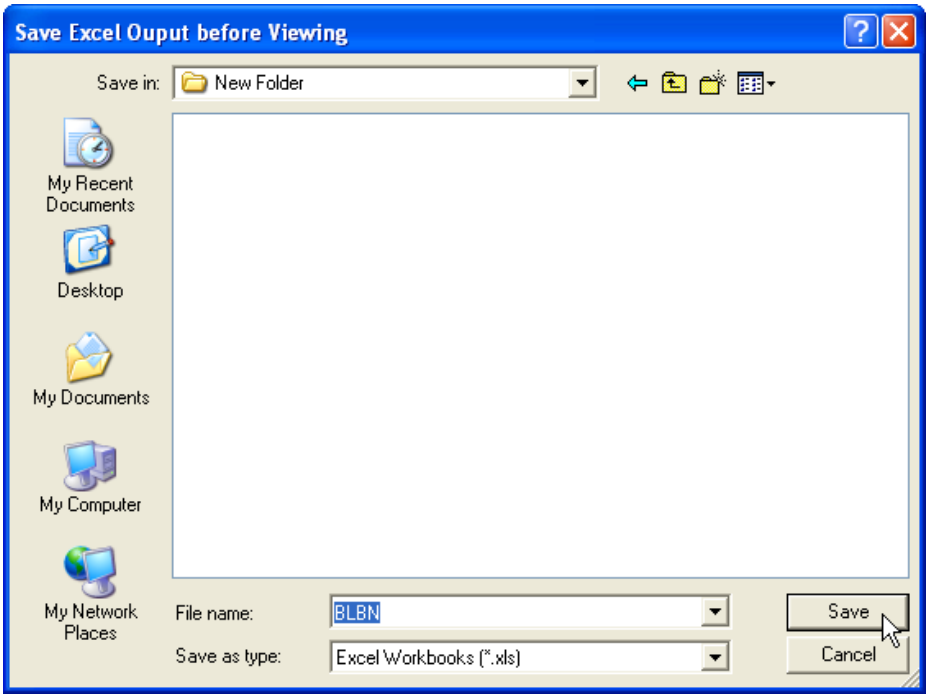
2 To run the Cost Calculation Module click on **Generate Outputs**.



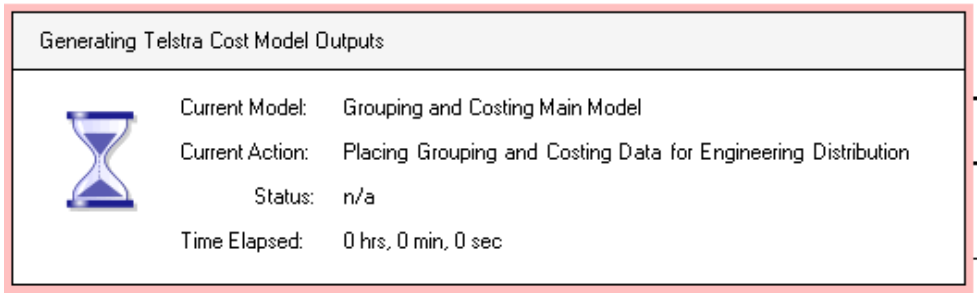
3 You will be prompted to enter a name for the model run and select a location for the file to be saved.



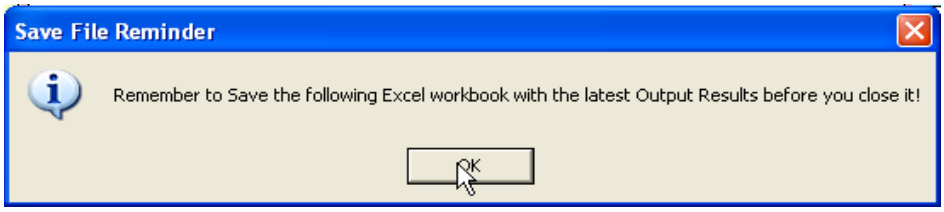
4 Navigate to the folder where the file is to be saved, name the file and click Save.



The Model will begin generating the output and a message box will appear informing you of the progress.



5 Once the processing is complete, a pop-up box will appear reminding you to save the results before closing the workbook. Click on the OK button to see the results.



6 The Model will open the Excel output file for viewing. The first page that will appear is the **ULL Investment by Band Summary** sheet that identifies the projected investment per line for the new network.

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A1 ULL Investment by Band Summary

ULL Investment by Band Summary

Investment Per Line

Investment Category	Band 1	Band 2	Band 3	Reserved	Total
Conduit	$ -	$ 375.60	$ -	$ -	$ -
Pits and Manholes	$ -	$ 62.45	$ -	$ -	$ -
Ducts and Pipes-Main	$ -	$ 438.04	$ -	$ -	$ -
Copper Cables	$ -	$ 328.33	$ -	$ -	$ -
Copper Cable Joints	$ -	$ 67.95	$ -	$ -	$ -
Copper Cables-Main	$ -	$ 396.28	$ -	$ -	$ -
Fibre Cables	$ -	$ 2.23	$ -	$ -	$ -
Fibre Cable Joints	$ -	$ 1.27	$ -	$ -	$ -
Optical Fibre	$ -	$ 3.50	$ -	$ -	$ -

Don't forget to save the file as soon as possible.

See ***Chapter 11*** for a description of the **Cost Calculation Module Excel file**.

11 The Cost Calculation Module

The **Cost Calculation Module** (or Output Spreadsheet) applies the input costs and ratios to the plant and equipment volumes, produced by the engineering modules, to calculate the total investment cost associated with the efficient access network. The capital costs associated with the assets are calculated using the capital cost and depreciation inputs. The Operating and maintenance expenses, indirect expenses and indirect asset costs are determined by applying the expense and indirect asset factors to the direct investment. The capital costs, operating and maintenance expenses, indirect and support asset costs and the indirect expenses are combined to calculate the total annual and monthly costs for an efficient access network.

There are twelve worksheets in the **Cost Calculation Module**. These worksheets can be combined into the following seven categories:

Input worksheets;

Composite cost calculation worksheets;

Network quantities worksheets;

Network cost worksheets;

Capital Cost Calculation; and

Investment and Annual Cost Summaries.

Each of these categories of worksheets performs specific functions that are critical to the calculation of the investments and annual costs.

11.1 Input Worksheets

There are three input worksheets in the **Cost Calculation Module**. Each worksheet is designed to accommodate sets of similar inputs. Virtually all the inputs are user adjustable. However, adjustments to these inputs should be made throughs the user interface. Changes made through the user interface will be populated into these worksheets once a specific scenario is run. Changes which are made directly into the input sheets in the **Cost Calculation Module** will be overridden with the data in the user interface once the integrated Model is run. The three input worksheets are:

Inputs Cost and Rules;

Inputs Ratios; and

Inputs Capital Costs.

a) Inputs Costs and Rules

The Inputs Costs and Rules worksheet contains all the costs for the various network components required to provide the ULLS. Most of these costs are taken directly from the **Access Network Modelling Costing Information** document that was assembled by the Telstra engineering department. There are more than 200 network cost inputs in this worksheet and they fall into the following general categories:

Costs for main and distribution copper and fibre;

Costs for constructing pits and manholes;

Costs for pillars including the pillar strips;

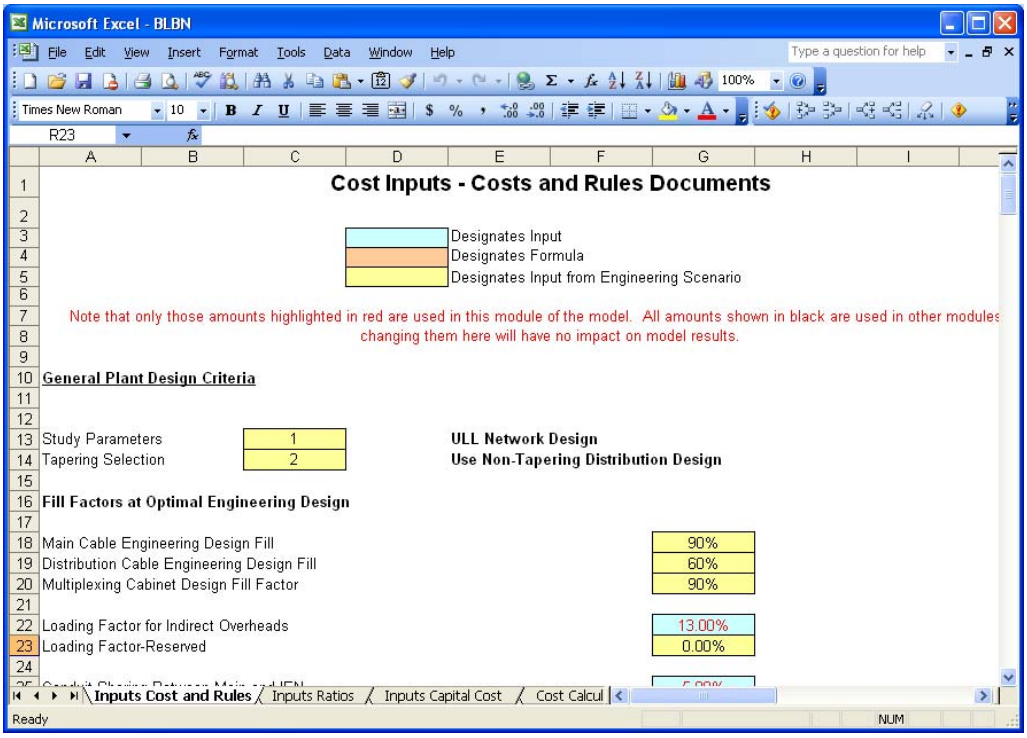
Breakout and reinstatement costs;

Cost for buying and placing conduit in different terrains;

Costs for terminating all the distribution facilities in the exchange; and

Costs for building terminals and two pair lead-ins.

The **Inputs Costs and Rules** also include inputs which represent network rules or placement and cost estimates. The estimates include the level of capitalized overheads, the level of conduit placed by developers in new estates, the sharing of entrance facility cost between the inter-exchange and distribution network, the size of conduit trenches and the size of manholes and pits. There are also a few capacity and fill factor inputs which are derived from the **Access Network Dimensioning Rules**.



If you wish to revise the input values in this worksheet, take note that only those cells with red text on a blue background are editable. Making changes to any other variables will have no impact on the model results contained in this spreadsheet.

Any changes to inputs made in the **Cost Calculation Module** will be overwritten when the model is operated from the user interface. Input changes should be made in the user interface.

Black text on a yellow background designates an input that is actually used in one of the engineering modules. These inputs are identified on this sheet only as a means of having a single sheet that identifies all cost and rules inputs used in the model. Changing these inputs in this Module will have no impact on the model outputs.

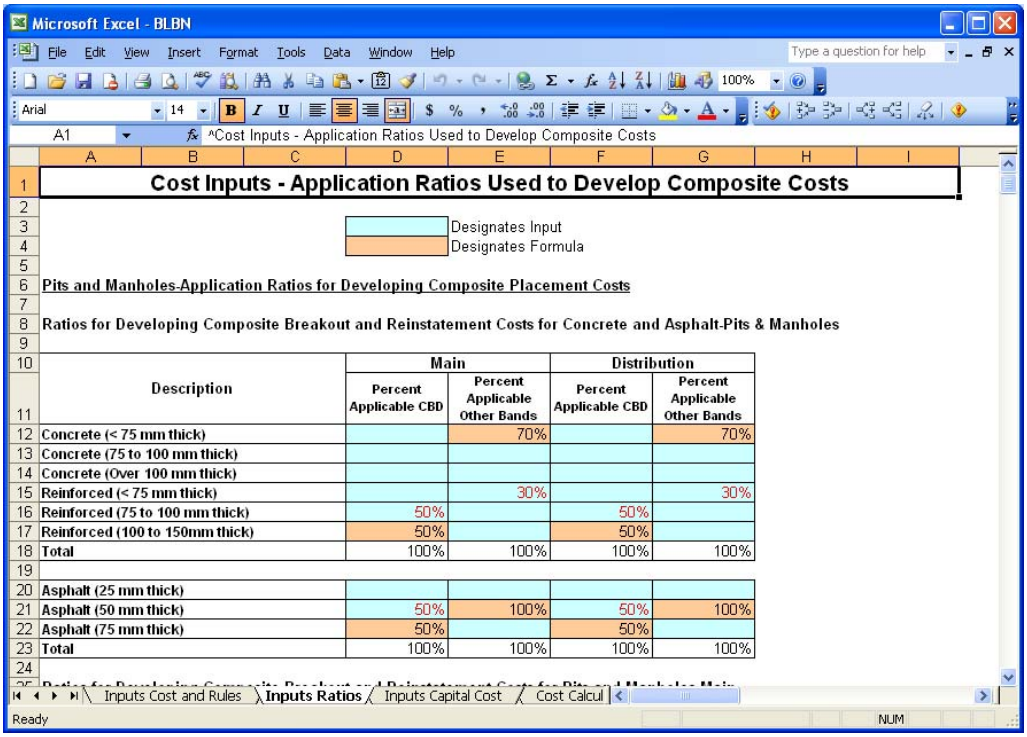
b) Inputs Ratios

The **Inputs Ratios** worksheet identifies ratios which reflect the probable occurrence of various types of placement activities when building a new network. The ratios in the ratio input sheet are designed to reflect the actual environment in which new construction would occur. The ratios identified on this page fall into the following categories:

- Ratios for determining the type and thickness of concrete or asphalt that would be encountered in building facilities in different areas;
- Ratios for identifying the portion of time each type of the breakout and reinstatement activities would be encountered when placing conduits, pits and manholes in different areas; and
- Ratios for identifying the portion of time each type of conduit placement activities (e.g. trenching roads, trenching sod, boring, etc.) would be encountered when placing conduit in different areas.

The ratios for placing pits, manholes and conduit in distribution areas are segregated into five density zones. A sixth density zone was included in The Model for potential use in addressing very rural areas in Band 3. In addition, separate ratios were developed for densely populated central business districts (CBDs).

The Model also provides separate ratios for different sizes of main conduit configurations. Again separate ratios are identified for conduit runs within a CBD and in other urban areas.



If you wish to revise the input values in this worksheet, take note that only those cells with red text on a blue background are editable. Making changes to any other variables will have no impact on the model results contained in this spreadsheet.

Any changes to inputs made in the **Cost Calculation Module** will be overwritten when the model is operated from the user interface. Input changes should be made in the user interface. Black text on an orange background designates a cell that is a calculation. These calculations are incorporated into the model to assure that the sum of all the possible placement activities equals 100 percent. Overriding these calculations may lead to errors.

c) Inputs Capital Costs

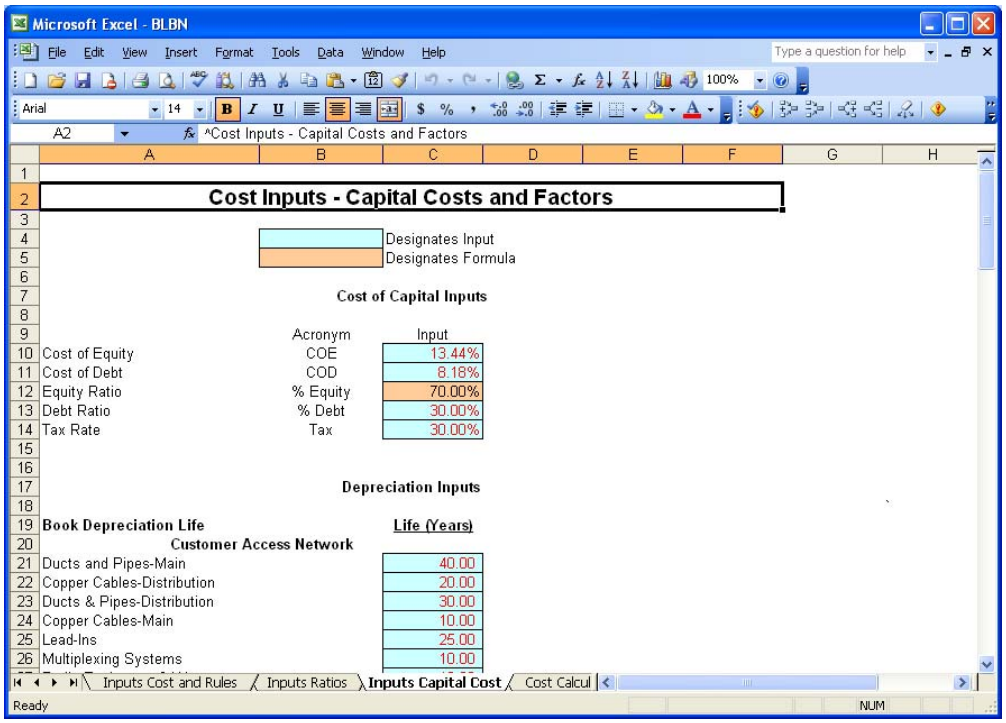
The **Inputs Capital Costs** worksheet identifies all the inputs required to turn an investment amount into an annual cost. All the inputs for determining capital costs and the direct and indirect ratios for determining operating expenses and indirect asset costs are identified on this worksheet.

The capital cost inputs include the costs for debt and equity, the capital structure ratios, the tax rate and the depreciation lives for each of the asset categories.

The sheet also includes expense factors for operating and maintenance expenses (expressed as a percentage of investment) and indirect expenses such as general administration and information technologies (expressed as a percentage of direct operating and maintenance expense).

There are also two sets of indirect investment ratios for network assets and general and administrative assets which are expressed as a percentage of direct plant in service.

By applying these capital and expense factors to investment one can derive annual and monthly capital costs.



If you wish to revise the input values in this worksheet, take note that only those cells with red text on a blue background are editable. Making changes to any other variables will have no impact on the model results contained in this spreadsheet.

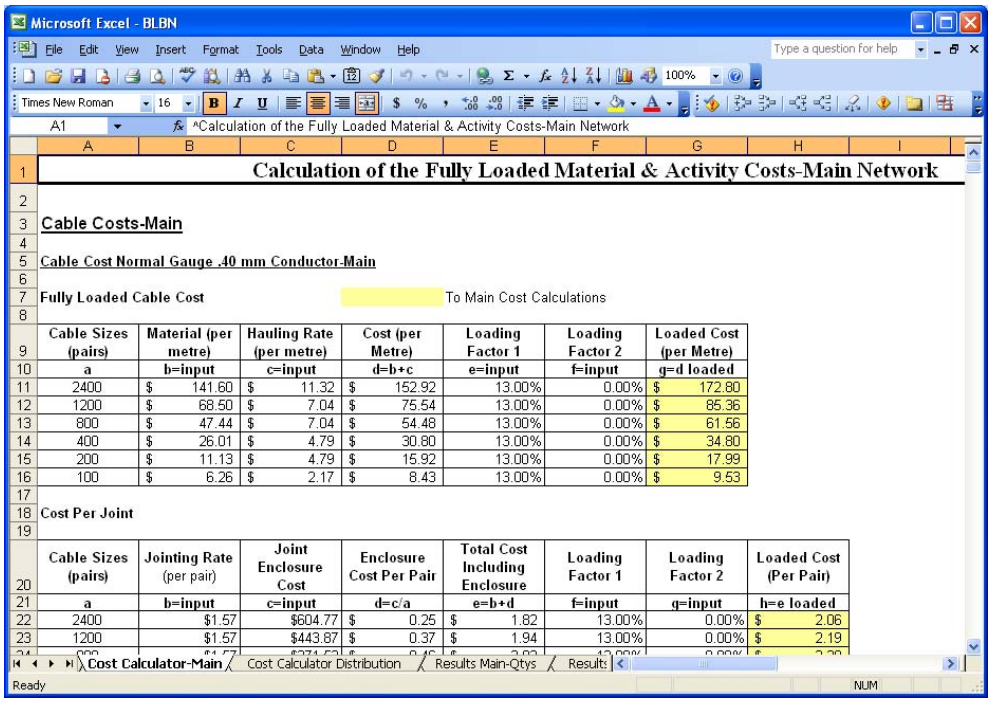
Any changes to inputs made in the **Cost Calculation Module** will be overwritten when the model is operated from the user interface. Input changes should be made in the user interface.

11.2 Composite Cost Calculation Worksheets

There are two cost calculator worksheets: **Cost Calculator-Main** and **Cost Calculator Distribution**. On these sheets the inputs from the Inputs Cost and Rules and the Inputs Ratios are used to derive composite costs that can be applied against the investment quantities derived in the **Engineering Distribution** and the **Engineering Main Modules**. One worksheet is the cost calculator worksheet for costs for the Main network, and the other is for the Distribution network.

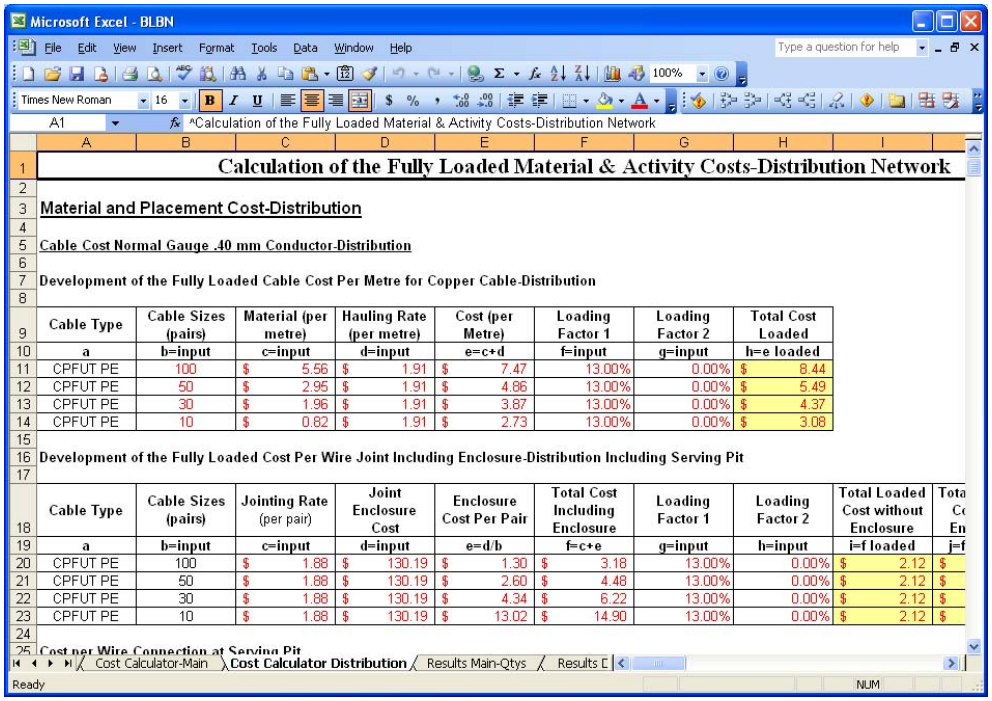
Functions performed on these worksheets include:

- Combining the various types of costs for a given activity to derive a combined cost for that activity (e.g. combining the material and hauling costs for cable to derive a combined single cost per metre);
- Applying the ratios for different types of placement activities to the cost of those activity to get a composite cost by density group (distribution) or conduit size (both main and distribution) to apply to quantities;
- Applying ratios to account for the cost savings that occur when placing cable in developer supplied trenches and when sharing trenches between the main cable and inter-exchange network facilities; and
- Applying factors to account for normal overhead loadings.



Cable Sizes (pairs)	Material (per metre)	Hauling Rate (per metre)	Cost (per Metre)	Loading Factor 1	Loading Factor 2	Loaded Cost (per Metre)
a	b=input	c=input	d=b+c	e=input	f=input	g=d loaded
2400	$ 141.60	$ 11.32	$ 152.92	13.00%	0.00%	$ 172.80
1200	$ 68.50	$ 7.04	$ 75.54	13.00%	0.00%	$ 85.36
800	$ 47.44	$ 7.04	$ 54.48	13.00%	0.00%	$ 61.56
400	$ 26.01	$ 4.79	$ 30.80	13.00%	0.00%	$ 34.80
200	$ 11.13	$ 4.79	$ 15.92	13.00%	0.00%	$ 17.99
100	$ 6.26	$ 2.17	$ 8.43	13.00%	0.00%	$ 9.53

Cable Sizes (pairs)	Jointing Rate (per pair)	Joint Enclosure Cost	Enclosure Cost Per Pair	Total Cost Including Enclosure	Loading Factor 1	Loading Factor 2	Loaded Cost (Per Pair)
a	b=input	c=input	d=c/a	e=b+d	f=input	g=input	h=e loaded
2400	$1.57	$604.77	$ 0.25	$ 1.82	13.00%	0.00%	$ 2.06
1200	$1.57	$443.87	$ 0.37	$ 1.94	13.00%	0.00%	$ 2.19



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A1 ^Calculation of the Fully Loaded Material & Activity Costs-Distribution Network

Calculation of the Fully Loaded Material & Activity Costs-Distribution Network

Material and Placement Cost-Distribution

Cable Cost Normal Gauge .40 mm Conductor-Distribution

Development of the Fully Loaded Cable Cost Per Metre for Copper Cable-Distribution

Cable Type	Cable Sizes (pairs)	Material (per metre)	Hauling Rate (per metre)	Cost (per Metre)	Loading Factor 1	Loading Factor 2	Total Cost Loaded
a	b=input	c=input	d=input	e=c+d	f=input	g=input	h=e loaded
CPFUT PE	100	$ 5.56	$ 1.91	$ 7.47	13.00%	0.00%	$ 8.44
CPFUT PE	50	$ 2.95	$ 1.91	$ 4.86	13.00%	0.00%	$ 5.49
CPFUT PE	30	$ 1.96	$ 1.91	$ 3.87	13.00%	0.00%	$ 4.37
CPFUT PE	10	$ 0.82	$ 1.91	$ 2.73	13.00%	0.00%	$ 3.08

Development of the Fully Loaded Cost Per Wire Joint Including Enclosure-Distribution Including Serving Pit

Cable Type	Cable Sizes (pairs)	Jointing Rate (per pair)	Joint Enclosure Cost	Enclosure Cost Per Pair	Total Cost Including Enclosure	Loading Factor 1	Loading Factor 2	Total Loaded Cost without Enclosure	Tota Co En
a	b=input	c=input	d=input	e=d/b	f=c+e	g=input	h=input	i=f loaded	j=f
CPFUT PE	100	$ 1.88	$ 130.19	$ 1.30	$ 3.18	13.00%	0.00%	$ 2.12	$
CPFUT PE	50	$ 1.88	$ 130.19	$ 2.60	$ 4.48	13.00%	0.00%	$ 2.12	$
CPFUT PE	30	$ 1.88	$ 130.19	$ 4.34	$ 6.22	13.00%	0.00%	$ 2.12	$
CPFUT PE	10	$ 1.88	$ 130.19	$ 13.02	$ 14.90	13.00%	0.00%	$ 2.12	$

Cost per Wire Connection at Serving Pit

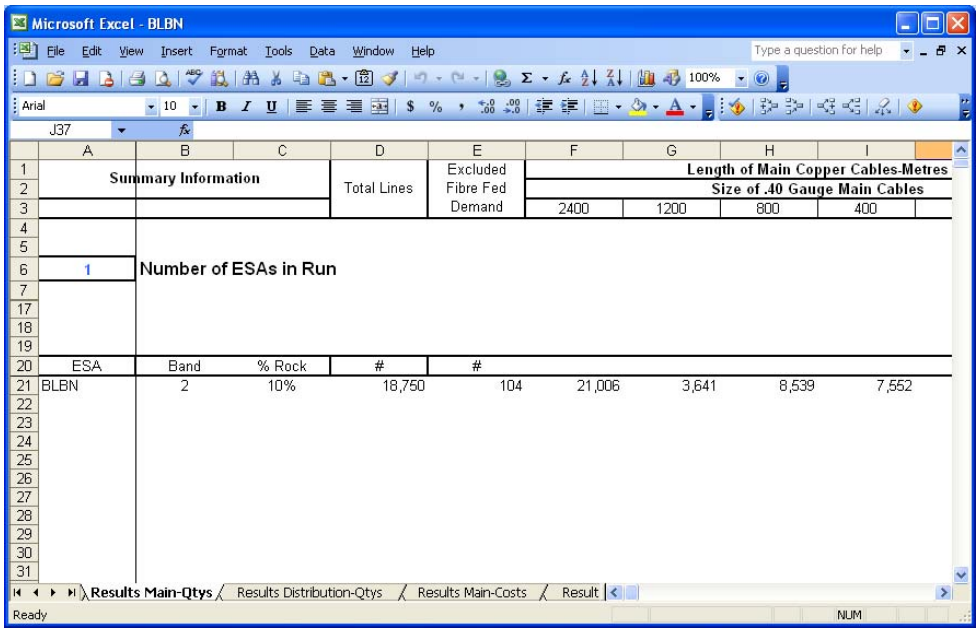
Cost Calculator-Main | Cost Calculator Distribution | Results Main-Qtys | Results E

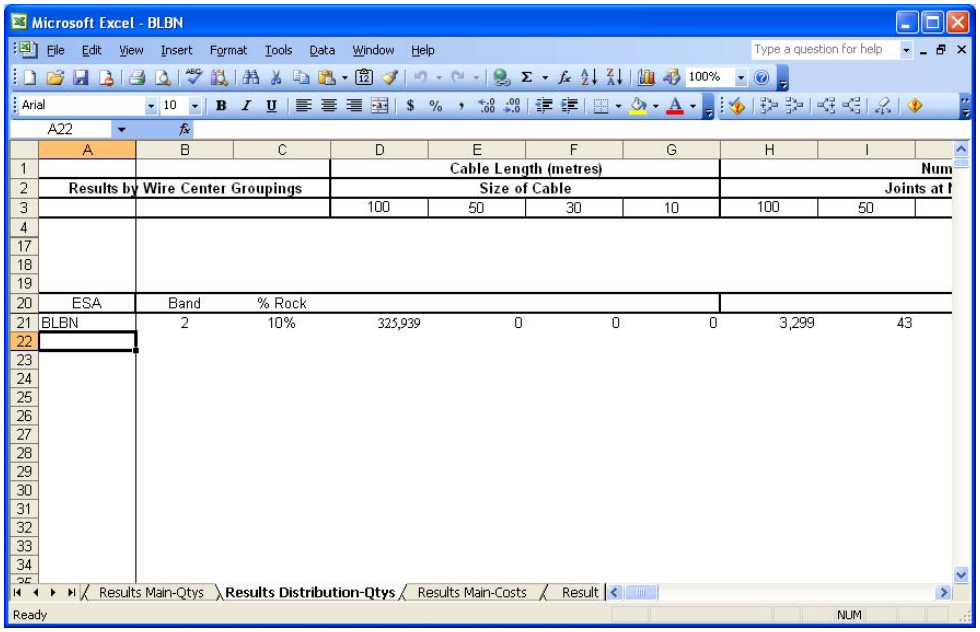
Ready NUM

These worksheets do not contain any editable variables and making changes to the formulas may result in unpredictable cost outcomes.

11.3 Network Quantities Worksheets

There are two network quantities worksheets: **Results Main – Qtys** and **Results Distribution - Qtys**. Each of these sheets displays the output by ESA that is produced by the Engineering Distribution Module and the Engineering Main Module. There is one line of data for each ESA and that one line of data coincides with the single line of data that would be shown on the Distribution – Summary and Main – Summary worksheets when any single ESA was processed through the two modules. These worksheets simply import the data from the Engineering Modules.

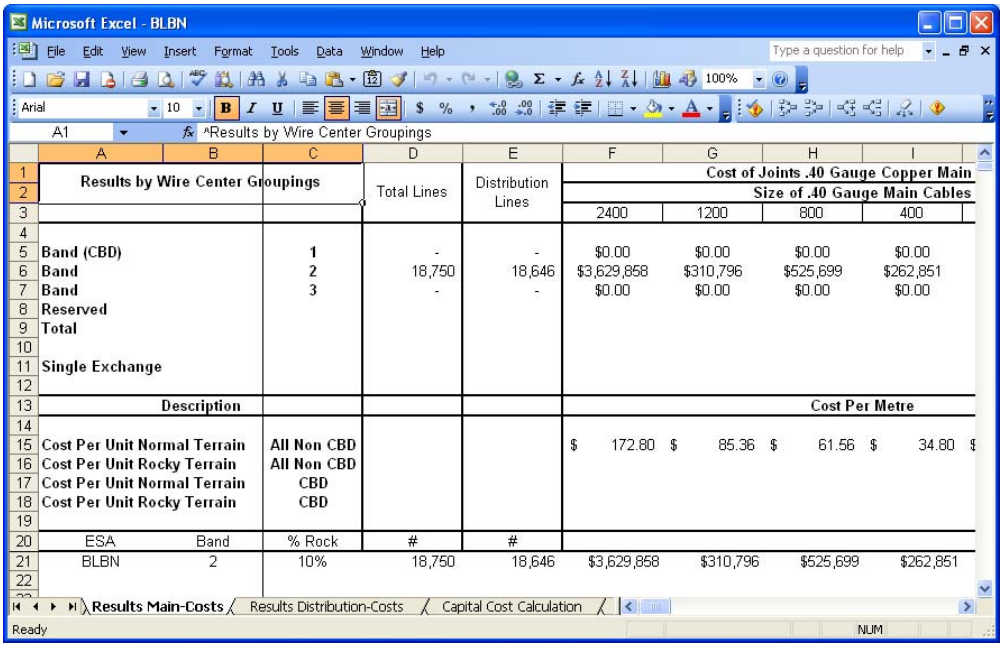




These worksheets do not contain any editable variables and making changes to the formulas may result in unpredictable cost outcomes.

11.4 Network Cost Worksheets

There are two network quantities worksheets: **Results Main –Costs** and **Results Distribution - Costs**. In each of these sheets the cost by ESA for each type of plant identified on the network quantity worksheets is calculated by applying the costs developed in the cost calculator worksheets to the quantities in the network quantity worksheets.



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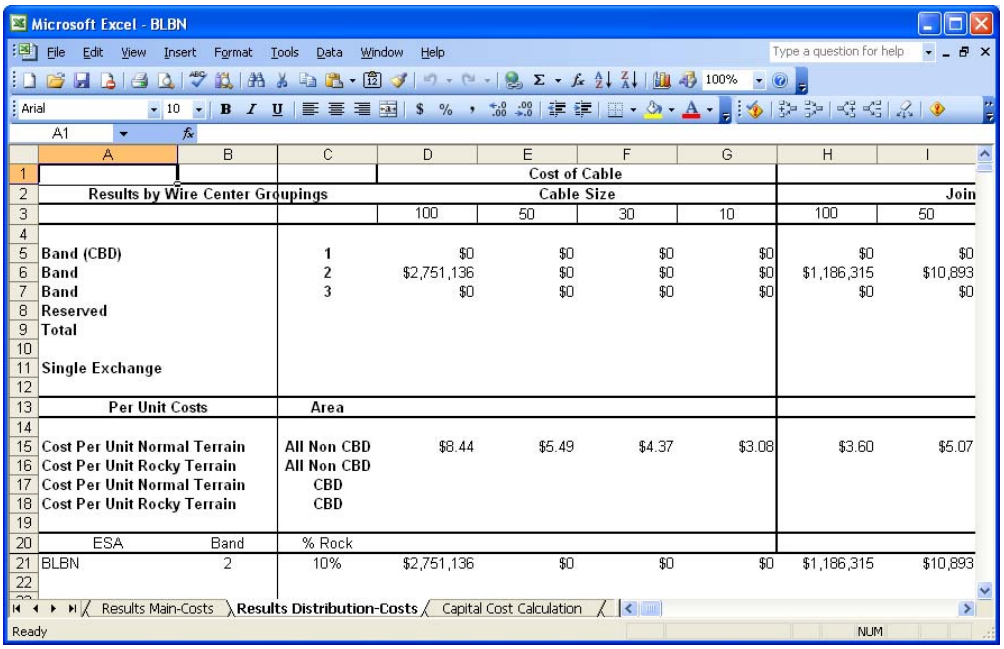
A1: ^Results by Wire Center Groupings

	A	B	C	D	E	F	G	H	I
1	Results by Wire Center Groupings			Total Lines	Distribution Lines	Cost of Joints .40 Gauge Copper Main			
2						Size of .40 Gauge Main Cables			
3						2400	1200	800	400
4									
5	Band (CBD)		1	-	-	$0.00	$0.00	$0.00	$0.00
6	Band		2	18,750	18,646	$3,629,858	$310,796	$525,699	$262,851
7	Band		3	-	-	$0.00	$0.00	$0.00	$0.00
8	Reserved								
9	Total								
10									
11	Single Exchange								
12									
13	Description							Cost Per Metre	
14									
15	Cost Per Unit Normal Terrain		All Non CBD			$ 172.80	$ 85.36	$ 61.56	$ 34.80
16	Cost Per Unit Rocky Terrain		All Non CBD						
17	Cost Per Unit Normal Terrain		CBD						
18	Cost Per Unit Rocky Terrain		CBD						
19									
20	ESA	Band	% Rock	#	#				
21	BLBN	2	10%	18,750	18,646	$3,629,858	$310,796	$525,699	$262,851
22									

Sheet tabs: Results Main-Costs | Results Distribution-Costs | Capital Cost Calculation

Ready | NUM



Microsoft Excel - BLBN

A1:

	A	B	C	D	E	F	G	H	I
1				Cost of Cable					
2	Results by Wire Center Groupings			Cable Size					Join
3				100	50	30	10	100	50
4									
5	Band (CBD)		1	$0	$0	$0	$0	$0	$0
6	Band		2	$2,751,136	$0	$0	$0	$1,186,315	$10,893
7	Band		3	$0	$0	$0	$0	$0	$0
8	Reserved								
9	Total								
10									
11	Single Exchange								
12									
13	Per Unit Costs		Area						
14									
15	Cost Per Unit Normal Terrain		All Non CBD	$8.44	$5.49	$4.37	$3.08	$3.60	$5.07
16	Cost Per Unit Rocky Terrain		All Non CBD						
17	Cost Per Unit Normal Terrain		CBD						
18	Cost Per Unit Rocky Terrain		CBD						
19									
20	ESA	Band	% Rock						
21	BLBN	2	10%	$2,751,136	$0	$0	$0	$1,186,315	$10,893
22									

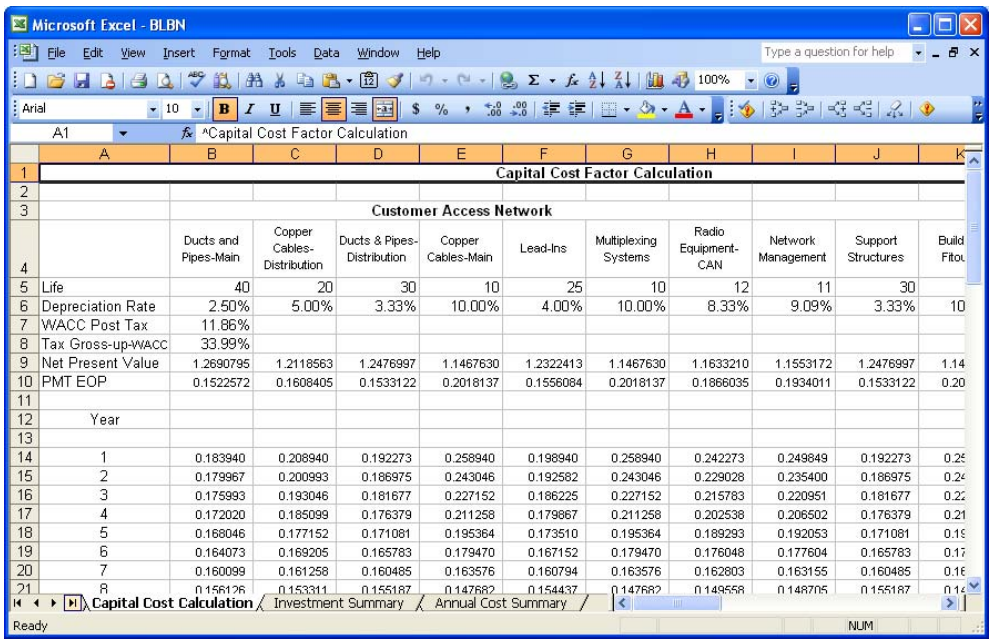
Sheet tabs: Results Main-Costs | Results Distribution-Costs | Capital Cost Calculation

Ready | NUM

These worksheets do not contain any editable variables and making changes to the formulas may result in unpredictable cost outcomes.

11.5 Capital Cost Calculation

The **Capital Cost Calculation** worksheet develops composite capital cost factors for each category of plant used in The Model. These factors account for the cost of financing throughout the plants life (i.e. equity and debt), the annual depreciation accruals throughout the life of the plant for each plant category and the income taxes associated with the equity return component of capital costs. These are all combined into a single factor that can be applied to the investment levels developed on the other worksheets.



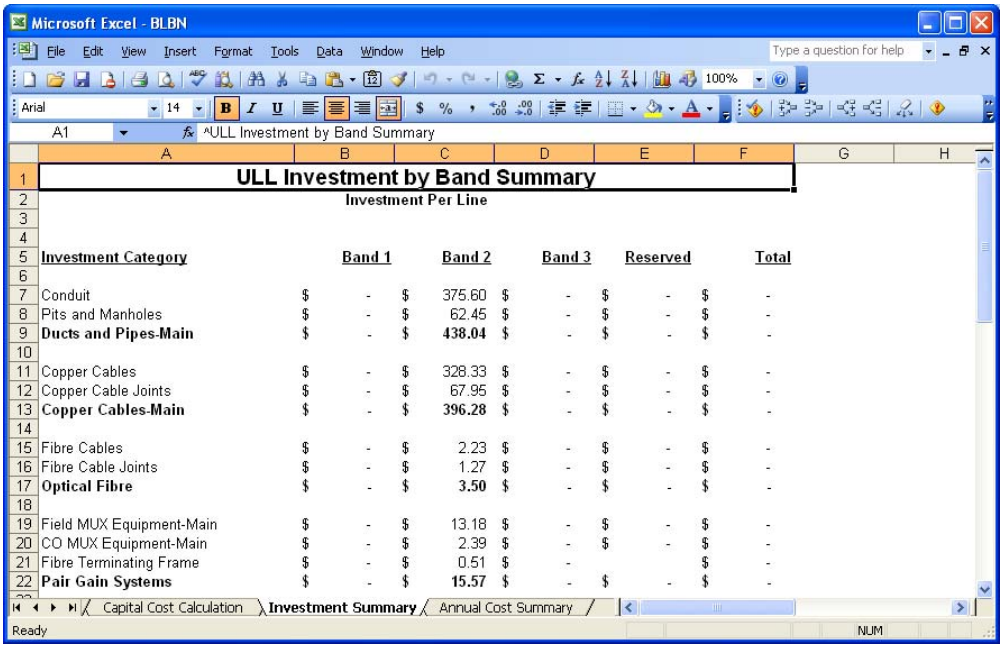
This worksheet does not contain any editable variables and making changes to the formulas may result in unpredictable cost outcomes.

11.6 Investment and Annual Cost Summaries

There are two summary worksheets. The **Investment Summary** worksheet identifies the ULL investment per line for each customer in ESA's that were processed. The investment costs on the two network cost worksheets are totalled by category and then divided by the number of customers in the studied ESAs. This produces an investment cost per customer for each category of plant in The Model (e.g. copper and fibre cables).

The annual and monthly costs for the investment derived above are calculated on the **Annual Cost Summary** worksheet. First the capital costs factors developed in the Capital Cost Calculation are applied to each of the investments for the various plant categories identified in the investment summary. Next the direct and indirect expense amounts are calculated by asset category. Finally, indirect asset costs are derived by asset category. These various costs are then combined to identify the annual and monthly costs associated with providing the service.

The calculations performed by each of these worksheets and how they produce the final results are described in more detail in the document **TEA Model Documentation**.



Microsoft Excel - BLBN

File Edit View Insert Format Tools Data Window Help

A1 ^ULL Investment by Band Summary

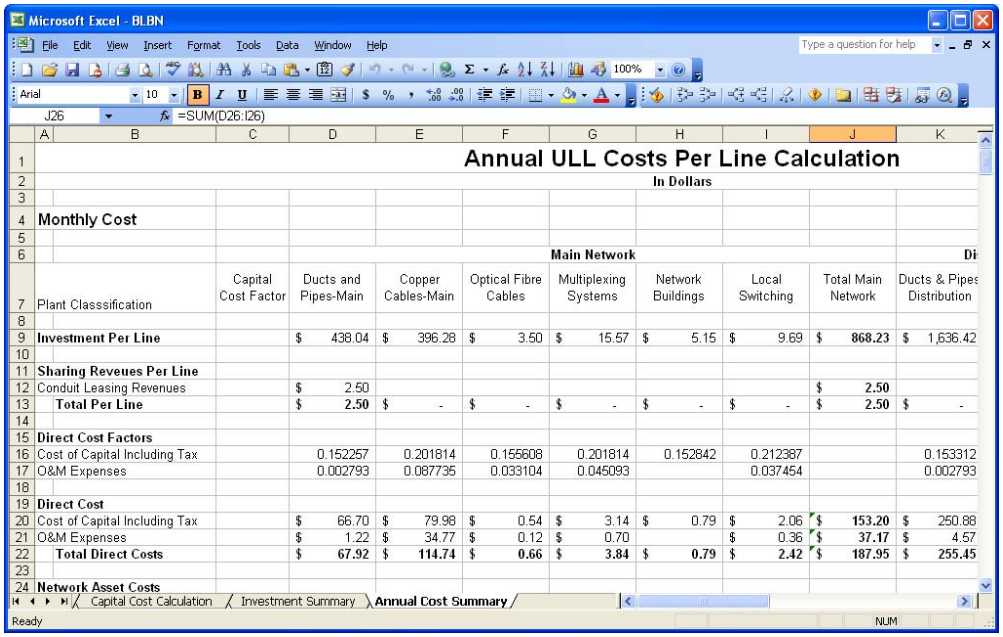
ULL Investment by Band Summary

Investment Per Line

Investment Category	Band 1	Band 2	Band 3	Reserved	Total
Conduit	$ -	$ 375.60	$ -	$ -	$ -
Pits and Manholes	$ -	$ 62.45	$ -	$ -	$ -
Ducts and Pipes-Main	$ -	$ **438.04**	$ -	$ -	$ -
Copper Cables	$ -	$ 328.33	$ -	$ -	$ -
Copper Cable Joints	$ -	$ 67.95	$ -	$ -	$ -
Copper Cables-Main	$ -	$ **396.28**	$ -	$ -	$ -
Fibre Cables	$ -	$ 2.23	$ -	$ -	$ -
Fibre Cable Joints	$ -	$ 1.27	$ -	$ -	$ -
Optical Fibre	$ -	$ **3.50**	$ -	$ -	$ -
Field MUX Equipment-Main	$ -	$ 13.18	$ -	$ -	$ -
CO MUX Equipment-Main	$ -	$ 2.39	$ -	$ -	$ -
Fibre Terminating Frame	$ -	$ 0.51	$ -	$ -	$ -
Pair Gain Systems	$ -	$ **15.57**	$ -	$ -	$ -

Capital Cost Calculation | **Investment Summary** | Annual Cost Summary

Ready NUM



Microsoft Excel - BLBN

File Edit View Insert Format Tools Data Window Help

J26 =SUM(D26:I26)

Annual ULL Costs Per Line Calculation

In Dollars

Monthly Cost

Plant Classsification	Capital Cost Factor	Ducts and Pipes-Main	Copper Cables-Main	Optical Fibre Cables	Multiplexing Systems	Network Buildings	Local Switching	Total Main Network	Ducts & Pipes Distribution
		Main Network							**Di**
Investment Per Line		$ 438.04	$ 396.28	$ 3.50	$ 15.57	$ 5.15	$ 9.69	$ **868.23**	$ 1,636.42
Sharing Reveues Per Line									
Conduit Leasing Revenues		$ 2.50						$ **2.50**	
Total Per Line		$ **2.50**	$ -	$ -	$ -	$ -	$ -	$ **2.50**	$ -
Direct Cost Factors									
Cost of Capital Including Tax		0.152257	0.201814	0.155608	0.201814	0.152842	0.212387		0.153312
O&M Expenses		0.002793	0.087735	0.033104	0.045093		0.037454		0.002793
Direct Cost									
Cost of Capital Including Tax		$ 66.70	$ 79.98	$ 0.54	$ 3.14	$ 0.79	$ 2.06	$ **153.20**	$ 250.88
O&M Expenses		$ 1.22	$ 34.77	$ 0.12	$ 0.70		$ 0.36	$ **37.17**	$ 4.57
Total Direct Costs		$ **67.92**	$ **114.74**	$ **0.66**	$ **3.84**	$ **0.79**	$ **2.42**	$ **187.95**	$ **255.45**
Network Asset Costs									

Capital Cost Calculation | Investment Summary | **Annual Cost Summary**

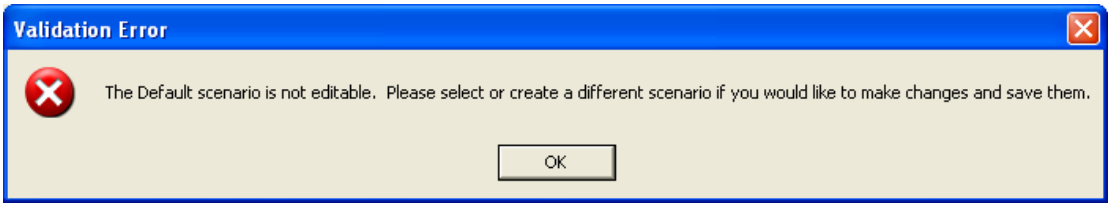
Ready NUM

These worksheets do not contain any editable variables and making changes to the formulas may result in unpredictable cost outcomes.

This last worksheet is where you will find the annual (and monthly) cost per line, averaged for all of the ESAs chosen in the Grouping Scenario. The cost is broken down into the component asset categories.

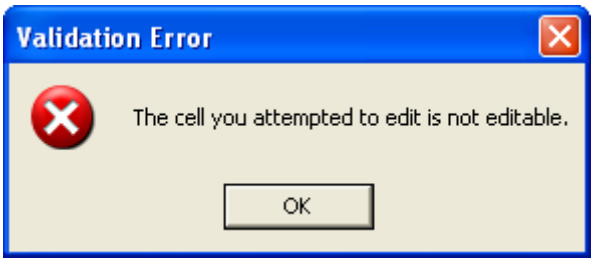
12 Troubleshooting

If there is an error opening The Model, you might need to install the .Net 1.1 Framework. From the **Telstra Cost Model Disk**, navigate to the "**1.1 Framework**" directory. Double-click the file "**dotnetfx.exe**" and follow the instructions for installation. If necessary, a Service Pack release for the .Net 1.1 Framework is also included on the disk. See ***Section 5.1 Installing The Model***.



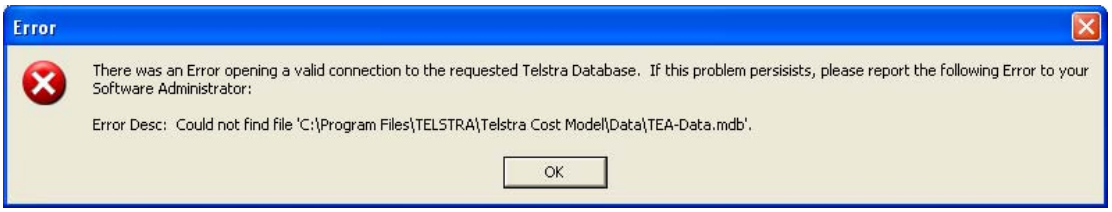
Issue: You have tried to edit a cell in the default scenario.

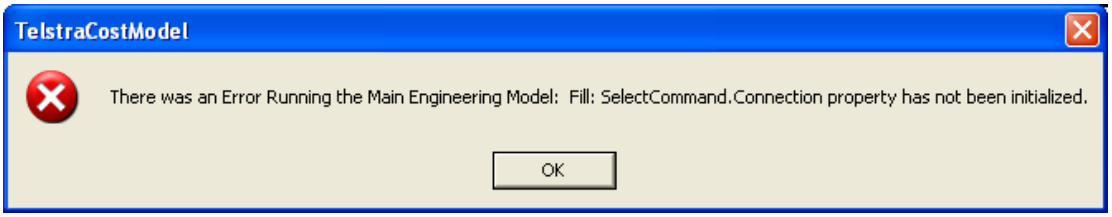
Solution: Create a new scenario before making the required changes. For further information see ***Section 7.1*** for the Grouping scenario, ***Section 8.1*** for the Engineering scenario or ***Section 9.1*** for the Costing scenario.



Issue: You have tried to edit a cell which is not editable.

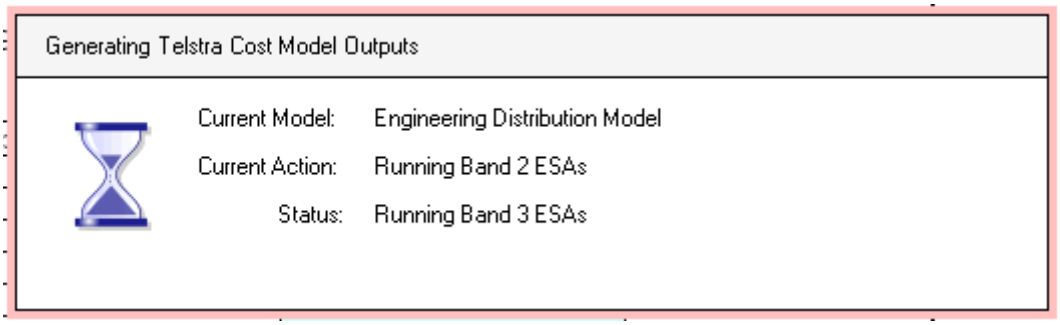
Solution: Only those items noted in ***Appendix A*** can be edited. They are generally recognisable by the red text on a blue background (except in the Grouping Scenario where the only editable items are the Rock% and the ESA selection).





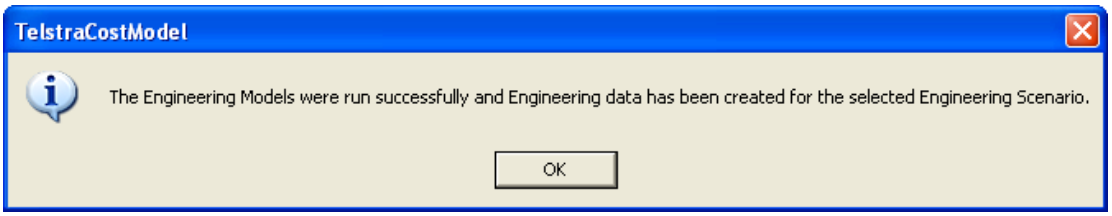
Issue: The TEA-Data database is not in the expected location and The Model could not make a connection to the database to generate the Engineering data.

Solution Ensure that the TEA-Data database is located in the installation folder. See ***Section 5*** for more information.



Issue: The Model doesn't seem to finish and you can see this dialog on screen with the status of data generation referring to Band 3 ESAs.

Solution The Model currently only runs on Band 2 ESAs. If you see this message, the engineering data generation has completed and The Model is waiting for you to click on the **OK** button on the dialog informing you of this. If this dialog (shown below) is not currently visible, it can be found by scrolling through the list of open windows using Alt-Tab. Click on the **OK** button and you will return to The Model.



13 References

Document Title	Description
TEA Model Documentation	Documentation of The Model architecture and methodology.
Access Network Modelling Costing Information	Documentation of the unit costs included in the model.
Access Network Dimensioning Rules	Documentation of the rules representing efficient network engineering best practices.

14 Index

APPENDIX A Editable Variables in The Model

A.1 Overview

The model contains an extensive list of user input variables. All these variables are accessed through the user interface[1]. There are six input sheets or input categories in the user interface:

(a) **Grouping Inputs** – the primary purpose of this input category is to provide the ability to select the ESAs to be process in any given run of the model;

(b) **General Plant Design Criteria – Main Network** – This category of inputs lists the engineering rules and criteria used in the Main Engineering Module in determining the types, sizes and quantities of each component of the main network required to efficiently provision a new customer access network for unbundled local loop (ULL) service;

(c) **General Plant Design Criteria – Distribution Network** – This category of inputs lists the engineering rules and criteria used in the Distribution Engineering Module in determining the types, sizes and quantities of each component of the distribution network required to efficiently provision a new customer access network.;

(d) **Cost Inputs - Costs and Rules Documents** – This category of inputs provides the network construction prices (i.e. equipment and placement prices) and network dimensioning criteria (i.e. sizes of trenches and manholes) used in the Cost Calculation Module to quantify the investment cost for the various network components identified in the engineering modules;

(e) **Cost Inputs - Application Ratios Used to Develop Composite Costs** - This category of inputs identifies ratios which reflect the probable occurrence of various types of placement activities which will be needed when building a new network; and

(f) **Cost Inputs – Capital Costs and Factors** - The category of inputs identifies all the inputs required to turn an investment amount into an annual cost including capital costs, depreciation lives, income taxes, direct and indirect expense and investment factors.

The network dimensioning and design criteria used in the engineering modules to quantify and size the network components required to efficiently provide access service were obtained from the **Access Network Dimensioning Rules** (**Rules**) document. These **Rules** were developed by Telstra's' plant engineering department and were based on the actual rules used by that department to design and construct new plant facilities. Most of the critical network dimensioning rules and parameters

[1] Note that these inputs can be also accessed and changed by dropping down into each of the modules; however, any changes made to these worksheets will be over ridden when the integrated model is run using the user interface.

are built into the model as user adjustable inputs. The inputs parameters also allow selection of the type of serviced being modelled (ULL or basic service) and/or the basic distribution network cable layout (i.e. tapered or non-tapered).

The vast majority of network construction pricing and dimensioning inputs are obtained from the **Access Network Modelling Costing Information** document compiled by the Telstra engineering department. The costing information contained in this document was primarily obtained from the Schedule of Rates document attached to vendor contracts. However, in certain instances the information in the contract had to be supplemented by either contractor quotes or engineering estimates. Virtually all of these pricing and dimensioning rules are user adjustable inputs into the model.

Application ratios are designed to account for variations in the environment and terrain in which the new facilities will be constructed. Construction costs vary based on the terrain (i.e. rocky or normal) and the type of construction environment (i.e. turf, roads, footpaths and driveways) that will be encountered when placing the facilities. The application ratios identify the percentage of time each type of placement activity will be required.

The capital cost inputs are the rate of return on equity, the cost of debt, the capital structure ratios, the income tax rate and the average depreciable life for each category of asset used in the TEA model. The expense inputs consist of factors to derive annual costs for:

- Direct expenses (e.g. maintenance, product management);
- Indirect expenses (e.g. information technologies, accounting);
- Network assets (e.g. network buildings, power systems); and
- Indirect assets (e.g. buildings, computer systems).

The list of user adjustable inputs provides a user with maximum flexibility and ease of use. The categories of inputs identified above allow users of the model to adjust the preponderance of critical parameters used in calculating the replacement CAN costs.

It should be noted that when making changes to the engineering inputs it can take many hours to process all ESAs through the model. Therefore, it is recommended that sensitivity runs on the impacts of changes to the engineering input variable be tested using one or a small group of ESAs. Once the final list of proposed inputs is determined then they can be run for all ESAs.

Note that changes to other input variables (i.e. network prices and ratios, capital costs, expense factors and rock percentages) are not processed through the engineering modules so processing time is reasonably fast even when all ESAs are being processed as long as there were no concurrent changes to the engineering variables.

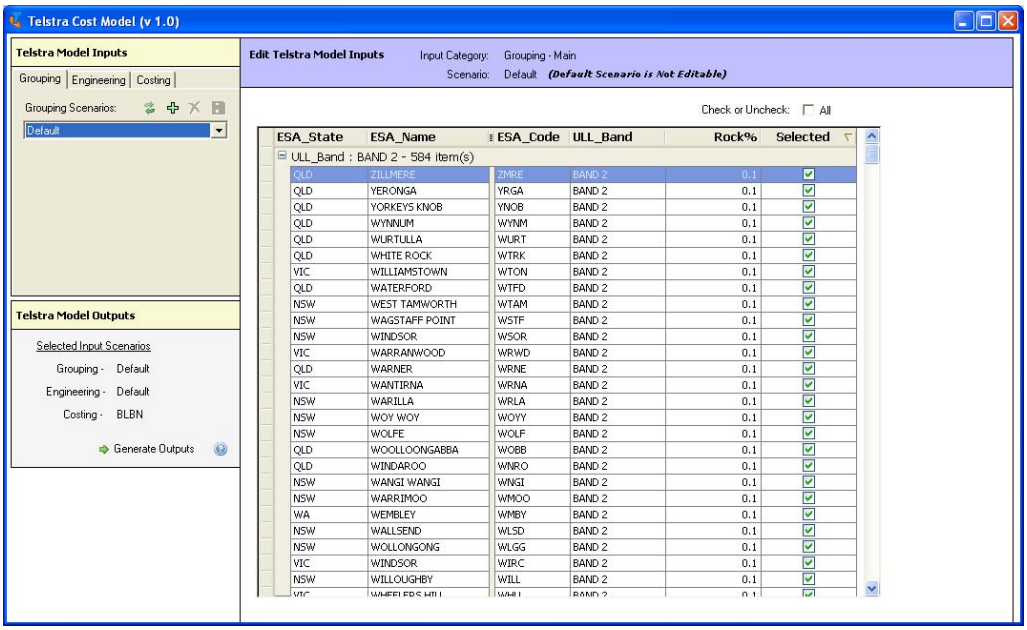
The following sections describe in more detail the input variables by the categories listed above.

A.2 Grouping Variables

The **Grouping Main** scenario input sheet provides two capabilities:

- The ability to select the specific ESA(s) that will be processed in any given model run; and
- The ability to adjust the percentage of rocky terrain that would be encountered in any ESA.

You can select to process any single, or any combination of, ESAs in a scenario.



The above picture shows the Grouping main input sheet. This sheet will appear when first opening the model or when the grouping tab is selected. The following categories of information are contained in each column of the sheet:

Column Heading	Description	☑ User Adjustable
ESA_State	The Australian State in which the ESA is Located ACT – Australian Capital Territory NSW – New South Wales NT – Northern territory QLD-Queensland SA-South Australia TAS-Tasmania VIC-Victoria WA-Western Australia	☒
ESA_Name	The name of the ESA – often corresponds with the locality (town, suburb)	☒
ESA_Code	The four-letter identification code for the ESA	☒
ULL_Band	The band to which the ESA is assigned according to the density rules. The Model currently includes only Band 2 ESAs.	☒
Rock%	The percentage of rocky ground that would be encountered in an ESA. This variable is used to determine placement costs in the Distribution Results – Costs tab of the Cost Calculation Module.	☑
Selected	Box identifying which ESA have been selected for processing in the current run of the model. A checkmark will be in the box if the ESA has been selected.	☑

Only the rock percentage and the ESA selection is user adjustable in the model at this time.

A.3 Engineering Variables : Engineering - Main

a) General

The **Engineering - Main** input sheet contains the key design criteria for the main network. These rules are taken from the **Access Network Dimensioning Rules** ("**Rules**") developed by the Telstra engineering department. The **Rules** are designed to reflect the best in-use engineering practices and procedures for deploying a new ULL network. Many of these rules can be adjusted in the input

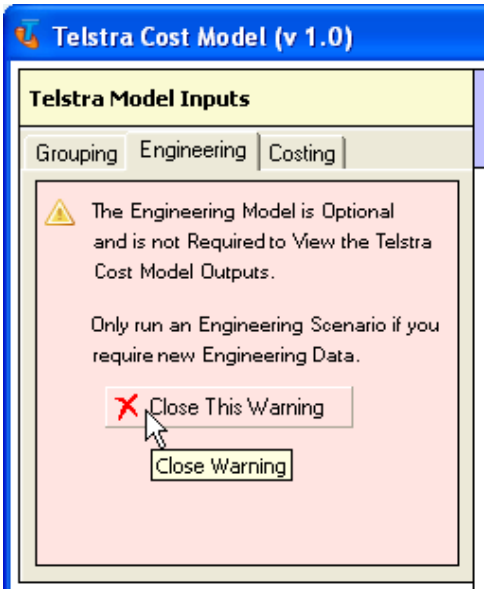
sheets incorporated into the user interface to the models[2]. The user adjustable rules and model parameters that are included in the **Engineering - Main** sheet are:

- The selection that specifies whether the module will design a main network for the ULL product (designated by a 1) or a network to provide basic service (designated by a 2);
- the main cable fill that is used to design the copper cable network in the main module;
- the multiplexing cabinet fill that is used to size the multiplexing equipment in the main module;
- the maximum haul length for each size (number of pairs) and gauge of main copper cables, which is used to determine the maximum distance between cable joints;
- the maximum haul length for each size (number of fibres) of main fibre cables, which is used to determine the maximum distance between cable joints; and
- the maximum allowable distance between manholes and pits in the main network.

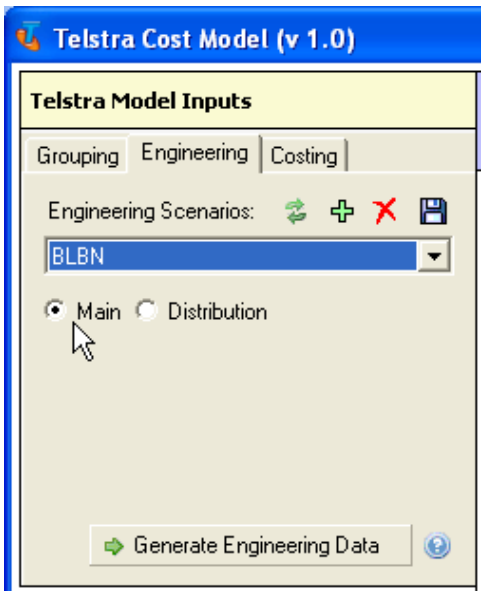
Changes to engineering rules require a significant time to process for a large grouping of ESAs. Sensitivity testing for the impact of changes to engineering inputs can be done efficiently by running the input changes on a single or small sample of ESAs. Once the final list of engineering inputs revisions has been decided, all ESAs can be run with the new inputs.

[2] Changes to these rules or parameters should be made in the inputs sheets incorporated into the user interface to the model. Input changes made directly into this module will not flow through to the Cost Calculation Module or results).

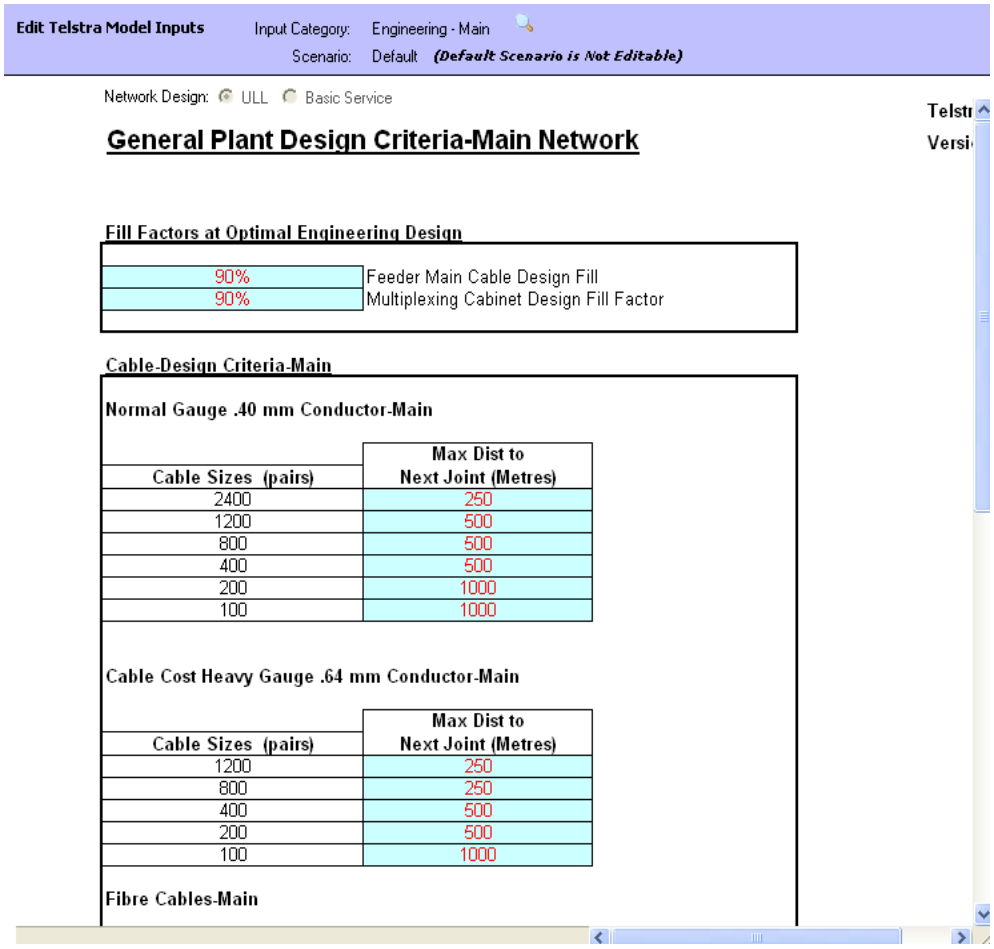
To access the **Engineering** input sheets select the **Engineering** tab and then click on the button to remove the warning.



Click on the button titled **Main** which is immediately below the drop down box to access the **Engineering Main** input sheet.



Once you have entered the **Engineering Main** page the following sheet appears in the **Edit Telstra Model Inputs** section of the page. Note that any item highlighted in red font with blue background is a user adjustable input. There are more than 25 user adjustable input variables on this sheet. Each can be adjusted by merely clicking on the box and typing in another input value. The default values for these inputs follow the guidelines specified in the **Rules**.



You will need to use the scrollbars located at the right and bottom of the main window to display all of the available information on these pages. Each of these inputs will be discussed in the order they appear on this sheet.

b) Specific Inputs

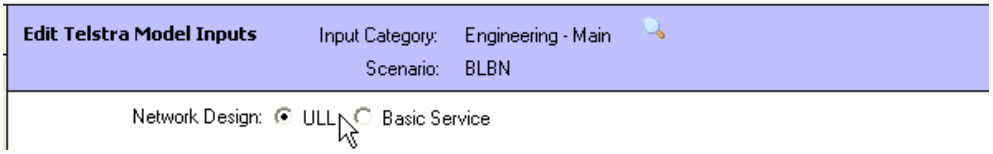
The model provides you with two options regarding the type of network being deployed:

1) Unbundled Local Loop; or

2) Basic Service.

The main difference between the two approaches is that the ULL service is provided over all copper facilities. Under this option the model will place copper facilities wherever they currently reside in the network.

You designate the type of network to be modelled by selecting the **Network Design** button that corresponds to your selection. The ULL and Basic Service network design buttons are found at the very top of the **General Plant Design Criteria-Main Cables Network** input sheet as shown below.



You can adjust the capacity criteria used by the model to design the main network. There are two user adjustable fill factors or capacity design criteria in the main model. Both are taken from the **Rules** document.

The **Feeder Main Cable Design Fill** is used to determine the number and size of main cables required to serve a given demand. This percentage designates the maximum level of usage that can be accommodated by any size of cable. Once this maximum is exceeded a larger cable or additional cable will be placed in the cable segment. For example, at the default 90% fill factor in the model, a 100 pair main cable can only accommodate 90 customers before a larger cable will be required (i.e. a 200 pair cable).

The **Multiplexing Cabinet Design Fill** factor is used, along with the multiplexing equipment maximum capacity limits, to determine the number and size of multiplexers that will be required.

Fill Factors at Optimal Engineering Design

90%	Feeder Main Cable Design Fill
90%	Multiplexing Cabinet Design Fill Factor

The next grouping of inputs identifies the **maximum haul distance for each size and type of main cable**. Once a cable run exceeds these distance parameters a new cable will need to be installed. To connect the two cables a cable joint is required. These distances determine how many of these joints will be required.

Cable-Design Criteria-Main

Normal Gauge .40 mm Conductor-Main

Cable Sizes (pairs)	Max Dist to Next Joint (Metres)
2400	250
1200	500
800	500
400	500
200	1000
100	1000

Cable Cost Heavy Gauge .64 mm Conductor-Main

Cable Sizes (pairs)	Max Dist to Next Joint (Metres)
1200	250
800	250
400	500
200	500
100	1000

Fibre Cables-Main

Number of Fibres	Max Dist to Next Joint (Metres)
120	15,000
60	24,000
48	24,000
36	24,000
24	24,000
12	24,000
6	24,000

There are currently three types of main cable in the model: normal .40 gauge; heavy .64 gauge; and fibre cables. Normal gauge main cables come in six sizes ranging from 100 to 2400 pair. Heavy .64 gauge cables range is size from 100 to 1200 pairs. Fibre cables contain between 6 and 120 fibres. The maximum haul distances are set at the length of cable that can be placed on a single cable drum.

The final category of user adjustable inputs in the main model is the **maximum distance between main pits and manholes**. The defaults for these inputs are taken from the **Rules**. Although the model allows you to adjust the maximum distance by manhole size the rules specify a maximum distance of 250 metres regardless of the size of pit or manhole that is placed.

Pits, Manholes and Pillars-Design Criteria

Name	Max Distance Between Manholes (m)
PF28 manhole	250
PF20 manhole	250
PF12 manhole	250
PF4 manhole	250
No. 9 Pit	250

A.4 Engineering Variables : Engineering - Distribution

a) General

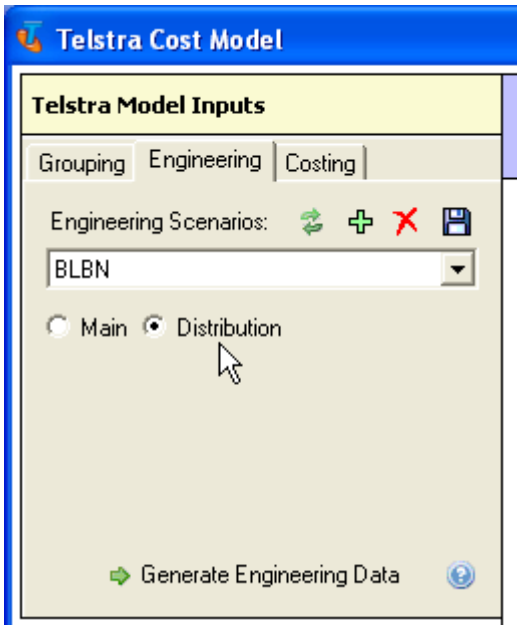
Engineering - Distribution contains the key design criteria for the distribution network. These criteria are taken from the **Rules** developed by the Telstra engineering department. The **Rules** are designed to reflect the best in-use engineering practices and procedures for deploying a new ULL network. Many of these rules can be adjusted in the input sheets incorporated into the user interface to the models[3]. The rules and model parameters that are included in the **Engineering - Distribution** worksheet are:

- the identifier that specifies whether a tapered or non-tapered design is used in the model run (i.e. 1 designates a tapered design and 2 designates a non-tapered design);
- the distribution cable fill that is used to design the copper cable network in the distribution module;
- the range of customers per square kilometre that are used to categorise DAs by density zone;
- the maximum haul length for each size of distribution cable, which is used to determine the maximum distance between cable joints;
- the maximum allowable distance between pits in the distribution network; and
- the percentage of time that one through four customers are served from a single pit.

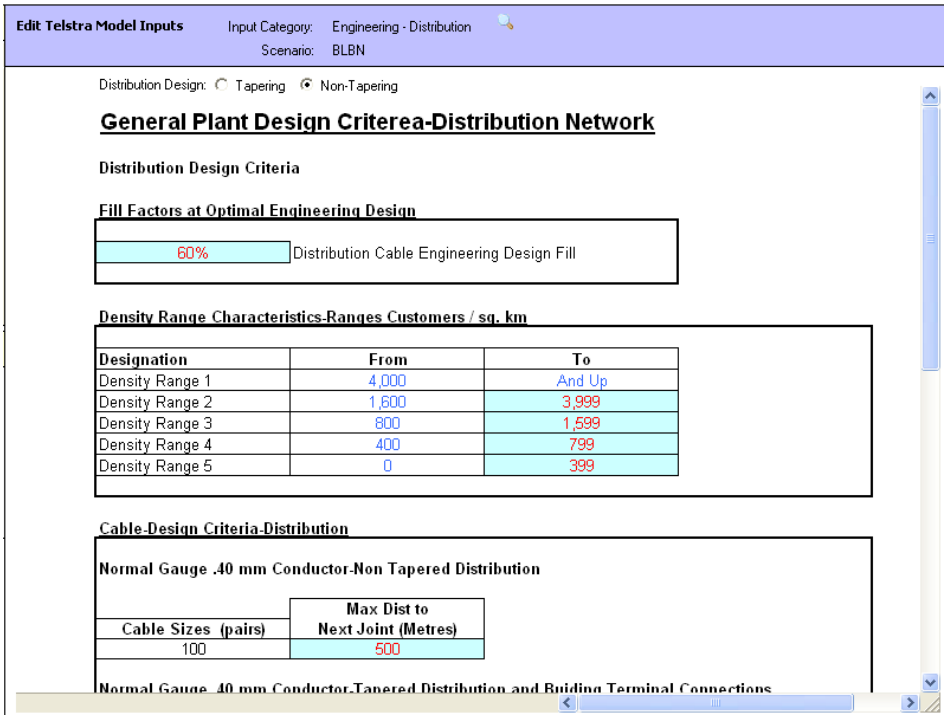
Changes to engineering rules require a significant time to process for a large grouping of ESAs. Sensitivity testing for the impact of changes to engineering inputs can be done efficiently by running the input changes on a single or small sample of ESAs. Once the final list of engineering inputs revisions has been decided, all ESAs can be run with the new inputs.

[3] Changes to these rules or parameters should be made in the inputs sheets incorporated into the user interface to the model. Input changes made directly into this module will not flow through to the Cost Calculation Module or results.

To access the **Engineering Distribution** input sheet click on the button titled **Distribution** which is immediately below the drop down box.



Once you have entered the **Engineering Distribution** page the following sheet appears in the **Edit Telstra Model Inputs** section of the page. Note that any item highlighted red font with blue background is a user adjustable input. There are more than 15 user adjustable input variables on this sheet. Each can be adjusted by merely clicking on the box and typing in another input variable. The default values for these inputs follow the guidelines specified in the **Rules**.



You will need to use the scrollbars located at the right and bottom of the window to display all of the available information on these pages. Each of these inputs will be discussed in descending order as they appear on this sheet.

b) Specific Inputs

The model provides two options regarding the design of the distribution network:

1) a tapered cable design; or

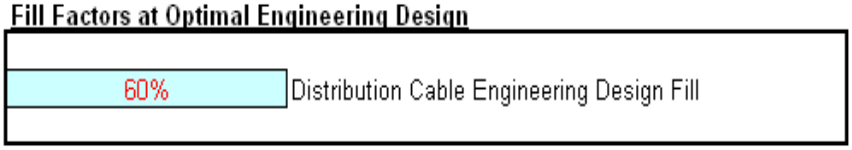
2) a non-tapered cable design.

The default scenario is specified in the **Rules** document as a non-tapered network design. Under this design, a standard 100 pair cable is used throughout the distribution network regardless of the demand on any given segment. This approach provides numerous efficiencies when installing and operating a distribution network and is the approach Telstra uses when deploying new distribution networks. Under the tapered network option the model will select the smallest size of cable that can be deployed (i.e. 10, 30, 50 or 100 pair cables) to meet the existing demand requirements based on the specified fill factor.

You designate the type of network to be modelled by selecting the **Network Design** button that corresponds to your selection. The **Tapered** and **Non-Tapered** distribution design buttons are found at the very top of the **General Plant Design Criteria - Distribution Network** Worksheet as shown below.

You can adjust the capacity criteria (i.e. fill factor) used by the model to design the distribution network. There is one user adjustable fill factor or capacity design criteria in the distribution. This factor is taken from the **Rules** document.

The **Distribution Cable Engineering Design Fill** is used to determine the number and size of distribution cables required to serve a given demand. This percentage designates the maximum level of usage that can be accommodated by any size of cable. Once this maximum is exceeded a larger cable (in the tapered network design) or additional cable (in the untapered network design) will be placed in the cable segment.



The **Density Range Characteristics** identify upper and lower limits for the number of customers per square kilometre for each of the density ranges. These limits are

used to group distribution areas into various categories based on customer density. This is required since the environment in which the new facilities must be placed (i.e. the types and number of manmade and natural obstacles that must be negotiated) will vary based on the customer density in a serving area. It should be noted that only the upper limit for each density group is adjustable. The lower limits are established using the upper limits for the other density zones.

Density Range Characteristics-Ranges Customers / sq. km

Designation	From	To
Density Range 1	4,000	And Up
Density Range 2	1,600	3,999
Density Range 3	800	1,599
Density Range 4	400	799
Density Range 5	0	399

The next grouping of inputs identifies the maximum haul distance for each size and type of distribution cable for a tapered and a non-tapered network design. Once a cable run exceeds these distance parameters a new cable will need to be installed. To connect the two cables a cable joint is required. These distances determine how many of these joints will be required.

Cable-Design Criteria-Distribution

Normal Gauge .40 mm Conductor-Non Tapered Distribution

Cable Sizes (pairs)	Max Dist to Next Joint (Metres)
100	500

Normal Gauge .40 mm Conductor-Tapered Distribution and Buiding Terminal Connections

Cable Sizes (pairs)	Max Dist to Next Joint (Metres)
100	500
50	500
30	500
10	500

There is only one type of cable in the Non Tapered distribution design.

The **maximum distance between distribution pits** is also a user adjustable distribution engineering input. These inputs can vary by size of pit, however, the default inputs are taken from the **Rules** document and do not vary by size of pit.

Pits and Pillar-Design Criteria Distribution

Pits-Design Characteristics

Name	Max Distance Between Pits (m)
No. 9 Pit	100
No. 6 Pit	100
No. 5 Pit	100

The **number of two pair lead-ins to be served from a standard distribution pit** is also a user adjustable input. The number of pits required will is dependent on the number of customers served by each pit. Per the **Rules**, up to four two pair lead-ins can be served from any one pit. However, there may be times when less than four customers can be served from a single pit. The model allows you to adjust the number of times 1, 2, 3 or 4 customers will be served from a single pit. The default in the model is the maximum allowed (i.e. 4).

Calculation of the Average Number of 2-Pair Lead-ins Served from a Pit

Number of Pairs Served by Pits	Occurance Percentage	Weighted Pairs/Pit
4	100%	4.00
3	0%	0.00
2	0%	0.00
1	0%	0.00
Weighted Average	100%	4.00

A.5 Costing Variables : Costing - Main

a) General

The **Cost Inputs --Costs and Rules Documents** contains all the costs for the various network components required to provide the unbundled local loop. Most of these costs are taken directly from the **Access Network Modelling Costing Information** document that was assembled by the Telstra engineering department. The primary source for the costing information contained in this document was the Schedule of Rates document attached to Telstra's vendor contracts. However, in certain instances the information in the contract had to be supplemented by either contractor quotes or engineering estimates. There are more than 200 network cost inputs in this worksheet and they fall into the following general categories:

- Costs for main and distribution copper and fibre cables which include the cost for the cable, the costs for hauling cables through conduit and the costs for joining the cables;

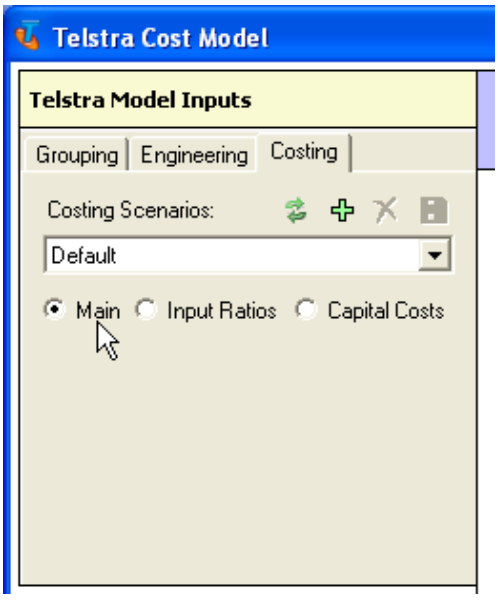
- Costs for constructing pits and manholes;

- Costs for pillars including the pillar strips;
- Breakout and reinstatement costs incurred when constructing pits, manholes and conduit runs;
- Costs for buying and placing conduit in different terrains;
- Costs for terminating all the distribution facilities in the exchange building including the entrance facilities, cable pressurization systems and cable terminating racks and blocks; and
- Costs for building terminals and two pair lead-ins.

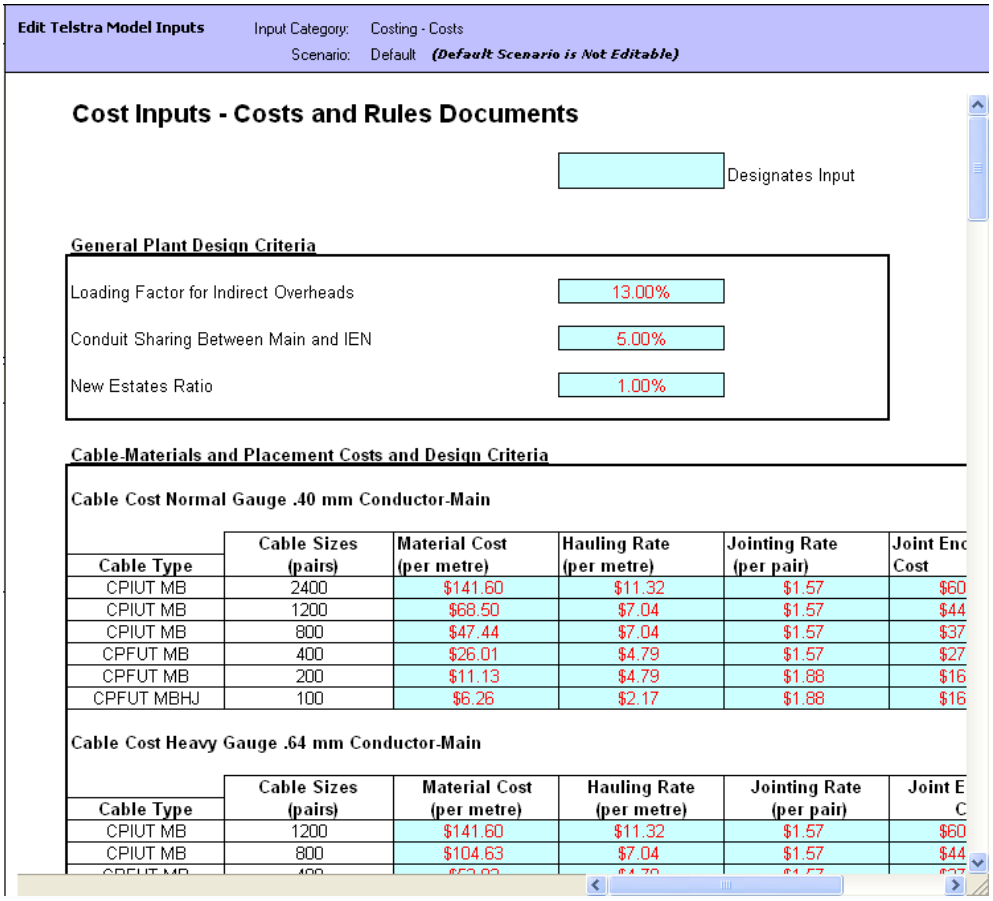
The **Cost Inputs - Costs and Rules Documents** also include inputs which represent network rules or plant sizing dimensions, design criteria and cost estimates. The estimates include the level of capitalized overheads, the amount of conduit placed in developer provided trenches in new estates and the amount of sharing of entrance facility cost between the interoffice and distribution network. Network dimensioning parameters include the width of the trenches for various sizes of conduit runs and the size of manholes and pits. The design criteria include the fill factors for various pieces of equipment. The estimates are based on Telstra's actual costs and/or construction experience. The dimensioning parameters and design criteria were taken from the plant specification and **Rules**.

A minimal amount of time is required to process changes to the cost and rules inputs regardless of the number of ESAs included in the run assuming no changes are made to the engineering inputs.

To access the **Costing – Main** input sheet select the **Costing** tab and then click on the button titled **Main** which is immediately below the drop down box.



Once you have entered the **Costing - Main** page the following sheet appears in the **Edit Telstra Model Inputs** section of the page. Note that any item highlighted red font with blue background is a user adjustable input. There are more than 200 user adjustable input variables on this sheet. Each can be adjusted by merely clicking on the box and typing in another input variable. The default values for these inputs are generally obtained from **Rules** or the **Access Network Modelling Costing Information**.



Edit Telstra Model Inputs Input Category: Costing - Costs
Scenario: Default *(Default Scenario is Not Editable)*

Cost Inputs - Costs and Rules Documents

Designates Input

General Plant Design Criteria

Loading Factor for Indirect Overheads	13.00%
Conduit Sharing Between Main and IEN	5.00%
New Estates Ratio	1.00%

Cable-Materials and Placement Costs and Design Criteria

Cable Cost Normal Gauge .40 mm Conductor-Main

Cable Type	Cable Sizes (pairs)	Material Cost (per metre)	Hauling Rate (per metre)	Jointing Rate (per pair)	Joint Enc Cost
CPIUT MB	2400	$141.60	$11.32	$1.57	$60
CPIUT MB	1200	$68.50	$7.04	$1.57	$44
CPIUT MB	800	$47.44	$7.04	$1.57	$37
CPFUT MB	400	$26.01	$4.79	$1.57	$27
CPFUT MB	200	$11.13	$4.79	$1.88	$16
CPFUT MBHJ	100	$6.26	$2.17	$1.88	$16

Cable Cost Heavy Gauge .64 mm Conductor-Main

Cable Type	Cable Sizes (pairs)	Material Cost (per metre)	Hauling Rate (per metre)	Jointing Rate (per pair)	Joint E C
CPIUT MB	1200	$141.60	$11.32	$1.57	$60
CPIUT MB	800	$104.63	$7.04	$1.57	$44

You will need to use the scrollbars located at the right and bottom of the main window to display all of the available information on these pages. Each of these inputs will be discussed in the order they appear on this sheet.

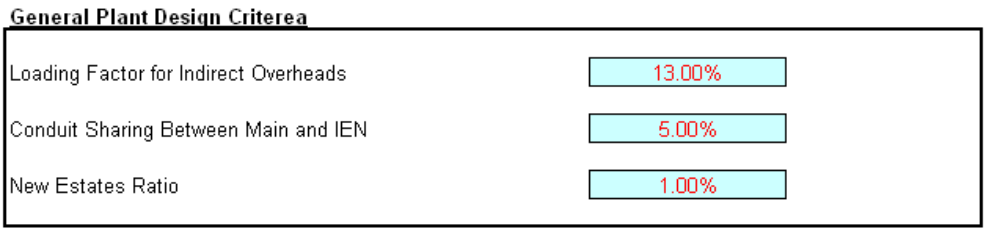
b) Specific Inputs

The initial input section identifies certain estimates that are used to calculate costs in the model. These estimates are the indirect overhead loading factor, the level of conduit sharing between the Inter-exchange and main networks and the percentage of occurrence of new estates.

Loading Factors for Indirect Overheads cover network management, materials handling and purchasing and other construction related costs that Telstra is required to capitalise.

The **Conduit Sharing Between Main and IEN** factor reflects the amount of time that the EIN and main network share the same trench.

The **New Estate Ratio** is based on the amount of time Telstra would be able to use contractor provided trenches when it installs a new network.



Each of the ratios and factors were derived from Telstra's actual experience and/or the opinions of experts in the respective areas.

There is an extensive list of user adjustable **main copper cable costs**. These costs vary by size and type of cable. There are six sizes of normal .40 gauge cable (i.e. 100, 200, 400, 800, 1200 and 2400). There are five sizes of heavy .60 gauge cable in the model (i.e. same sizes as normal cable excluding the 2400 pair). There are seven sizes of fibre cable ranging from 6 to 120 fibres. There are five separate costs associated with each size and type of main copper cable: **material costs; hauling rate; joint rate; joint enclosure cost; and branch enclosure cost**.

The **Material Costs** reflect the actual per metre cost for each size and type of cable.

The **Hauling Rate** is stated as a cost per metre and is the amount a contractors charge for pulling the cable through conduit.

Jointing Rate is for each pair of wires that are connected. The **Joint Enclosure** encases a joint and is required each time two cables are joined together.

An additional **Branch Enclosure Kit** is required when the joint is the result of merging two or more cable runs.

Cable-Materials and Placement Costs and Design Criteria

Cable Cost Normal Gauge .40 mm Conductor-Main

Cable Type	Cable Sizes (pairs)	Material Cost (per metre)	Hauling Rate (per metre)	Jointing Rate (per pair)	Joint Enclosure Cost	Branch Enclosure (Connection)
CPIUT MB	2400	$141.60	$11.32	$1.57	$604.77	$25.93
CPIUT MB	1200	$68.50	$7.04	$1.57	$443.87	$25.93
CPIUT MB	800	$47.44	$7.04	$1.57	$371.52	$22.67
CPFUT MB	400	$26.01	$4.79	$1.57	$270.93	$21.84
CPFUT MB	200	$11.13	$4.79	$1.88	$162.82	$17.70
CPFUT MBHJ	100	$6.26	$2.17	$1.88	$162.82	$17.70

Cable Cost Heavy Gauge .64 mm Conductor-Main

Cable Type	Cable Sizes (pairs)	Material Cost (per metre)	Hauling Rate (per metre)	Jointing Rate (per pair)	Joint Enclosure Cost	Branch Enclosure (Connection)
CPIUT MB	1200	$141.60	$11.32	$1.57	$604.77	$25.93
CPIUT MB	800	$104.63	$7.04	$1.57	$443.87	$25.93
CPFUT MB	400	$53.92	$4.79	$1.57	$270.93	$21.84
CPFUT MB	200	$26.53	$4.79	$1.88	$270.93	$21.84
CPFUT MBHJ	100	$13.20	$2.17	$1.88	$162.82	$17.70

Fibre Cables-Main

Cable Type	Number of Fibres	Material & Placing (per metre)	Hauling Rate (per metre)	Jointing Rate (per pair)
FNPEHJ/STD	120	$7.28	$3.83	$20.19
FNPEHJ/STD	60	$4.24	$3.83	$20.19
FNPEHJ/STD	48	$5.21	$3.83	$20.19
FNPEHJ/STD	36	$2.43	$3.83	$20.19
FNPEHJ/STD	24	$1.86	$3.83	$20.19
FNPEHJ/STD	12	$1.35	$3.83	$20.19
FNPEHJ/STD	6	$0.98	$3.83	$20.19

The costs for each of these functions are taken directly from the **Access Network Modelling Costing Information** document.

There are similar cost inputs for **fibre cables** with the exception that instead of having a separate cost for branch enclosures the branch enclosure cost is included in a separately identified joint enclosure for cable merges. The fibre cable material costs, hauling rate and jointing rate are identified in the above inputs section. The fibre joint enclosure costs are incorporated into a separate cost matrix.

Fibre Optic Joint Enclosure-Main

Cable Type	Joint Enclosure Cost
Optical Fibre enclosure 24 Fibre	$309.69
Egerton 24/72 single ended closure	$549.52
Corning UCNCP 9-24 MAX (494/509)	$1,269.56
Corning UCNCP 9-24 MAX (494/509)	$1,222.68
Corning UCNCP 9-28 MAX (494/510)	$1,529.18
Corning UCNCP 9-28 MAX (494/511)	$1,698.26

There is a similar set of user adjustable inputs for **Distribution Copper Cables**. There are four sizes of distribution cable (i.e. 10, 30, 50, and 100). Note that 100 pair cables are the only one used in the distribution network when a non tapered network design is selected. However, the other size cables will still be required for lead-ins to building terminals. Like main cables, there are the same five costs

associated with each size of distribution cable: **Material Costs; Hauling Rate; Jointing Rate; Joint Enclosure Cost;** and **Branch Enclosure Cost**. The costs for each of these functions are user adjustable and the default values are taken directly from the **Access Network Modelling Costing Information** Document.

Cable Cost Normal Gauge .40 mm Conductor-Distribution and Buiding Terminal Connections

Cable Type	Cable Sizes (pairs)	Material Cost (per metre)	Hauling Rate (per metre)	Jointing Rate (per pair)	Joint Enclosure Cost	Branch Enclosure (Connection)
CPFUT PE	100	$5.56	$2.17	$1.88	$130.19	$0.00
CPFUT PE	50	$2.95	$2.17	$1.88	$130.19	$0.00
CPFUT PE	30	$1.96	$2.17	$1.88	$130.19	$0.00
CPFUT PE	10	$0.82	$2.17	$1.88	$130.19	$0.00

There are also two inputs for costs associated with connecting 2 pair cables to the distribution network.

Cost per Wire Connection at Serving Pit-Distribution

Cable Type	Cable Sizes (pairs)	Connecting Wires (Per Pair)	Joint Enclosure Cost
PEIFLI PE	2	$1.88	$130.19

The model has 40 user adjustable inputs associated with the costs and dimensions for distribution and main **Pits** and **Manholes**. For each size of pit and manhole there are contractor costs for purchasing and placing the pit or manhole in normal and rocky terrain. The size of the top of each type of pit or manhole, including the excavation margins required to allow for placing each size of pit or manhole, are also user adjustable inputs. These manhole and pit dimensions are required to identify the extent of any breakout or reinstatement activity that would be required in building a new network.

Pits, Manholes and Pillars-Materials and Placement Costs and Design Criteria

Manhole Cost-Main

Description	Normal Placement Cost	Rocky Placement Cost	Width (Metres)	Length (Metres)	Margin on Sides Pit/MH	Margin at Ends Pit/MH
PF28 manhole	$20,006.12	$24,596.70	5.15	1.80	0.20	0.20
PF20 manhole	$11,877.73	$14,793.32	3.86	1.73	0.20	0.20
PF12 manhole	$6,210.52	$7,957.56	2.90	1.38	0.20	0.20
PF4 manhole	$4,896.56	$6,132.60	2.60	1.24	0.20	0.20
No. 9 Pit	$1,261.37	$1,516.10	2.04	0.55	0.20	0.20

Pit Costs-Main and Distribution

Description	Normal Placement Cost	Rocky Placement Cost	Width (Metres)	Length (Metres)	Margin on Sides Pit/MH	Margin at Ends Pit/MH
No. 9 Pit	$1,261.37	$1,516.10	2.04	0.55	0.10	0.10
No. 6 Pit	$708.63	$843.23	1.37	0.55	0.10	0.10
No. 5 Pit	$254.82	$314.21	0.71	0.46	0.10	0.10

There are costs for two sizes of **Pillars** in the model (i.e. an 1800 and 900 pillar). The costs are unloaded contractor prices for a fully installed terminal. There are also costs for the **Terminal Strips** used to attach the cables to the terminals.

Pillar Costs

Type	Pillar Cost (per unit)	Terminal Strips (per unit)
Large	$1,863.67	$426.16
Small	$1,639.10	$286.34

When deploying a new network a company will frequently encounter roads or driveways that need to be removed (i.e. breakout) in order to dig the trench, and then replaced (i.e. reinstated) once the trench is dug. These **Breakout and Reinstatement Costs** vary by the type and thickness of material that is being removed and replaced (i.e. concrete, asphalt, pavers, sod, etc.). The model has costs for each of these breakout and reinstatement activities.

Breakout and Reinstatement Costs for Manholes, Pits and Conduits

Breakout and Reinstatement Costs by Activity

Description	Breakout Cost (Per Sq Metre)	Reinstate Cost (Per Sq Metre)
Concrete (< 75 mm thick)	$60.66	$67.55
Concrete (75 to 100 mm thick)	$72.33	$85.06
Concrete (over 100 mm thick)	$86.29	$94.14
Reinforced (< 75 mm thick)	$60.66	$83.73
Reinforced (75 to 100 mm thick)	$72.33	$106.63
Reinforced (100 to 150mm thick)	$72.33	$119.47
Asphalt (25 mm thick)	$60.66	$63.06
Asphalt (50 mm thick)	$60.66	$78.52
Asphalt (75 mm thick)	$60.66	$99.05
Brick Pavers	$48.61	$64.42
Kerbing	$60.66	$97.22
Turf		$13.50

Average Width Breakout and Reinstatement for Trenching Roads, Footpaths, Sidewalks and Drives (cm)-Main & Distribution

Description	1 x 50mm Conduit	1 x 100mm Conduit	2 x 100mm Conduit	4 x 100mm Conduit	6 x 100mm Conduit
Width Trench-Road Crossing	22	22	36	36	50
Ave Width Replaced Footpath	150	150	150	150	150

Description	8 x 100mm Conduit	12 x 100mm Conduit	16 x 100mm Conduit	20 x 100mm Conduit	24 x 100mm Conduit
Width Trench-Road Crossing	64	50	64	64	64
Ave Width Replaced Footpath	150	150	150	150	150

The model also provides user adjustable inputs for the **width of the trenches and footpaths** that will be removed and reinstated. These dimensions are necessary to ascertain the volume of the breakout and reinstatement activity that will be required when deploying conduit in different areas. There are two measurements for each type of conduit run. The first is the width of the trench that will be required to place that particular conduit configuration. This will be used when bisecting a drive, street or footpath. The second measurement is for the standard width of a footpath. When the right of way for a conduit run is directly below the footpath the whole footpath must be removed and replaced.

There are numerous **costs for constructing conduit runs**. The costs vary by the size of the conduit configuration: 1 50 millimetre (mm) conduit; 1 100 mm conduit; 2 100 mm conduits; 4 100 mm conduits; 6 100 mm conduits; 8 100 mm conduits; 12 100 mm conduits; 16 100 mm conduits; 20 100 mm conduits and 24 100 mm

conduits. Costs also vary between rocky and normal terrain and the type of trenching or boring placement techniques used.

Boring is only possible for the smaller conduit configurations (i.e. up to 2 100 mm conduits).

Costs can vary based on the environment in which the trenching is taking place (e.g. under roadways). The model has numerous user adjustable inputs to reflect all of these circumstances.

Conduit Costs Including Placing Cost-Distribution and Main

Cost Per Metre for Placing Conduit Runs Including the Cost for Boring and Trenching Lines-Distribution and Main

Description	Soil Type	1 x 50mm Conduit (Cost/Metre)	1 x 100mm Conduit (Cost/Metre)	2 x 100mm Conduit (Cost/Metre)	4 x 100mm Conduit (Cost/Metre)	6 x 100mm Conduit (Cost/Metre)
Trench-Turf	Normal	$23.76	$28.50	$36.18	$60.30	$93.85
Trench-Turf	Rock	$79.79	$95.01	$108.38	$145.41	$314.11
Trench-Road Xing	Normal	$99.53	$133.70	$155.77	$183.24	$210.00
Trench-Road Xing	Rock	$168.76	$180.30	$216.49	$243.72	$360.00
Trench-Footpaths & Drives	Normal	$99.53	$133.70	$155.77	$183.24	$210.00
Trench-Footpaths & Drives	Rock	$168.76	$180.30	$216.49	$243.72	$360.00
Boring-Footpath & Drives	Normal	$47.87	$69.93	$120.72		
Boring-Footpath & Drives	Rock	$264.47	$297.52	$502.08		
Boring-Under Roads	Normal	$51.59	$76.75	$120.72		
Boring-Under Roads	Rock	$284.02	$322.76	$502.08		
New Estates-Open Trench		$8.57	$12.65	$22.48		

Description	Soil Type	8 x 100mm Conduit (Cost/Metre)	12 x 100mm Conduit (Cost/Metre)	16 x 100mm Conduit (Cost/Metre)	20 x 100mm Conduit (Cost/Metre)	24 x 100mm Conduit (Cost/Metre)
Trench-Turf	Normal	$129.62				
Trench-Turf	Rock	$454.29				
Trench-Road Xing	Normal	$235.00	$260.00	$270.85	$342.80	$416.63
Trench-Road Xing	Rock	$500.00	$734.63	$1,051.06	$1,358.46	$1,792.14
Trench-Footpaths & Drives	Normal	$235.00	$260.00	$270.85	$342.80	$416.63
Trench-Footpaths & Drives	Rock	$500.00	$734.63	$1,051.06	$1,358.46	$1,792.14

The model has costs for two sizes of **remote multiplexers** (i.e. Alcatel CMUX AU). The large remote CMUX has a maximum capacity of 786 services and the smaller unit can handle a maximum of 384 services. These remote multiplexers are connected to a unit in the exchange building (i.e. Alcatel CMUX NU). The exchange building unit has the capacity to terminate services from seven remote units.

Costs for all of the structure required for terminating cables in the exchange building are also user adjustable inputs into the model. These entrance facilities include the **Cable Vault,** the **Main Distribution Frame (MDF),** the **Cable Termination (MDF) Blocks** and the **Cable Racking** needed to carry the cables from the vault to the mainframe. There is also a separate cost for attaching the cables to the blocks on the main frame (**Joint Cost**). The cost for a cable vault and the associated cable rack vary by the size of the ESA (i.e. number of distribution conduits entering the office). It is assumed that a cable vault is not required if the office serves less than 12 distribution conduits. Finally there are separate inputs to identify the **Percentage** of the cable racking and vault cost that will be assigned to basic access services.

Multiplexing Systems-Costs and Design Criteria

Type of Equipment	Cost per System
Alcatel CMUX AU	$87,900
Alcatel CMUX AU	$72,900
Alcatel CMUX NU	$39,611

Entrance Facility-Costs and Design Criteria

Type of Equipment	Cost Cable Vault per Exchange	Cost Cable Racking per Exchange	Percent Vault Assigned to CAN	Percent Racking Assigned to CAN
Up to a 12 Conduit Requirement				
13 to 23 Conduit Requirement	$ 90,000.00	$ 18,000.00	95%	95%
24 to 35 Conduit Requirement	$ 130,000.00	$ 45,000.00	95%	95%
36 or Greater Conduit Requirement	$ 180,000.00	$ 74,000.00	95%	95%

Type of Equipment	Cost per System
Siemens MDF Block	$168.34
MDF Ironwork	$2,400.00
Joint at Mainframe Block	$1.18

The larger main cables (i.e. 1200 pair and up) are pressurised with air. An air compressor and its accessories are required to pressurize these cables. The model has costs for each one of the components of the **Cable Pressurization System**. Only one compressor and flow panel is required for each exchange building. However, certain infrastructure costs and the air access point (RTAP) costs are incurred for each cable connected to the system.

Cable Pressurisation System-Dry Air Compressor

	Contract Price
Dry Air Compressor Basic System	
Compressor & Infrastructure	$5,000.00
Flow Panel	$1,000.00

	Contract Price
Dry Air Compressor Per Cable Components	
Air Access Point (RTAP)	$209.26
Initial Infrastructure	$153.50

An **Optical Fibre Terminating Unit** is required for terminating fibre cables in the exchange building. These units have the capability to terminate up to 120 fibres. A **rack** is also required to house the optical fibre terminating unit. Each rack can accommodate up to 6 terminating units.

Termination of Optical Fibre at Exchange

Type of Equipment	Cost per System
Optical Fibre Termination Unit	$ 7,357.72
Type 92 Rack	$ 1,179.86

There is a cost for terminating large lead-ins for **Building Terminals**. The costs include the strip on which the cable is terminated and the cost for connecting the cable to that strip. The model contains a composite cost for acquiring and

installing the terminal strip and connecting the cables to those strips. There is a separate cost for each size of building terminal lead-in that is based on the cable costs identified above.

The building terminal itself is supplied by the building owner.

Building Terminal Strip Cost-Installed (Includes Joint)-Terminal Provided By Owner

Size	Cost
100	$317.57
50	$175.17
30	$110.00
10	$63.22

The model also includes a composite cost for **Lead-ins**. There is a standard flat rate per lead-in and additional rates for the cost for the lead-in cable.

2 Pair Lead-Ins

Lead-in Cost Excluding Cable

Cost of Placing Lead-in

Size	Cost
2	$282.91

Cost of Cable

Cable Type	Cable Sizes (pairs)	Material Cost (per metre)	Hauling Rate (per metre)
PE	2	$0.21	$1.47

A.6 Costing Variables : Costing - Input Ratios

a) General

The **Cost Inputs – Application Ratios Used to Develop Composite Costs** sheet identifies ratios which reflect the probable occurrence of various types of placement activities when building a new network. In deploying a new network, a company would face various types of environments where facilities would need to be constructed. In dense central business districts almost all placement of conduit and manholes would occur in areas with existing concrete or pavement. In rural areas, the probability that the trenching or constructing activity would require dealing with concrete or pavement is significantly less. The ratios in the ratio input sheet are designed to reflect the actual environment in which this new construction would occur. The ratios generally fall into the following categories:

- Ratios for determining the type and thickness of concrete or asphalt that would be encountered in building facilities in different areas;

- Ratios for identifying the portion of time each type of the breakout and reinstatement activity would be required when placing pits and manholes in different areas;

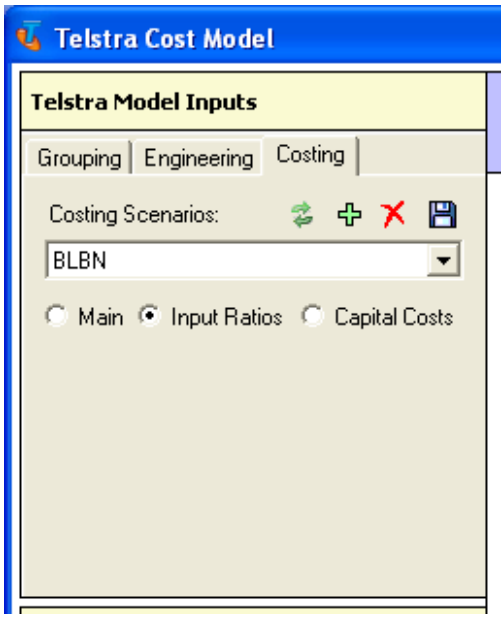
- Ratios for identifying the portion of time each type of conduit placement activity (e.g. trenching and boring) would be required when placing conduit in different areas.

In determining the types of placement activities that would be encountered in placing a new network, the model needed to be able to differentiate between serving areas. It is clear that the amount of concrete footpaths and roads that would be encountered varies based on the density of the area being served. For this reason the ratios for placing pits, manholes and conduit in distribution areas are segregated into five density zones. A sixth density zone was included in the model for potential use in addressing very rural areas in Band 3. In addition, separate ratios were developed for densely populated central business districts (CBDs). By providing separate inputs for serving areas with significantly different characteristics the model is better suited to reflect the construction activities that would be required in the real world.

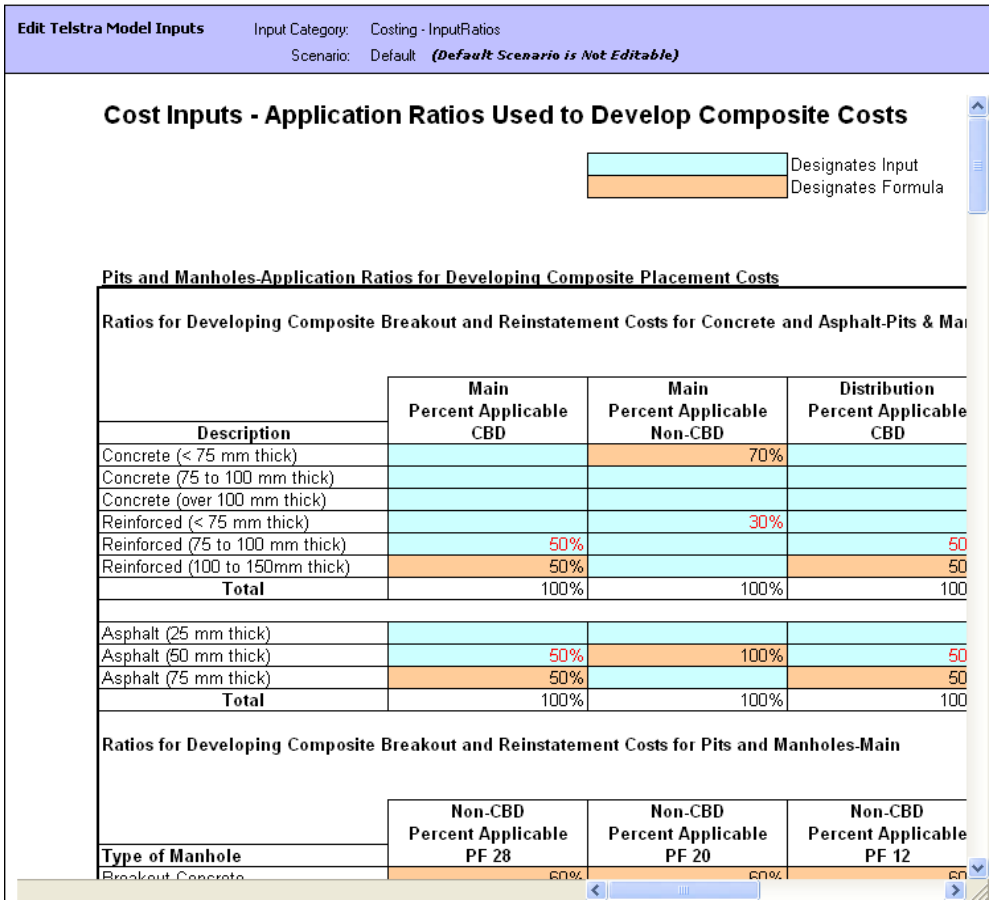
The model also provides separate ratios for different sizes of main and distribution conduit configurations. Again separate ratios are identified for main and distribution conduit runs within a CBD and in other urban areas. The ratios used in the model vary by the size of the conduit configuration. Exchange buildings are generally located in the densely populated downtown area of an ESA. Main conduit runs are generally small on the outskirts or fringes of the ESA and get larger as they accumulate demand as they approach the exchange building. The ratio inputs allow you to reflect the different characteristics of various portions of the ESAs along these main conduit runs.

A minimal amount of time is required to process changes to the cost and rules inputs regardless of the number of ESAs included in the run assuming no changes are made to the engineering inputs.

To access the **Costing – Input Ratios** input sheet select the **Costing** tab and then click on the button titled **Input Ratios** which is immediately below the drop down box.



Once you have entered the **Costing – Input Ratios** page the following sheet appears in the **Edit Telstra Model Inputs** section of the page. Note that any item highlighted red font with blue background is a user adjustable input. Each user input can be adjusted by merely clicking on the box and typing in another input value.



Edit Telstra Model Inputs Input Category: Costing - InputRatios
Scenario: Default *(Default Scenario is Not Editable)*

Cost Inputs - Application Ratios Used to Develop Composite Costs

Designates Input
Designates Formula

Pits and Manholes-Application Ratios for Developing Composite Placement Costs

Ratios for Developing Composite Breakout and Reinstatement Costs for Concrete and Asphalt-Pits & Ma

Description	Main Percent Applicable CBD	Main Percent Applicable Non-CBD	Distribution Percent Applicable CBD
Concrete (< 75 mm thick)		70%	
Concrete (75 to 100 mm thick)			
Concrete (over 100 mm thick)			
Reinforced (< 75 mm thick)		30%	
Reinforced (75 to 100 mm thick)	50%		50
Reinforced (100 to 150mm thick)	50%		50
Total	100%	100%	100
Asphalt (25 mm thick)			
Asphalt (50 mm thick)	50%	100%	50
Asphalt (75 mm thick)	50%		50
Total	100%	100%	100

Ratios for Developing Composite Breakout and Reinstatement Costs for Pits and Manholes-Main

Type of Manhole	Non-CBD Percent Applicable PF 28	Non-CBD Percent Applicable PF 20	Non-CBD Percent Applicable PF 12
Breakout Concrete	60%	60%	60

You will need to use the scrollbars located at the right and bottom of the main window to display all of the available information on these pages. Each of these inputs will be discussed in the order they appear on this sheet.

Certain ratios on many of these input sheets are highlighted in orange. The orange designates a formula. In most instances the sum of all the factors must equal 100 percent. For instance, some form of activity will be required every time a conduit run is constructed. The formulas highlighted in orange ensure that the sum of all the factors total 100 percent. Overriding these formulas could lead to input errors.

b) Specific Inputs

There are inputs for **Breakout** and **Reinstatement** costs for six types of concrete pavement and three types of asphalt pavement in the model. Ratios were required to develop a composite cost for concrete and asphalt breakout and reinstatement. Note that these ratios do not identify the amount of time that a

breakout or reinstatement activity is required. The ratios merely identify the type or thickness of concrete or asphalt that will be encountered when a road, driveway or pathway is removed and replaced. The input box below identifies the **proportion of time each thickness and/or type of concrete or asphalt will be encountered when placing pits**. There is a separate input section that is virtually identical to the one identified below that is used to calculate breakout and reinstatement costs for conduit runs.

Ratios for Developing Composite Breakout and Reinstatement Costs for Concrete and Asphalt-Pits & Manholes

Description	Main Percent Applicable CBD	Main Percent Applicable Non-CBD	Distribution Percent Applicable CBD	Distribution Percent Applicable Non-CBD
Concrete (< 75 mm thick)		70%		70%
Concrete (75 to 100 mm thick)				
Concrete (over 100 mm thick)				
Reinforced (< 75 mm thick)		30%		30%
Reinforced (75 to 100 mm thick)	50%		50%	
Reinforced (100 to 150mm thick)	50%		50%	
Total	100%	100%	100%	100%
Asphalt (25 mm thick)				
Asphalt (50 mm thick)	50%	100%	50%	100%
Asphalt (75 mm thick)	50%		50%	
Total	100%	100%	100%	100%

There are five types of environments that necessitate incurring breakout and reinstatement costs:

- concrete;
- asphalt;
- kerbing;
- pavers; and
- turf.

The following input sheets allow you to adjust the amount of each type of breakout and reinstatement activity that would be encountered when building a new network.

There is also an input box for no activity required so the total of all placement activities should be 100 percent.

In the main network there are separate ratios for each size of manhole (i.e. PF28, PF 20, PF12 and PF 4) and pit (Number 9 pit). There are also separate ratios for the central business district. As a main route approaches an exchange the customer density increases increasing the likelihood of encountering concrete, asphalt or other obstacles.

The size of the manholes required also increases the closer the route is to the exchange. For this reason, separate input ratios are assigned to each size of manhole and pit along the main cable route.

Ratios for Developing Composite Breakout and Reinstatement Costs for Pits and Manholes-Main

Type of Manhole	Non-CBD Percent Applicable PF 28	Non-CBD Percent Applicable PF 20	Non-CBD Percent Applicable PF 12	Non-CBD Percent Applicable PF 4
Breakout Concrete	60%	60%	60%	38%
Breakout Asphalt	35%	35%	35%	20%
Breakout Pavers	5%	5%	5%	5%
Breakout Kerbing				
Reinstate Turf				32%
No Activity				5%
Total	100%	100%	100%	100%

Ratios for Developing Composite Breakout and Reinstatement Costs for Pits by Density Zone-Distribution

Density Range	All Pits Percent Applicable DR1	All Pits Percent Applicable DR2	All Pits Percent Applicable DR3	All Pits Percent Applicable DR4
Breakout Concrete	60%	50%	30%	15%
Breakout Asphalt	20%	25%	25%	10%
Breakout Pavers	15%	5%	5%	5%
Breakout Kerbing				
Reinstate Turf	5%	20%	40%	65%
No Activity				5%
Total	100%	100%	100%	100%

There is also a different set of placement ratios for each of the density zones for distribution cable. There are five density zones in the model with the potential to add a sixth. Each zone has its own set of input factors. In addition there is a separate set of factors for distribution networks in a central business district.

There are five separate costs associated with placing conduit in the ground:

1) trenching through turf;

2) trenching through roads;

3) trenching through footpaths and drives;

4) boring under roads; and

5) boring under footpaths and drives.

The model contains ratios to identify the **percentage of time each activity would be encountered** in a new build. The model contains a separate set of inputs for each size of main conduit configuration.

As laid out in the previous section, there are nine main conduit configurations running in size from one 100 millimetre (mm) conduit to twenty four 100 mm conduits.

There is also a separate set of inputs for small conduit runs in rocky terrain. In normal terrain ploughing would typically be used to place small conduit configurations under roads and footpaths. However, this option is not generally used in rocky terrain so a separate set of inputs is required for these small conduit configurations.

There is another set of inputs for placing main conduits in central business districts due to the unique nature of these areas.

Ratios of the Amount of Each Type of Conduit Placement Activity for Areas Outside the CBD-MAIN (Exception for small conduit runs in rocky terrain below)

Type of Placement Activity	Main Percent Applicable 1 X 100mm Conduit	Main Percent Applicable 2 X 100mm Conduit	Main Percent Applicable 4 X 100mm Conduit	Main Percent Applicable 20 X 100mm Conduit	Main Percent Applicable 24 X 100mm Conduit
Number of 100 mm Conduits					
Trench-Turf	56%	56%	40%		
Trench-Road Xing	2%	2%	22%	22%	22%
Trench-Footpaths & Drives	2%	2%	38%	78%	78%
Boring-Footpath & Drives	20%	20%			
Boring-Under Roads	20%	20%			
Total	100%	100%	100%	100%	100%

Exception for the Alternate Amount of Each Type of Conduit Placement Activity for Rocky Areas Outside the CBD-MAIN (Small conduit runs only)

Type of Placement Activity	Percent Applicable 1 X 100 mm	Percent Applicable 2 X 100 mm
Number of 100 mm Conduits		
Trench-Turf	56%	56%
Trench-Road Xing	22%	22%
Trench-Footpaths & Drives	22%	22%
Boring-Footpath & Drives	0%	0%
Boring-Under Roads	0%	0%
Total	100%	100%

Ratios of the Amount of Each Type of Placement Activity Used in the Model Within the CBD-MAIN

Type of Placement Activity	Percent Applicable All
Max # 100 mm Conduits	
Trench-Road Xing	22%
Trench-Footpaths & Drives	78%
Total	100%

There is also an extensive set of inputs for the **types of placing activities that would be encountered in distribution areas**. As with main conduit configurations, the type of placing activity varies by size of the conduit configuration. In addition, there is a separate set of ratios for each of the five distribution density zones identified in the model.

There are seven distribution conduit configurations in the model ranging from one 50 mm conduit to twelve 100 mm conduits. Unlike main conduits, there are separate placement ratios for every density zone for each distribution conduit configuration. As a consequence each conduit configuration requires a separate matrix as shown by the examples below.

There is also a separate matrix for placing small conduit configurations in rocky terrain. Separate ratios are also provided for placing distribution cables in central business districts.

Ratios of the Amount of Each Type of Conduit Placement Activity Used in the Model for 1x50 Conduit Configurations Outside the CBD-DISTRIBUTION

Normal Terrain

Description	Percent Applicable Normal DR1	Percent Applicable Normal DR2	Percent Applicable Normal DR5	Percent Applicable Reserved
Trench-Turf	5%	20%	85%	100%
Trench-Road Xing	2%	2%	2%	
Trench-Footpaths & Drives	2%	2%		
Boring-Footpath & Drives	71%	56%	3%	
Boring-Under Roads	20%	20%	10%	
Total	100%	100%	100%	100%

Rocky Terrain

Description	Percent Applicable Normal DR1	Percent Applicable Normal DR2	Percent Applicable Normal DR5	Percent Applicable Reserved
Trench-Turf	5%	20%	85%	100%
Trench-Road Xing	22%	22%	10%	
Trench-Footpaths & Drives	73%	58%	5%	
Boring-Footpath & Drives	0%	0%	0%	
Boring-Under Roads	0%	0%	0%	
Total	100%	100%	100%	100%

Ratios of the Amount of Each Type of Conduit Placement Activity Used in the Model for 12x100 Conduit Configurations Outside the CBD-DISTRIBUTION

All Terrain

Type of Placement Activity	Percent Applicable All DR1	Percent Applicable All DR2	Percent Applicable All DR5	Percent Applicable Reserved
Trench-Road Xing	22%	22%	22%	
Trench-Footpaths & Drives	78%	78%	78%	100%
Total	100%	100%	100%	100%

The final category of ratio inputs is used to ascertain the **percentage of time each type of breakout and reinstatement activity would be encountered** when trenching through footpaths, drives and streets. In other words when going through streets what is the relevant relationship between the amount of time the street was made of asphalt or concrete.

There are separate inputs for urban band two ESAs and central business districts. There are also separate matrices for main and distribution conduit runs.

Ratios of Composite Breakout and Reinstatement Costs for Conduit Runs-MAIN - MAX NUMBER OF CONDUITS

Description	Trenching Turf Non CBD	Trenching Roads Non CBD	Trenching Roads CBD	Trenching Footpaths & Trenching Drives Non CBD	Trenching Footpaths & Trenching Drives CBD	Boring & New Estates
Breakout & Reinstate Concrete		15%	15%	85%	85%	
Breakout & Reinstate Asphalt		75%	75%	10%	10%	
Breakout & Reinstate Pavers		5%	5%	5%	5%	
Breakout & Reinstate Kerbing		5%	5%	0%	0%	
Reinstate Turf	80%					
No Reinstatement	20%					100%
Total	100%	100%	100%	100%	100%	100%

The distribution network matrix is virtually identical to the main matrix shown above.

A.7 Costing Variables : Costing - Capital Cost

a) General

The **Cost Inputs - Capital Costs and Factors** identifies all the inputs required to turn an investment amount into an annual cost. All of the inputs for determining capital costs and the direct and indirect ratios for determining operating expenses and indirect asset costs are identified on this worksheet.

- The capital cost inputs include the costs for debt and equity, the debt ratio for determining the capital structure, the tax rate and the depreciation lives for each of the asset categories.

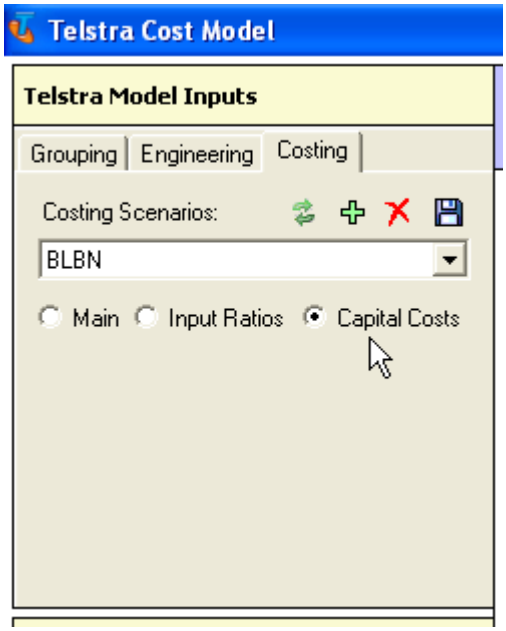
- The sheet also includes expense factors for operating and maintenance expenses (expressed as a percentage of investment) and indirect expenses such as general administration and information technologies (expressed as a percentage of direct operating and maintenance expense).

- There are also two sets of indirect investment ratios for network assets and general and administrative assets which are expressed as a percentage of direct plant in service.

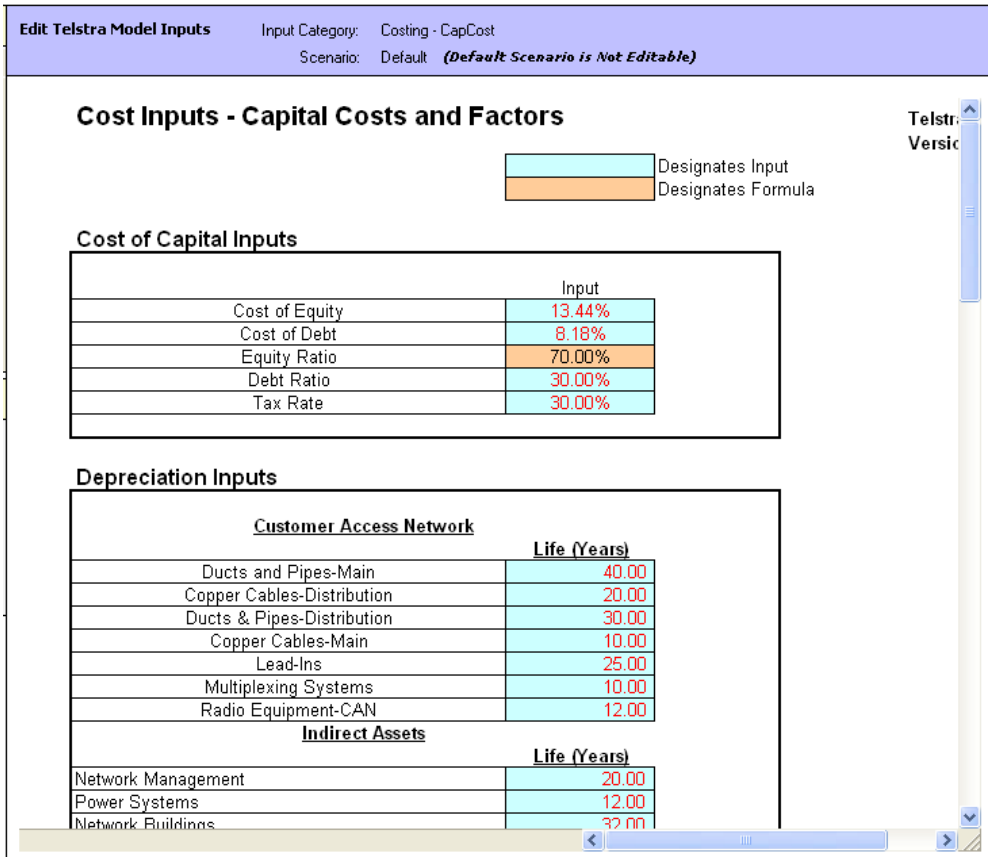
- Applying these capital and expense factors to investment derives annual and monthly capital costs.

- A minimal amount of time is required to process changes to capital cost or factor inputs regardless of the number of ESAs included in the run assuming no changes are made to the engineering inputs.

To access the **Costing – Cap Cost** sheet select the **Costing** tab and then click on the button titled **Capital Costs** which is immediately below the drop down box.



Once you have entered the **Costing – CapCost** page the following sheet appears in the **Edit Telstra Inputs** section of the page. Note that any variable highlighted red font with blue background is a user adjustable input. Each user input can be adjusted by merely clicking on the box and typing in another input variable.



Edit Telstra Model Inputs Input Category: Costing - CapCost
Scenario: Default *(Default Scenario is Not Editable)*

Cost Inputs - Capital Costs and Factors

Telstr
Versic

Designates Input
Designates Formula

Cost of Capital Inputs

	Input
Cost of Equity	13.44%
Cost of Debt	8.18%
Equity Ratio	70.00%
Debt Ratio	30.00%
Tax Rate	30.00%

Depreciation Inputs

Customer Access Network	Life (Years)
Ducts and Pipes-Main	40.00
Copper Cables-Distribution	20.00
Ducts & Pipes-Distribution	30.00
Copper Cables-Main	10.00
Lead-Ins	25.00
Multiplexing Systems	10.00
Radio Equipment-CAN	12.00
Indirect Assets	**Life (Years)**
Network Management	20.00
Power Systems	12.00
Network Buildings	32.00

You will need to use the scrollbars located at the right and bottom of the main window to display all of the available information on these pages. Each of these inputs will be discussed in the order they appear on this sheet.

If a ratio on these sheets is highlighted in orange the ratio is the result of a calculation. In most instances, the sum of all the factors must equal 100 percent. Overriding these formulas could lead to input errors.

b) Specific Inputs

There are four **capital cost and tax inputs** into the model. These inputs include the cost of equity, the cost of debt, the debt ratio and the income tax rate. The equity ratio is also identified in the input box but it is the result of a calculation that determines the reciprocal of the debt ratio. The debt ratio, cost of equity and cost of debt were provided by Telstra's finance department and are supported by an extensive study. The tax rate is the corporate tax rate.

Cost of Capital Inputs

	Input
Cost of Equity	13.44%
Cost of Debt	8.18%
Equity Ratio	70.00%
Debt Ratio	30.00%
Tax Rate	30.00%

The **depreciation lives for each category of asset** are inputs into the model. These lives were provided by Telstra's accounting department and were based on studies of Telstra's actual asset lives. These factors are applied to the projected plant balances to determine the annual depreciation accruals.

Depreciation Inputs

Customer Access Network	Life (Years)
Ducts and Pipes-Main	40.00
Copper Cables-Distribution	20.00
Ducts & Pipes-Distribution	30.00
Copper Cables-Main	10.00
Lead-Ins	25.00
Multiplexing Systems	10.00
Radio Equipment-CAN	12.00
Indirect Assets	**Life (Years)**
Network Management	20.00
Power Systems	12.00
Network Buildings	32.00
Other Indirect (Fleet, etc.)	10.00
Information Technology	5.00
Software	5.00
Buildings	48.00
Interexchange	**Life (Years)**
Optical Fibre	25.00
SDH Transmission Equipment	15.00
IEN Software	5.00
Radio Transmission	16.00
Radio Spectrum	14.00
Misc. Transmission	10.00
Switching	**Life (Years)**
Local Switching	9.00
Switching Software	5.00

The model includes an **offset for sharing conduit** with other providers. A provider wishing to share Telstra's conduit can do this by leasing the conduit through commission approved lease rates. To reflect this sharing of conduit costs the model has a set of inputs to ensure these leased revenues reduce the overall cost of the distribution network. The specific inputs into model to reflect conduit sharing through leasing are the annual amount of anticipated conduit leasing revenues, the portion of the total that is attributable to leasing distribution CAN as opposed to IEN ducts and pipes and the portion of the total revenue that can be attributed to leasing facilities in band two operating areas. The default revenue value is Telstra's actual leasing revenues.

Conduit Sharing Leasing

Conduit Sharing Annual CAN Revenue	$ 39,927,674
Percent CAN	50%
Percent Band 2	94%

The **operating and maintenance expense ratios** were developed from Telstra's actual annual expense accruals. There is a separate operating and maintenance factor for each asset category. Actual expenses were adjusted to eliminate costs that should not be recovered from the ULL rate (e.g. retail sales costs and installation charges that are recovered through separate rates). These adjusted amounts are then divided by the actual plant balance on Telstra's books for each category of expense to develop the factors. There are two exceptions to this process. For main and distribution ducts and pipes and main and distribution copper cables the denominator in the factor development is the projected investment in each of these assets as opposed to the book investment. This is necessary due to the large differential between historic and projected investment.

O & M Factors

Customer Access Network	Base Factor
Ducts and Pipes	0.002793
Copper Cables	0.087735
Multiplexing Systems	0.045093
Other	-
Switching Equipment	**Base Factor**
Switching Equipment-Local	0.037454
Switching Equipment-Trunk	0.077557
Switching Equipment-Other	0.034526
Inter-Exchange Investment	**Base Factor**
Inter-Exchange Cables	0.033104
Other Cables-CAN	
Transmission Equipment	0.051134
Radio Bearer Equipment-CAN	0.073840
Radio Bearer Equipment	0.100515
Other Systems and Equipment	**Base Factor**
Data Equipment	0.089859
Mobile Network and Terminating Equipment	0.023202
Customer Equipment	0.126526
Satellite Equipment	0.069264
International Network-Cables	0.006601
International Network-Other Systems	0.033127
Other Communications Plant & Equipment	0.068754

There are also numerous **factors for reflecting the costs of indirect expense and investment** in the model. Indirect expenses include product management, information technology, general and administrative and other organizational costs. The factors for these costs were also based on Telstra's actual expenses. The booked expense was first adjusted to eliminate retail costs and costs which are recovered through rates other than the ULL rate. The adjusted amounts are divided by the total adjusted actual operating and maintenance expenses to derive a factor to apply to operating and maintenance expenses in the model.

Indirect Expense Factors

	Base Factor
Product and Customer	0.178692
General Administration	0.357852
Information Technology	0.300357
Accommodation & Property	0.048087
Other Non Communications Asset Costs	0.045543
Other Organizational Costs	0.005227

Indirect Asset Factors

	Base Factor
Land	0.001937
Buildings	-
Building Improvements	0.010318
Information Technology	0.000895
Other Indirect (Fleet, etc.)	0.006216
Software	0.005754
Intangibles	0.008422

Network Support Asset Factors

	Base Factor
Network Land	0.003043
Network Buildings	0.015229
Network Building Improvements	0.000535
Network Power Systems	0.005830
Network Management Systems	0.002490
Support Structures	0.001417

Indirect assets are general purpose land and buildings, information technology assets and software and other indirect assets (i.e. fleet, intangibles). These factors were based on Telstra's actual investment in these categories of assets. Book amounts for the assets were adjusted to remove cost of retail assets and assets recovered through non ULL rates. The adjusted investment was then divided by the total book investment for direct assets adjusted to reflect the forward looking cost of copper cables and pipes and ducts. The resulting factors are applied to the projected plant in the model to derive the projected investment in these indirect assets. Capital cost factors are then applied to the modelled investment to derive annual and monthly costs for the assets.

Network support assets include network land and buildings, network power systems, network management systems and support structures. The network support asset factors are calculated using the same basic approach that was used to develop the factors for the other category of indirect assets. Adjusted book network support asset amounts were divided by adjusted total direct asset costs to derive the factors.