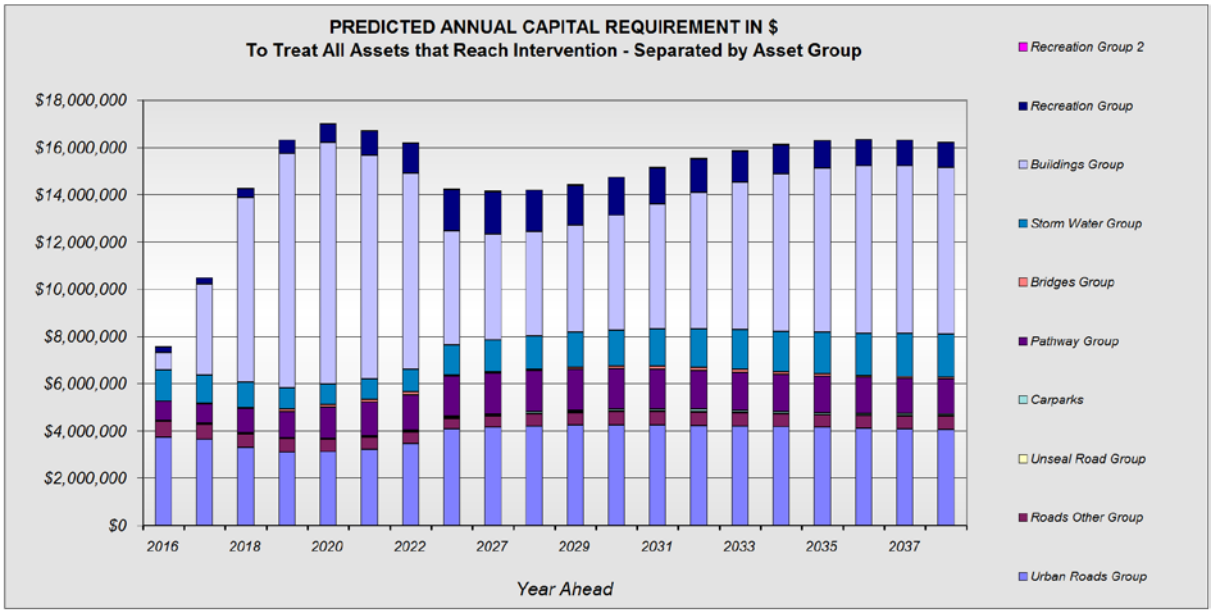
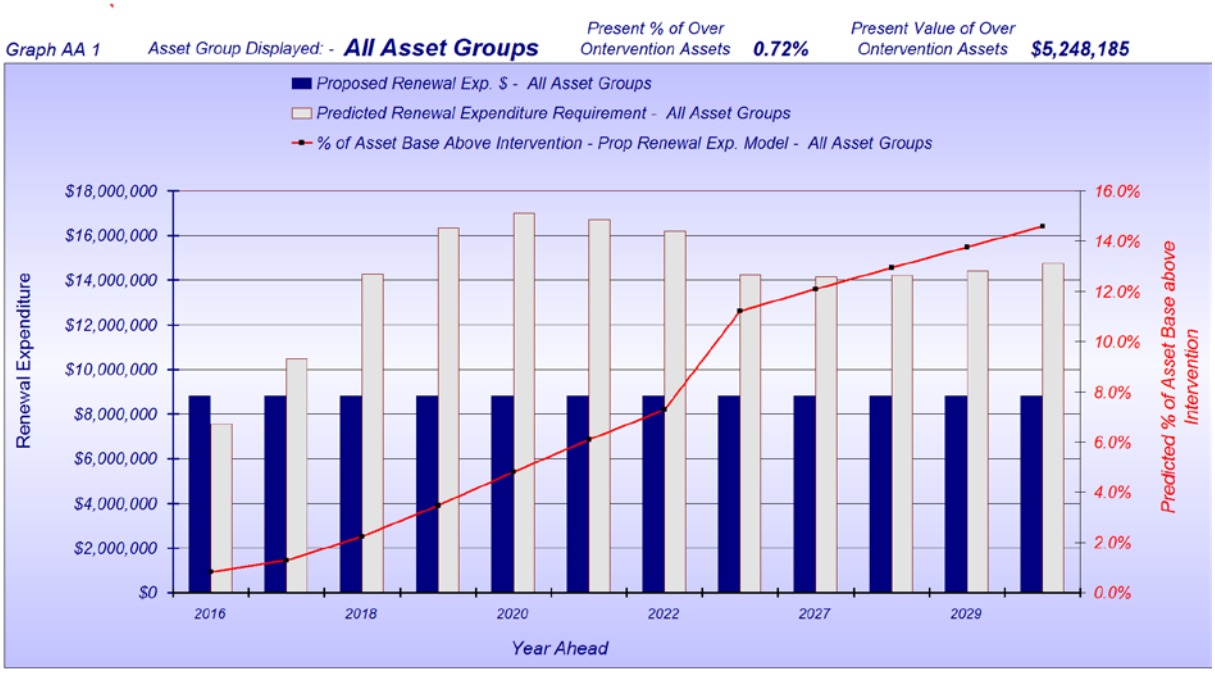
# The Moloney Financial Model Manual

## Version N3, Feb 2017



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# 1 Introduction

The Moloney Financial Model, or as it is sometimes referred to as, the Renewal Gap program, has been developed to assist Local Government authorities gain a better understanding of the future renewal cost associated with their infrastructure assets. These assets were created over a long period of time and Councils need to understand the future renewal demand pattern. The Moloney software can greatly assist in quantifying renewal demand across the whole asset range.

At the heart of the Moloney system is a financial modelling application hosted in an MS-Excel file called "Model All". This file has been developed as part of the broader Moloney asset management system over the last 20 years. Two additional MS-Excel files enable the software to be more broadly used. Together these three files make up the Moloney Financial Modelling – Renewal Gap software suite that can be used in conjunction with any other asset management software system.

The key function of the system is the ability to predict future renewal demand.

## 1.1 The Basics of the Moloney Model

The Moloney Model operates at a network level to determine the future renewal (or replacement) demand to maintain the whole of a like performing asset set to a predetermined condition level.

The model is predicated on the assumption that an individual asset is created; it decays with time, and will eventually require renewal, or rehabilitation. The rate of decay needs to be established and at any point in time the asset can be assigned a condition rating. The condition rating scale MUST be linked to the progress of the asset from "new" condition to the point at which it requires rehabilitation.

To drive the model the user first must identify sets of assets. These will have sufficient commonality in performance and costs to be usefully grouped and modelled. For each asset set to be modelled the program needs:

- Condition distribution based on a 0 – 10 scale where 0 is new and 10 has no remaining value
- Degradation curve expressed in average years of life within each condition range 0 – 9
- Unit renewal value of the asset – eg \$30/$m^2$ for road pavement rehabilitation
- Service level, or intervention level at which you need to rehabilitate the asset eg Condition 8

With all the above information in place, it becomes a mathematical exercise to determine the profile of the renewal demand. Once the actual, or proposed, renewal expenditure profiles are input, the renewal gap profile is created by taking the proposed expenditure profile from the predicted renewal demand

## 1.2 Modelling Issues

The rehabilitation activity may not necessarily require the complete replacement of the asset. Some lesser treatment may restore the full life potential of the asset. The key being the grouping of like performing assets that will be subject to the same rehabilitation treatment.

The process can be long and complex to analyse all of your infrastructure assets, and to expect a piece of software to deliver meaningful results without proper attention to sound input information is foolhardy.

If you intend to obtain a meaningful result from this software be prepared to review all input data in an analytical way. If the results look wrong, they probably are and it will generally be your base data that is at fault. Look at the base data and satisfy yourself that it properly reflects the true situation with your assets.

Another common problem is the adoption of a level of service (intervention level) that delivers a better condition standard than that which currently exists. In other words, you are asking for a better condition than you currently have. You should not be surprised in this situation to get a high early renewal demand. After all, if you ask for a better condition outcome you should expect to have to pay the price.

## 1.3 Program Cell Shading Convention for all Moloney Files

There is a general cell shading convention operating within all Moloney files and programs. An understanding of this will assist with identifying the status of the data within a given cell, as well as where it has come from. Detailed below is an explanation of the cell shading convention.

| | |
|---|---|
| | Generally a cell used for a heading although in some cases the text or number in the heading is Linked by formulae to other cells on the same sheet. **Do Not Amend.** |
| | These are the cells that require variable input information for the operation of the model. **These are the only cells you should amend** |
| | These Cells are all linked by formulae to other cells on the same Sheet. **Do not Amend** |
| | Date is placed into these cells during the running of the program operations **Do not Amend** |
| | These cells contain the Excel sheet comments or are linked by formulae to cells on another work sheets **Do not Amend** |
| | Cells Containing Important Excel NOTES to explain the sheet There are many other unshaded cells with excel explanations but the key ones are shaded |
| | Generally a blank cell on the sheet with no program function |

As a general rule you may only amend the GREEN SHADED Cells within the System.

## 1.4 Conventions used in this document and the Software

- Notes and tips will appear in boxed text to the right of the page
- Menu commands will appear in Courier mono spaced type. Multi-level commands will be separated by arrows, such as:

  `Input Pro Forma → Required Data Sheet Operations → Bring in All Nominated Default distributions within Table 2 and 3.`

- Detailed explanations can be found within the program sheets wherever you see a red triangle in the top right corner of a cell (an excel Comment)

# 2 Moloney Financial Modelling – Basic Set Up

The Moloney Financial Model - Renewal Gap system is contained in three MS-Excel files working together to produce the overall result. The MS-Excel file names are:

- Input Pro Forma
- Model All
- Asset Graphs

The three files work together. All of the raw data is entered into “Input Pro Forma”. The aim is to have the “Required Data” sheet of that file fully populated for all 40 potential base data sets. Data is then moved to “Model All”, where the modelling is done. Finally, “Asset Graphs” displays the results.

For advanced users, there is the additional possibility of adjusting data in “Model All” and saving those adjustments back into “Input Pro Forma”.

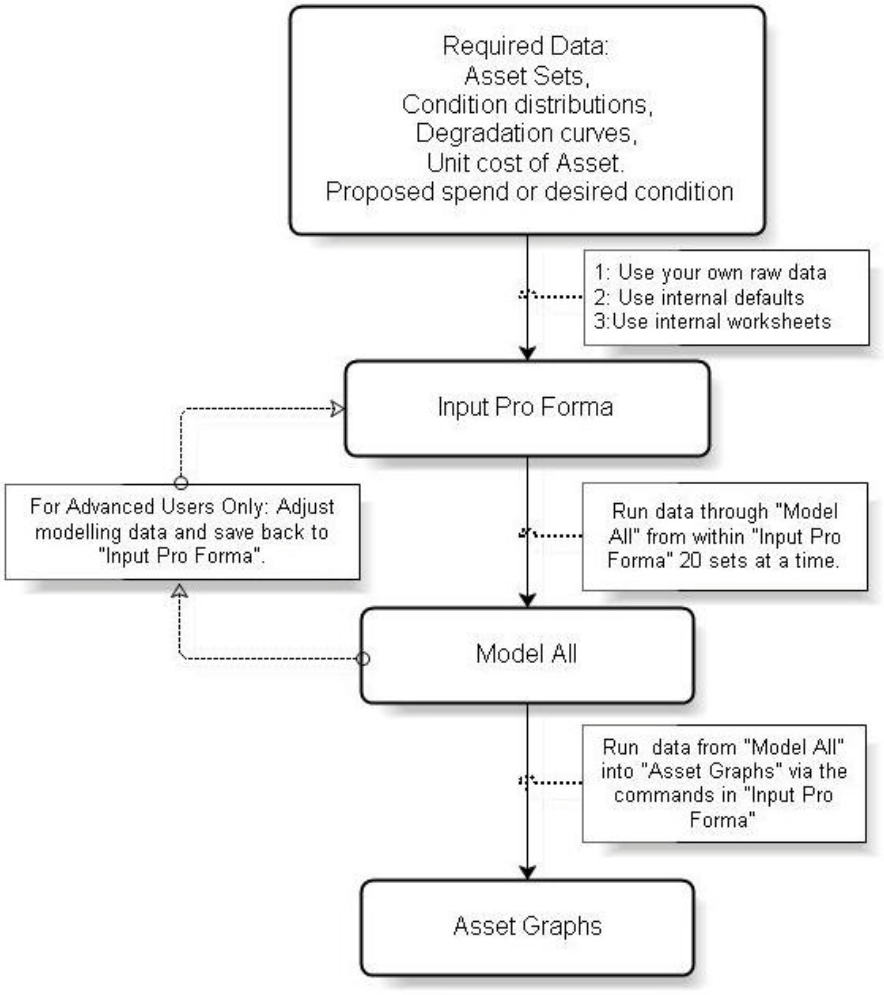



**Figure 1: Data flow diagram for the Renewal Gap.**

## 2.1 Input Pro Forma

The prime purpose of this file is to provide the tools to manipulate the asset input information, so that it can be run through “Model All”. With “Input Pro Forma” populated the whole modelling process can be managed from the “Run and Review Results” Sheet within this file. A further more detailed explanation of the file and its operations is provided later in this document

"Input Pro Forma" has the capacity for up to 40 individual data sets to be modelled separately and then grouped for display as required in "Asset Graphs".

## 2.2 Model All

This file can be seen as the engine room of the modelling process. It does all of the calculations and predictive modelling based upon your input data. However, the basic user does not have to access this file at all, as the input information goes into "Input Pro Forma" and the overall results are displayed within "Asset Graphs".

For the more advanced user, "Model All" provides a great opportunity to trial variations to the basic input parameters and to assess the sensitivity of the model to such changes. A detailed explanation of "Model All" and its operations and outputs is available as a separate document titled "Model All File Explanation". It is strongly recommended the user read this document to gain an understanding the operations and assumptions behind the modelling process.

## 2.3 Asset Graphs

This file is designed to present overall modelling results for the 40 possible individual data sets. Modelling results are displayed within the file in 3 ways at 3 different levels.

- Single display for overall results for all asset groups combined
- At an asset group level – eg the Roads Group covering pavements, sealed surfaces, kerbs etc
- At an individual Asset set level – eg Link Road Pavement assets (within the Roads Group)

# 3 The "Input Pro Forma" File

"Input Pro Forma" is a complex file designed to assist with the formatting of the modelling input information to suit the "Model All" file. The goal is to populate Tables 1 to 4 of the "Required Data" sheet for all 40-asset sets. There are three methods of populating the "Required Data" sheet.

- Fill in the four tables directly, from your own data sources (from other data bases).
- Place the overall asset details in Table 1 and then used the default distributions in Tables 2 & 3
- Use the Internal worksheets to assist with the populating of the data.

NOTE
Even the data sets you are **NOT** using must be fully populated

Or use a combination of all three of the above. The actual methods of populating the "Required Data" sheet will be explained in more detail later in this document.

Data entry is complete when you have all four tables on the "Required Data" sheet of "Input Pro Forma" filled in for all 40 individual data sets.

## 3.1 Sheets within "Input Pro Forma"

There are 16 sheets within "Input Pro Forma", each is described here.

### 3.1.1 Notes on File

This sheet will be found in all Moloney files and is aimed at providing a basic explanation of the particular file and how it fits in with the overall operation of the Program. The aim is to have sufficient information within the sheet to enable a reasonable user to get started without having to refer to this manual.

There is a button around cell C6 titled “Set calculations to Automatic Update”. This button is on the “Notes on File” sheet of all 3 Financial Modelling files and resets Excel to automatically update formulae cells. Automatic Updates can be disabled if the program is interrupted and this will reset them.

> Tip!
>
> If calculated cells do not update there is a Button to reset calculations to Automatic, on notes on file sheet within all 3 files.

### 3.1.2 Required Data Sheet

As the name implies this sheet holds all of the required data for the running of the Renewal Gap Program. Once you have filled in the four tables for all 40 data sets your task is complete and the program can be run.

The first table holds general information and statistics relation to the data sets. The second holds the present condition distributions of the asset sets on a 0 – 10 scale. The third houses the degradation or performance curves and finally the forth allows you to define the asset type. (Asset type is used to match default distributions that are stored within the system, when they are called up).

### 3.1.3 Graphs Sheet

This sheet is designed to enable you to view your condition distributions and degradation curves in a graphical format. It also provides the facility to view them against the various Moloney Default curves that are built into the software for the particular asset type.

The sheet contains four graphs covering the condition distribution and degradation curve for each of the 40 data sets. The graphs are arranged in two paired sets. The first pair, between Columns A – M, contain the condition distribution and degradation curve that you plan to use within the “Required Data” sheet for each asset set. The slider bar at cell K1 allows you to move between the 40 data sets on the “Required Data” sheet. The second set of graphs between Columns O – AA display the default condition distributions and degradation curves that relate to the selected asset set based on the type of asset selected in table 4 of the “Required Data” sheet. The slider bar at Cell Z1 allows you to move between the 6 default condition distributions and compare them with your distribution. The default distributions where possible are based on a broad range of real data and range in six steps from Very Good to Poor Condition.

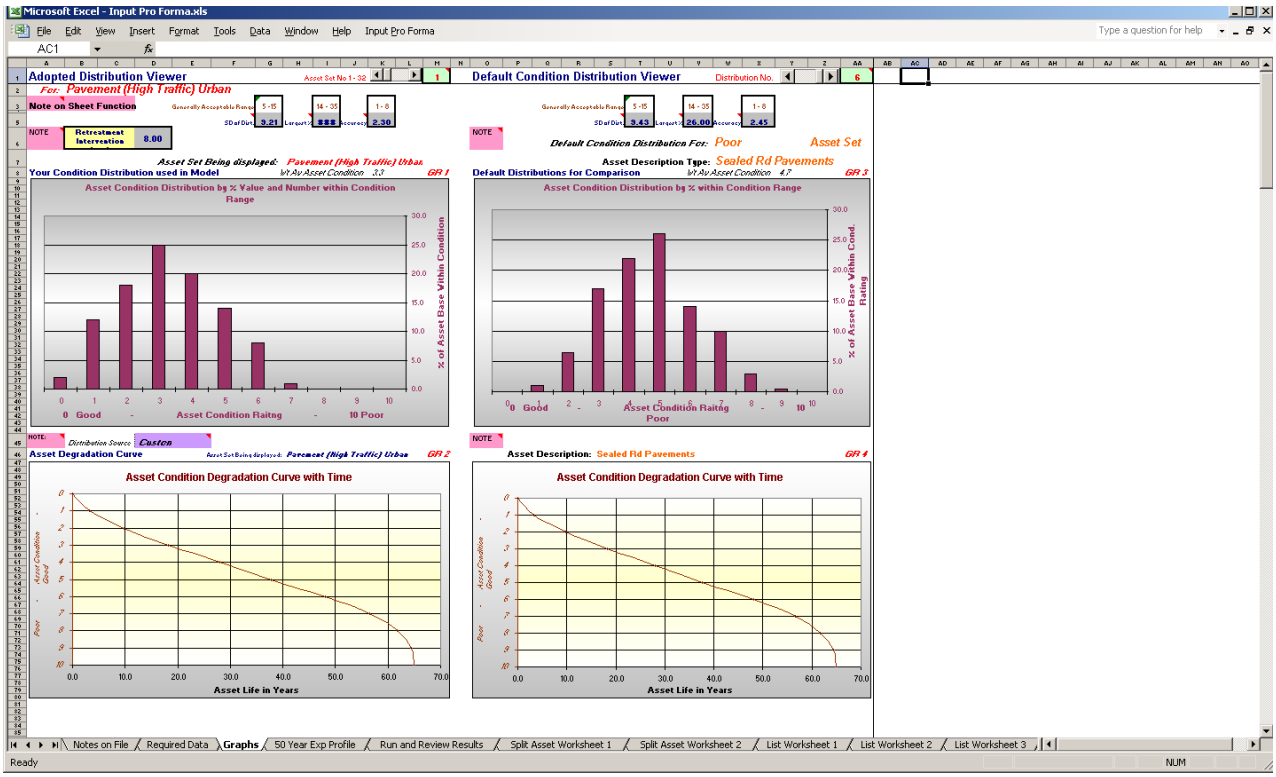



**Figure 2A: The Graphs Sheet**

The default distribution graphs have six different condition distributions and one degradation curve for each of the 20 data set types that are available from the pick list within row 58 of the “Required Data” sheet. As a guide to evaluating your condition distribution, long-term assets would be expected to have a normal or skewed normal distribution, while short-term assets would tend to be flatter in profile. If the distribution has gaps or appears otherwise to be unrealistic then it should be reviewed.

There are three key distribution indicators within row five of the sheet with suggested acceptable ranges. It is difficult to cover all situations but if your figures fall outside of the suggested ranges you should review the distribution and satisfy yourself of their accuracy.

The present condition distribution represents the starting point for the modelling process. The accuracy of this distribution is vital to the overall outcome and this sheet has been provided to enable you to review your distributions against a series of typical graphs.

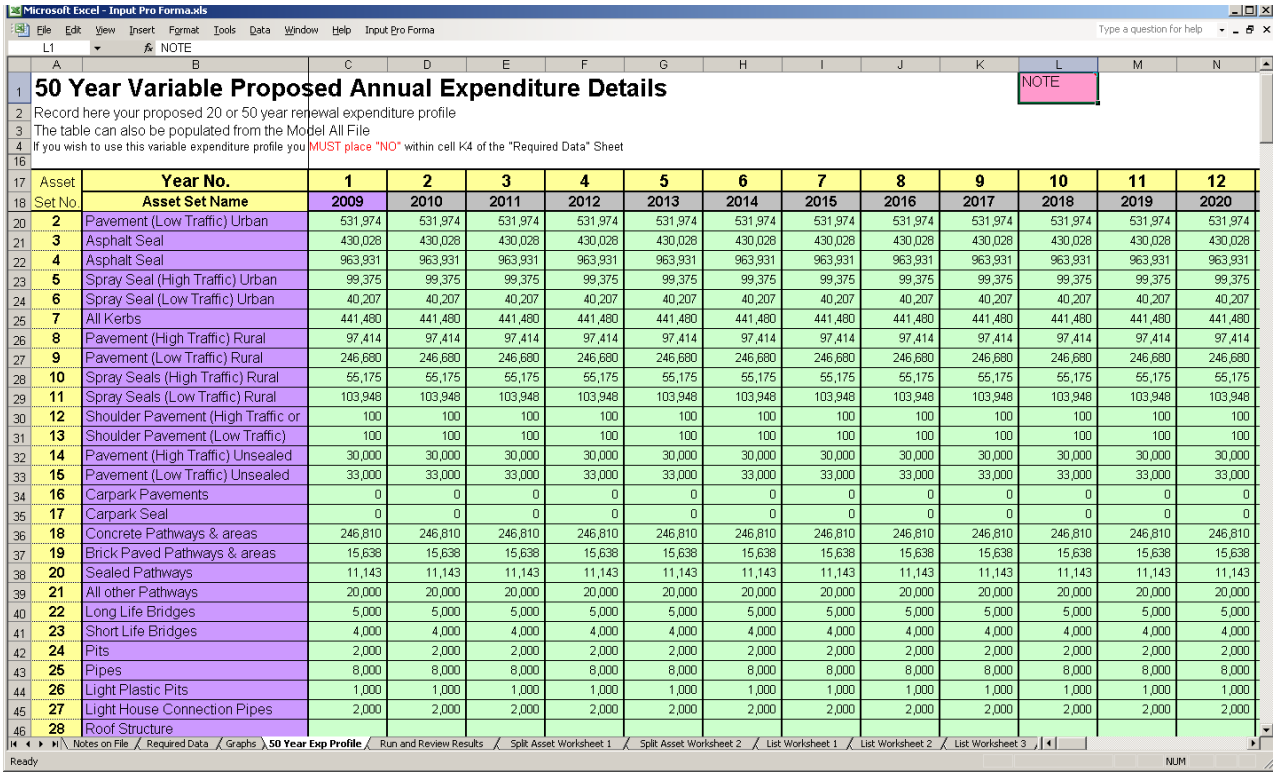
### 3.1.4 50 Year Exp Profile Sheet

This sheet enables the user to vary the proposed renewal expenditure levels with time. Often this will be done within the Model All file and the results directly transferred back here from that file.

**Note**

If you wish to have the model use the 50-Year expenditure profile you MUST place a “**No”** in cell K4 of the “Required Data” sheet. This tells the program to use the data in the “50 Year Exp Profile” sheet.

There is a small check undertaken concerning the contents of this sheet before the model is run. If the total proposed renewal expenditure profile on the sheet for either of the two groups of 20 Data sets (1 –20 & 21-40) is less than $500,000 then cell K4 on the “Required Data” sheet is set to YES (assuming that you have not already filled this sheet in).



Microsoft Excel - Input Pro Forma.xls

File Edit View Insert Format Tools Data Window Help Input Pro Forma

L1 NOTE

**50 Year Variable Proposed Annual Expenditure Details**

Record here your proposed 20 or 50 year renewal expenditure profile
The table can also be populated from the Model All File
If you wish to use this variable expenditure profile you MUST place "NO" within cell K4 of the "Required Data" Sheet

NOTE

| Asset Set No | Year No. / Asset Set Name | 1 2009 | 2 2010 | 3 2011 | 4 2012 | 5 2013 | 6 2014 | 7 2015 | 8 2016 | 9 2017 | 10 2018 | 11 2019 | 12 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | Pavement (Low Traffic) Urban | 531,974 | 531,974 | 531,974 | 531,974 | 531,974 | 531,974 | 531,974 | 531,974 | 531,974 | 531,974 | 531,974 | 531,974 |
| 3 | Asphalt Seal | 430,028 | 430,028 | 430,028 | 430,028 | 430,028 | 430,028 | 430,028 | 430,028 | 430,028 | 430,028 | 430,028 | 430,028 |
| 4 | Asphalt Seal | 963,931 | 963,931 | 963,931 | 963,931 | 963,931 | 963,931 | 963,931 | 963,931 | 963,931 | 963,931 | 963,931 | 963,931 |
| 5 | Spray Seal (High Traffic) Urban | 99,375 | 99,375 | 99,375 | 99,375 | 99,375 | 99,375 | 99,375 | 99,375 | 99,375 | 99,375 | 99,375 | 99,375 |
| 6 | Spray Seal (Low Traffic) Urban | 40,207 | 40,207 | 40,207 | 40,207 | 40,207 | 40,207 | 40,207 | 40,207 | 40,207 | 40,207 | 40,207 | 40,207 |
| 7 | All Kerbs | 441,480 | 441,480 | 441,480 | 441,480 | 441,480 | 441,480 | 441,480 | 441,480 | 441,480 | 441,480 | 441,480 | 441,480 |
| 8 | Pavement (High Traffic) Rural | 97,414 | 97,414 | 97,414 | 97,414 | 97,414 | 97,414 | 97,414 | 97,414 | 97,414 | 97,414 | 97,414 | 97,414 |
| 9 | Pavement (Low Traffic) Rural | 246,680 | 246,680 | 246,680 | 246,680 | 246,680 | 246,680 | 246,680 | 246,680 | 246,680 | 246,680 | 246,680 | 246,680 |
| 10 | Spray Seals (High Traffic) Rural | 55,175 | 55,175 | 55,175 | 55,175 | 55,175 | 55,175 | 55,175 | 55,175 | 55,175 | 55,175 | 55,175 | 55,175 |
| 11 | Spray Seals (Low Traffic) Rural | 103,948 | 103,948 | 103,948 | 103,948 | 103,948 | 103,948 | 103,948 | 103,948 | 103,948 | 103,948 | 103,948 | 103,948 |
| 12 | Shoulder Pavement (High Traffic or | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 13 | Shoulder Pavement (Low Traffic) | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 14 | Pavement (High Traffic) Unsealed | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 |
| 15 | Pavement (Low Traffic) Unsealed | 33,000 | 33,000 | 33,000 | 33,000 | 33,000 | 33,000 | 33,000 | 33,000 | 33,000 | 33,000 | 33,000 | 33,000 |
| 16 | Carpark Pavements | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17 | Carpark Seal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18 | Concrete Pathways & areas | 246,810 | 246,810 | 246,810 | 246,810 | 246,810 | 246,810 | 246,810 | 246,810 | 246,810 | 246,810 | 246,810 | 246,810 |
| 19 | Brick Paved Pathways & areas | 15,638 | 15,638 | 15,638 | 15,638 | 15,638 | 15,638 | 15,638 | 15,638 | 15,638 | 15,638 | 15,638 | 15,638 |
| 20 | Sealed Pathways | 11,143 | 11,143 | 11,143 | 11,143 | 11,143 | 11,143 | 11,143 | 11,143 | 11,143 | 11,143 | 11,143 | 11,143 |
| 21 | All other Pathways | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| 22 | Long Life Bridges | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 |
| 23 | Short Life Bridges | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 |
| 24 | Pits | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| 25 | Pipes | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 |
| 26 | Light Plastic Pits | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| 27 | Light House Connection Pipes | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| 28 | Roof Structure | | | | | | | | | | | | |

Notes on File | Required Data | Graphs | 50 Year Exp Profile | Run and Review Results | Split Asset Worksheet 1 | Split Asset Worksheet 2 | List Worksheet 1 | List Worksheet 2 | List Worksheet 3

Ready NUM

**Figure 3 The "50 Year Exp Profile" sheet**

### 3.1.5 Run and Review Sheet

The “Run and Review” sheet contains six control buttons enabling the user to run the program. The entire program can be run from **Button 5**, or it can be run in stages via **Buttons 1 – 4**. If you run the program in stages, **Button 1** will take the first 20 data sets from “Input Pro Forma” to “Model All”. **Button 2** will transfer that data from “Model All” to “Asset Graphs”. **Buttons 3** & **4** operate in the same way on data sets 21 – 40.

The advantage with the use of **Buttons 1 – 4** is that you can review and amend results within "Model All" before transferring final results to "Asset Graphs". If you amend the modelling variables within "Model All" for a single asset set you MUST activate **Button MV 1** on the "Modelling Variables" sheet if you want the amended results to be carried through to "Asset Graphs". You can review and amend any of the 20 data sets within "Model All" one at a time and then save those results within "Model All" using **Button MV 1** on the required Data sheet.

**Note**

**If you edit data within "Model All"**
Use the **MV 1** button to save the changes within Model All
Use the **MV 2** button to save amendments back to "Input Pro Forma"

Once you have reviewed and amended the various data sets within Model All" you can transfer all of your amendments for the whole 20 data sets within "Model All" back to "Input Pro Forma" via **Button MV 2** on the "Modelling Variables" sheet of "Model All". This saves your changes and next time you run the program from the "Input Pro Forma" file your amendments will be reflected in the results within the "Asset Graphs" file.

To transfer the amended results from "Model All" to "Asset Graphs" you go to the "Run and Review" sheet of "Input Pro Forma" and activate Button 2 or Button 4 as appropriate. Alternatively you could run the whole program from Button 5.

Button 6 was added to the "Run and Review" sheet in September 2009 to format a template within "Asset Graphs" to match the user's desired asset set groupings. Note: Button 5 also activates the program linked to Button 6 at the end of its run. Thus Button 5 remains the one selection to activate the whole program.

**Note**

"Button 6" checks for errors in the set-up of asset group numbers and names on the "Required Data" sheet. If any are found the user will get an error message and the problem cells will be shaded red.

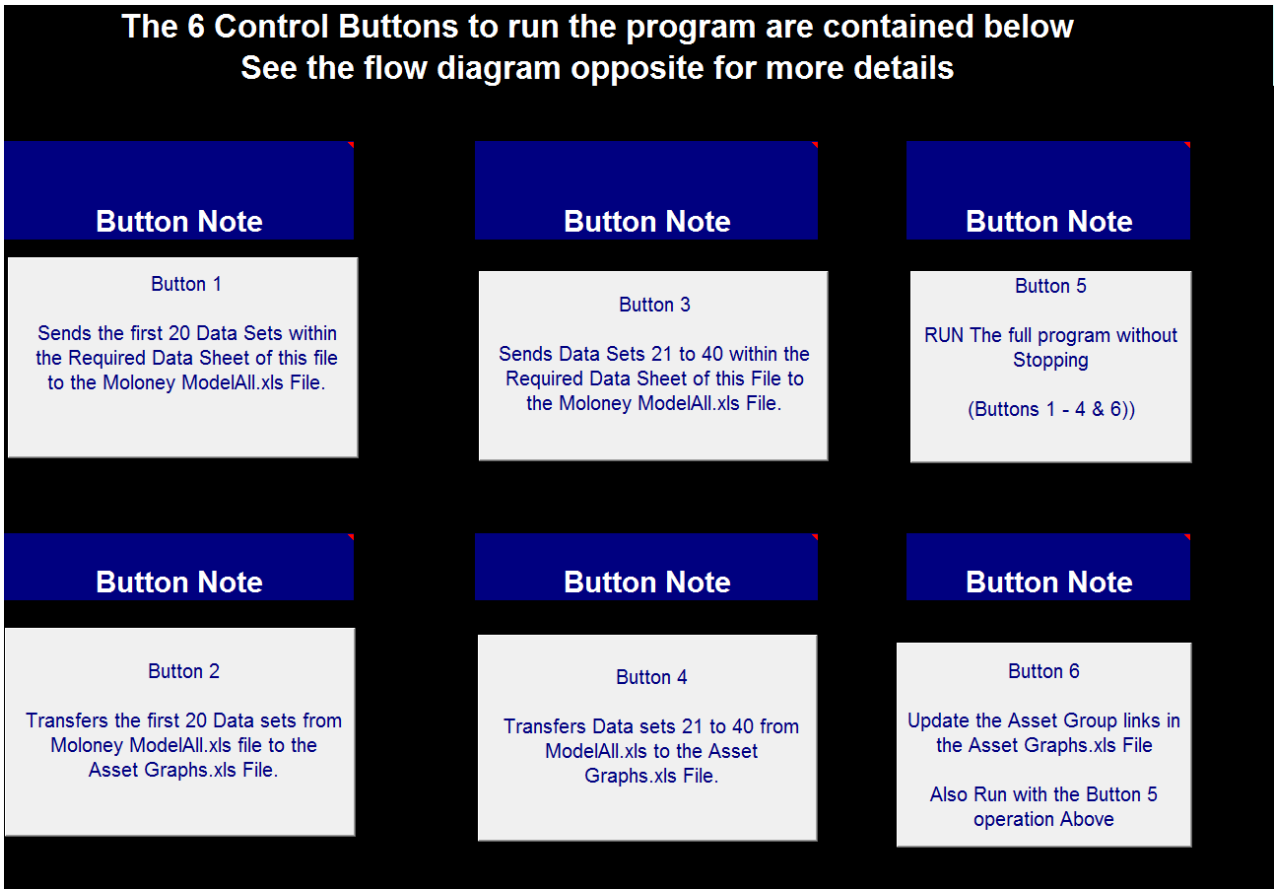



**Figure 4: The Control Buttons on "Run and Review" sheet**

# Moloney Financial Modelling Program

**Flow Chart of Operations from "Run and Review" sheet of "Input Pro Forma**

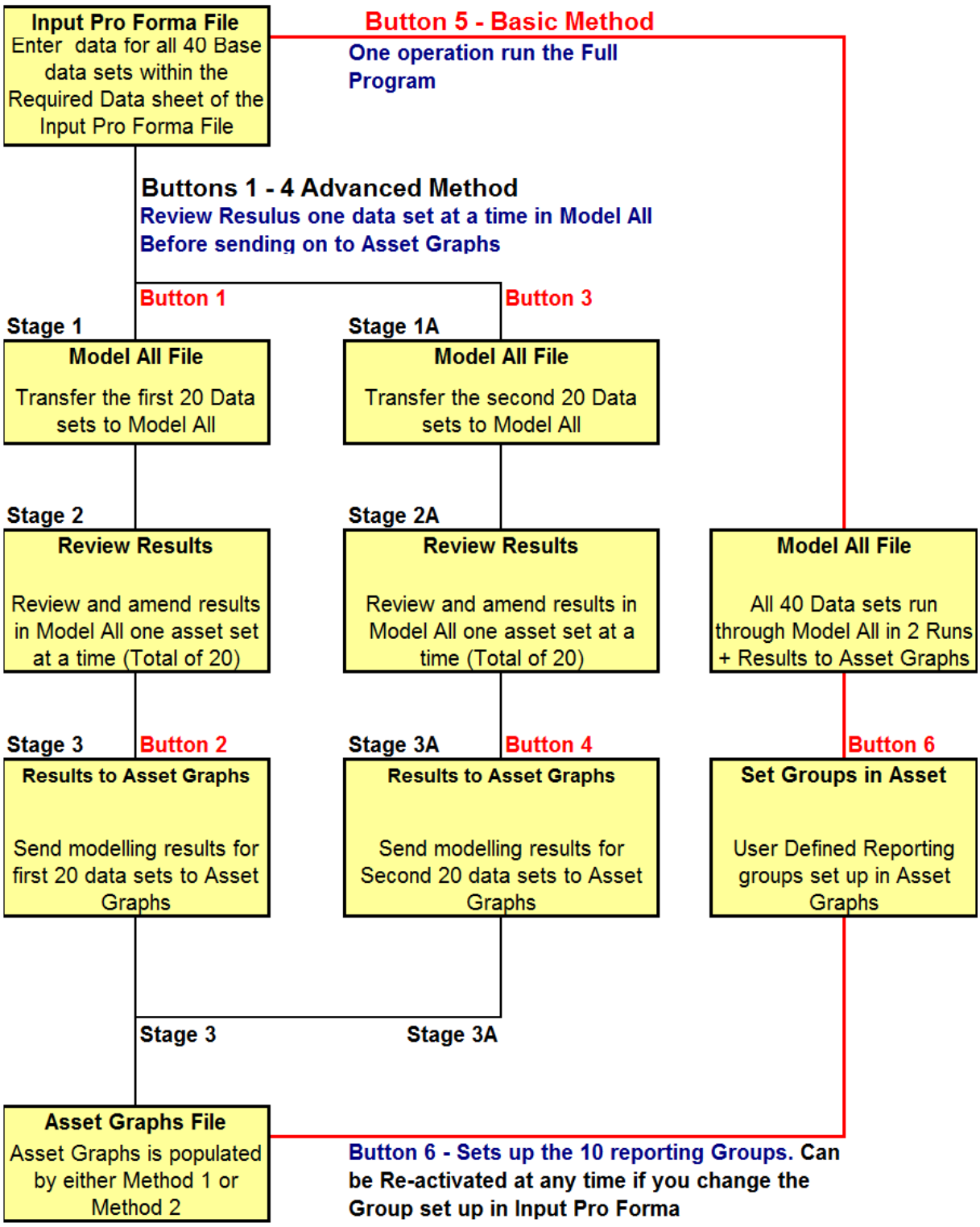



**Figure 4A : Program Flow Chart on "Run and Review" sheet**

### 3.1.6 The Nine Individual asset work Sheets

Nine individual asset work sheets have been provided to assist with managing data and formatting it for transfer to the “Required Data” sheet. There is no need to use these sheets at all, but they have been set up primarily to assist with the development of the present condition distribution for particular data set types.

You may use the one work sheet more than once if required and the asset set number location within the “Required Data” sheet where the results land is also user definable on the work sheet. A more detailed explanation of the use of the sheets will be provided later in this manual.

### 3.1.7 Condition Distribution Converter Sheets

The Moloney Model operates on a strict 0 – 10 condition rating range. Zero being a new asset with no faults and 10 an asset with no remaining life. If you draw your condition distribution information from some other database then this sheet has been provided to assist you to convert you distribution to the required 0 – 10 condition format.

The converter provides you with a 0 – 300 possible range for the % of your assets within a given condition. At the head of the conversion table you nominate the range you are using as well as whether condition is improving or degrading with ascending condition number. The program then delivers a 0 – 10 condition distribution for use within the “Required Data” sheet.

If you have a very limited condition range, say 1-5 or 1-3, it is difficult to create a broader condition range and you may need to do some manual adjustments to the final result. However if you are compressing a larger condition range the converter will deliver sound results.

### 3.1.8 Program Amendments Sheets

Finally there is a sheet that records the details of any program amendments following the first release of the Version N1 Software. The amendments that were listed here from previous software versions have been removed.

## 3.2 Importing data from older versions of the Renewal Gap Program

There are two buttons on the “Required Data” sheet (Button 3 & Button 4) around cell Q1 for importing data to this file from a version N2 “Input Pro Forma” as well as uploading to an empty current N3 file format. See the Button Notes for more details.

The upload of your old data from a previous modelling exercise is a good starting point. The condition distributions will be copied to the new file as custom distributions, in case you have made any fine-tuning to them in the old format without changing the status in row 36.

The old “Input Pro Forma file from the N2 or N3 program version is saved into the same folder as the 3 new Modelling files and renamed as “Input”. Data is then brought into the new files from Buttons 3 or 4 as appropriate.

**Note**

If you were using one of the default condition distributions, it is good practice to identify the distribution you used in row 36.

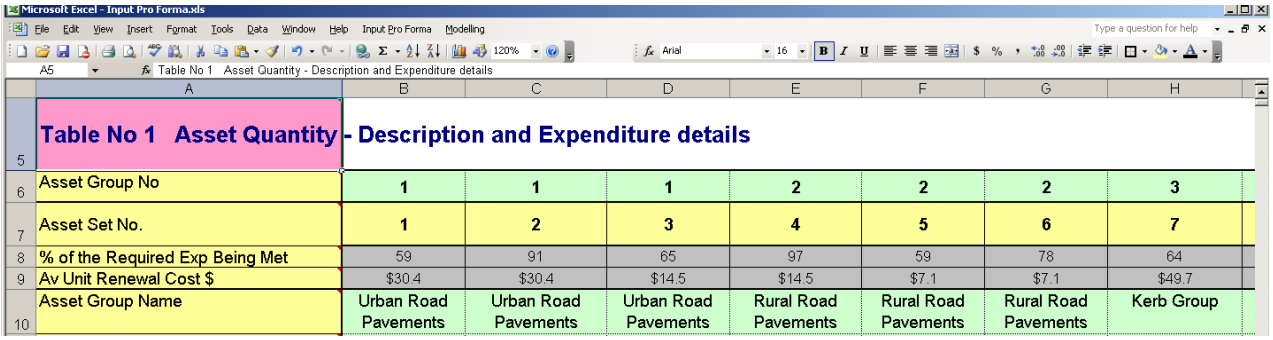
## 3.3 Asset Sets and Asset Groups within the “Required Data” Sheet

The N3 software version now enables great flexibility with the set-up of asset groups.

**Note**

The asset groups are set-up for display within “Asset Graphs” automatically when you run the software. In previous versions you had to set up the “Asset Graphs” template manually.

There are 40 individual data sets for separate modelling. The 40 asset sets are grouped into, between two to ten, asset groups with between one to 19 individual data sets within each group.



| | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| 5 | **Table No 1 Asset Quantity - Description and Expenditure details** | | | | | | | |
| 6 | Asset Group No | **1** | **1** | **1** | **2** | **2** | **2** | **3** |
| 7 | Asset Set No. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 8 | % of the Required Exp Being Met | 59 | 91 | 65 | 97 | 59 | 78 | 64 |
| 9 | Av Unit Renewal Cost $ | $30.4 | $30.4 | $14.5 | $14.5 | $7.1 | $7.1 | $49.7 |
| 10 | Asset Group Name | Urban Road Pavements | Urban Road Pavements | Urban Road Pavements | Rural Road Pavements | Rural Road Pavements | Rural Road Pavements | Kerb Group |

**Figure 5 Example of seven Asset Sets being sent to three different Asset Groups**

In Table 1 of the “Required data” sheet as detailed above, there are three asset groups set up as per row 6 and 10. The first three asset sets have been allocated to “Group 1” and modelling results will land within the “Group 1” sheet of “Asset Graphs”. Asset sets 4, 5 & 6 will land in the “Group 2” sheet while asset set 7 will land on the Group 3 Sheet.

All 40 sets must be defined, even if the user only wants to model a smaller number. The next sub section provides an example of the recommended details for the data sets that are not to be modelled.

**Note**

The names within row 10 MUST be the same for all of the same asset group numbers in row 6.

### 3.3.1 How to define ‘spare’ Asset Sets

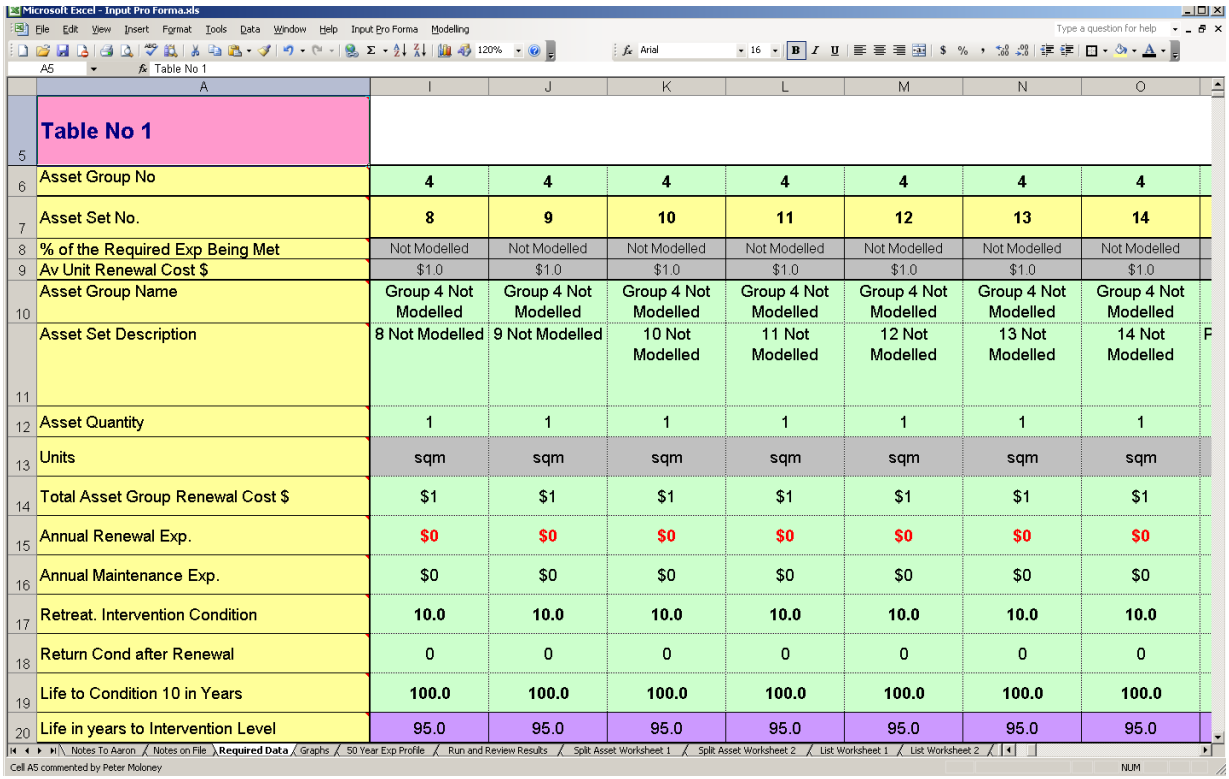
For data sets on the “Required Data” sheet surplus to the user’s requirements the user should enter the following data: (Refer to the figure below that illustrates the Table 1 requirements)

- Row 6 - Asset Group No
- Row 10 - Asset Group Name
- Row 11 - A Unique asset set description. (No repeated asset set names allowed)
- Row 12 & 13 - Asset set Quantity of 1 and any units of pick list at row 13
- Row 14 - Total Asset set renewal Cost - $1.00
- Row 15 & 16 – Zero proposed expenditure
- Row 17 & 18 – Intervention level for non modelled assets (recommend 10 and 0 for return condition)
- Row 19 – Asset life in years recommend 100
- Table 2 – Fill in rows 24 to 34 such that the total % in row 35 = 100 or choose a default from row 36
- Table 3 – Same as above for rows 42 – 54
- Table 4 – Choose an asset type from the pick list in row 58

> Note
>
> Up to 20 asset sets can be allocated to an asset group.
> The maximum number of asset Groups is ten. Same name MUST be used for the whole asset group.

Detailed below is the recommended format for filling in asset sets within table 1 that you are not using for modelling. In this case we are dealing with Data sets 8 – 14, which are all being allocated to “Group 4”.

> **Note**
>
> In Row 8 the program automatically records that the asset set is not being modelled because the total asset set renewal value within row 14 is less than $21.00



Microsoft Excel - Input Pro Forma.xls

Table No 1

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 | **Table No 1** | | | | | | | |
| 6 | Asset Group No | **4** | **4** | **4** | **4** | **4** | **4** | **4** |
| 7 | Asset Set No. | **8** | **9** | **10** | **11** | **12** | **13** | **14** |
| 8 | % of the Required Exp Being Met | Not Modelled | Not Modelled | Not Modelled | Not Modelled | Not Modelled | Not Modelled | Not Modelled |
| 9 | Av Unit Renewal Cost $ | $1.0 | $1.0 | $1.0 | $1.0 | $1.0 | $1.0 | $1.0 |
| 10 | Asset Group Name | Group 4 Not Modelled | Group 4 Not Modelled | Group 4 Not Modelled | Group 4 Not Modelled | Group 4 Not Modelled | Group 4 Not Modelled | Group 4 Not Modelled |
| 11 | Asset Set Description | 8 Not Modelled | 9 Not Modelled | 10 Not Modelled | 11 Not Modelled | 12 Not Modelled | 13 Not Modelled | 14 Not Modelled |
| 12 | Asset Quantity | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | Units | sqm | sqm | sqm | sqm | sqm | sqm | sqm |
| 14 | Total Asset Group Renewal Cost $ | $1 | $1 | $1 | $1 | $1 | $1 | $1 |
| 15 | Annual Renewal Exp. | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** |
| 16 | Annual Maintenance Exp. | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| 17 | Retreat. Intervention Condition | **10.0** | **10.0** | **10.0** | **10.0** | **10.0** | **10.0** | **10.0** |
| 18 | Return Cond after Renewal | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19 | Life to Condition 10 in Years | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| 20 | Life in years to Intervention Level | 95.0 | 95.0 | 95.0 | 95.0 | 95.0 | 95.0 | 95.0 |

**Figure 6 Example of asset sets and Group, which are not to be modelled**

If, as in this example, the model only needed seven data sets in three groups, then the modeller would need to allocate the remaining 33 data sets as per the shortened example. Because there are more than 20 data sets to be allocated to groups the model would need two additional asset groups.

Data sets 8 – 26 could be allocated to Group 4 as illustrated above and data sets 27 – 40 to Group 5. Hence only five of the ten asset groups were used and only Group 1, 2 & 3 sheets within "Asset Graphs" would be populated.

## 3.4 Asset Type Selection

To make use of the default distributions in Tables 2&3 the modeller must define the asset type in Table 4 of the "Required Data" sheet. The program has a set of default asset types, condition distributions and degradation curves that can be called up. There are 20 pre-defined asset types with matched potential distributions.

Use the Asset Set Type in row 58 to set the asset type for an asset set. Once this is done appropriate distributions can be uploaded to tables 2 and 3

> Tip!
>
> To operate the program at a very basic level you can call up the most appropriate default condition distribution and a single default degradation curve.

**Table No 4 Selection of Asset Type**

| | Sealed Rd Pavements | Sealed Rd Pavements | Asphalt Surfaces | Asphalt Surfaces | Sprayed Seal | Sprayed Seal | Kerbs |
|---|---|---|---|---|---|---|---|
| **Standard Asset Type Ref No** | 1 | 1 | 3 | 3 | 4 | 4 | 6 |

**Figure 7 Set the Asset type in Row 58**

The green shaded cells in the above table are located at row 58 of the "Required Data" sheet and the matched distributions are brought in based upon the asset type name in Row 58. These cells are set to a pick list restricting you to one of the set 20 Data Set Types.

Detailed in the table below are the names of the 20 data types that are currently contained within the program. They are aimed at Local Government use but can be adapted to other environments.

> At a very high level of operation the 20 standard asset types are also user definable. However these asset types are used for state wide data reporting. It is not recommended that the general user amend these asset set types and stored distributions.
>
> Please contact us if you need any further details regarding this matter, as there are further implications to the operation of the software in relation to changes to these variables.

**Table 1: Standard Asset Types**

| Asset Type Description | |
|---|---|
| **No.** | **Description** |
| 0 | Custom |
| 1 | Sealed Rd Pavements |
| 2 | U/S Rd Pavements |
| 3 | Asphalt Surfaces |
| 4 | Sprayed Seal |
| 5 | Footpaths |
| 6 | Kerbs |
| 7 | Bridges |
| 8 | Storm Water |
| 9 | Building Structure |
| 10 | Building Roof |
| 11 | Building Mech. Services |
| 12 | Building Fit Out |
| 13 | Play Equipment |
| 14 | Sports Ovals |

| Asset Type Description | |
|---|---|
| **No.** | **Description** |
| 15 | W/W Pits and Pipes |
| 16 | W/W Pumping Stations |
| 17 | W/W Mech. And Elect. |
| 18 | W/W Reticulation |
| 19 | W/S Pumping Stations |
| 20 | W/S Mech. And Elect. |

## 3.5 Populating the Required Data Sheet

As discussed, there are four tables on this sheet, which must be completed. Once assets sets are decided, each must be given a condition distribution, a degradation curve and some other data. There are three basic methods of inputting this information into the "Required Data" sheet:

- Directly populate from an external data source
- Enter overall quantities and then use default condition distributions and degradation curves
- Use of the Internal Worksheets to assist with data entry.

You may end up using a combination of all three methods to populate the one "Input Pro Forma" file depending upon the availability of information.

### 3.5.1 Populate the Required Data Sheet from an External Database

If you have a detailed database for an asset set with sound condition information, then this would be the best place to gather the necessary information for the "Required Data" Sheet. You may have to massage the data a little to get it into the necessary format.

#### 3.5.1.1 Table 1 Asset sets and Groups

Asset quantity and renewal cost should be relatively straightforward. For modelling purposes, it is the cost of the proposed renewal, rather than the historic or replacement costs of the asset.

NOTE
Use the Renewal Cost, not the historic or replacement cost.

Within Table 1, Row 9 has a calculated field that may be of use for some asset sets. It is the unit renewal cost represented by row 14 divided by Row 12. It is provided as a quick check of the basic input information by displaying the average unit renewal cost for the asset set. See Figure 6 above for an example. Similarly row 8 is a calculated field representing the % of the long-term average renewal demand being met.

TIP
Rows 8 and 9 are check rows to assist with the detection of bad data

#### 3.5.1.2 Table 2: Present Condition Distribution

The present condition distribution within Table 2 may come directly from your database or may need to be converted within the "Condition Dist Converter" sheet. See Section 3.1.7 above as well as the sheet itself for more details.

#### 3.5.1.3 Table 3: Degradation Curve

Each Asset Set in Table 1 requires a matched degradation curve in Table 3. If you have two or more consistent condition assessments for a given asset set then you should be able to produce a unique degradation curve for use within the model. This will greatly enhance the accuracy of your results. If you don't have unique degradation curves there are defaults, available (Nominate in Row 54)

Advanced Tip

There is a software tool available to develop degradation curves from raw data. Please contact Moloney Asset Management for further detail.

### 3.5.2 Populate "Required Data" Sheet with overall quantities and default Distributions

In its absolute simplest form the whole program can be run based on the default distributions. This will provide you with a rough first cut financial forecast, from which point you can start to refine the inputs as better condition information becomes available. In a similar way degradation curves can also be populated with a default set of values.

While the user will still need to populate the details in Table 1 and Table 4 manually, the program can load Table 2 and Table 3 once the user nominates that a default degradation curve will be used and selects which pre-defined condition distribution to use.

There are six preset condition distributions available for each of the 20 asset types that can be nominated in Table 4, on Row 58. They range from "Very Good" to "poor" and have been developed by an examination of many real data sets. The figures for the Road related assets are very strong, based upon around 160 different data sets for Councils right across Australia. For other asset classes the distributions are not as strongly based.

Advanced Tip.

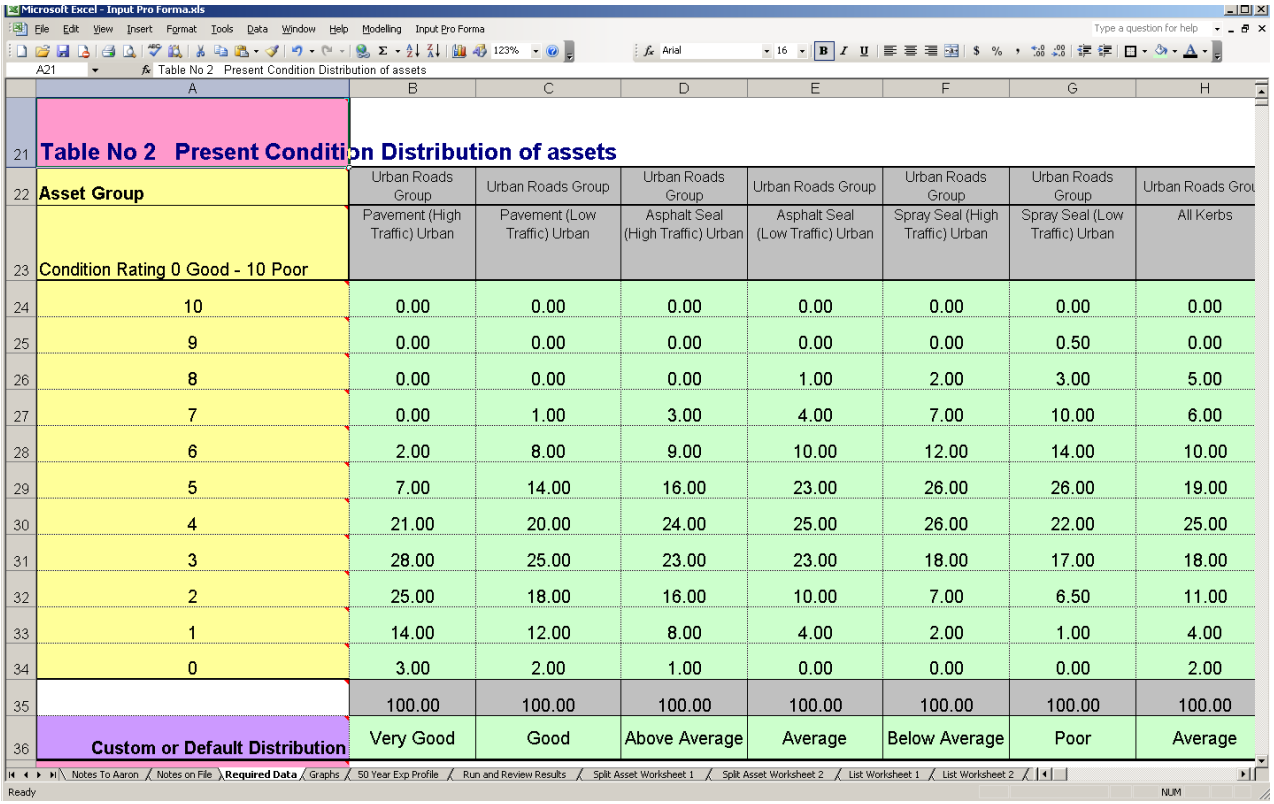
You can load a default distribution and then modify it to match your particular conditions. In this case be sure to change Row 36 to "Custom" so that your amendments will not be overwritten later.

Degradation curve selection is simpler, but there is only one default curve for each asset type. This is selected in Row 54.

Once custom and default distributions are nominated go to the custom file menu (under the File & Edit Menus) and choose the following.

> `Input Pro Forma → Required Data Sheet Operations→ Bring in All Nominated Default distributions within Table 2 and 3.`

This action will bring in all of the default distributions you have nominated in rows 36 & 54 and they will be matched to the asset type you have nominated within row 58.



Microsoft Excel - Input Pro Forma.xls

A21 Table No 2 Present Condition Distribution of assets

| | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| 21 | **Table No 2 Present Condition Distribution of assets** | | | | | | | |
| 22 | **Asset Group** | Urban Roads Group | Urban Roads Group | Urban Roads Group | Urban Roads Group | Urban Roads Group | Urban Roads Group | Urban Roads Grou |
| 23 | Condition Rating 0 Good - 10 Poor | Pavement (High Traffic) Urban | Pavement (Low Traffic) Urban | Asphalt Seal (High Traffic) Urban | Asphalt Seal (Low Traffic) Urban | Spray Seal (High Traffic) Urban | Spray Seal (Low Traffic) Urban | All Kerbs |
| 24 | 10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 25 | 9 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 | 0.00 |
| 26 | 8 | 0.00 | 0.00 | 0.00 | 1.00 | 2.00 | 3.00 | 5.00 |
| 27 | 7 | 0.00 | 1.00 | 3.00 | 4.00 | 7.00 | 10.00 | 6.00 |
| 28 | 6 | 2.00 | 8.00 | 9.00 | 10.00 | 12.00 | 14.00 | 10.00 |
| 29 | 5 | 7.00 | 14.00 | 16.00 | 23.00 | 26.00 | 26.00 | 19.00 |
| 30 | 4 | 21.00 | 20.00 | 24.00 | 25.00 | 26.00 | 22.00 | 25.00 |
| 31 | 3 | 28.00 | 25.00 | 23.00 | 23.00 | 18.00 | 17.00 | 18.00 |
| 32 | 2 | 25.00 | 18.00 | 16.00 | 10.00 | 7.00 | 6.50 | 11.00 |
| 33 | 1 | 14.00 | 12.00 | 8.00 | 4.00 | 2.00 | 1.00 | 4.00 |
| 34 | 0 | 3.00 | 2.00 | 1.00 | 0.00 | 0.00 | 0.00 | 2.00 |
| 35 | | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| 36 | **Custom or Default Distribution** | Very Good | Good | Above Average | Average | Below Average | Poor | Average |

Notes To Aaron | Notes on File | Required Data | Graphs | 50 Year Exp Profile | Run and Review Results | Split Asset Worksheet 1 | Split Asset Worksheet 2 | List Worksheet 1 | List Worksheet 2

Ready NUM

**Figure 8: Example of Table 2 Default Condition Distributions**

The table above provides an example of some of the default condition distributions that are available for different asset set types.

These curves are specifically tailored to the asset type particularly for road and bridge assets where they are based upon a very large sample size.

> Note
>
> Sealed Road Pavements condition distributions range from very good to poor.
>
> The average distribution for the kerbs is different to the average for the sealed road pavements.

### 3.5.3 Internal "Input Pro Forma" Worksheets

There are a series of nine worksheets within "Input Pro Forma", primarily designed to assist in the development of condition distributions for various asset sets. The sheets can be used to land your data at any desired asset set location within the "Required Data" sheet.

The N2 version saw a complete reconstruction of the worksheets so that they became far more extensive and adaptable. The new N3 version has continued this trend with the "Split Asset" Sheet being extended from 4 to 10 user definable components. There are 3 types of worksheets as detailed below.

- Split asset worksheet - 2 Sheets
- List Worksheet - 4 Sheets
- Construction date Worksheet - 3 Sheets

#### 3.5.3.1 The Split Asset Sheets

There are two split asset worksheets available within the file. If more are needed, use each sheet more than once and save the details into "Required Data" between uses.

These sheets were originally designed for buildings but can be used for any asset set that can be broken down into sub components. For example, bridges can be split up into foundations, sub-structures, deck and ancillary. Each component performs in a similar way and each has a quite different life-cycle.

When using the sheet for Buildings, each single building can be divided into up to 10 sub components. For example a building could be broken down into the following sub asset sets (Structure, Roof, Plumbing, Electrical, Mechanical services, Floor coverings, Internal Finishes and External Finishes). A set percentage of the total building renewal cost is then allocated to each asset sub group. In this way the overall valuation of a single asset can be distributed in a set ratio across the 10-possibe components.

#### 3.5.3.2 Split Asset Table SA1

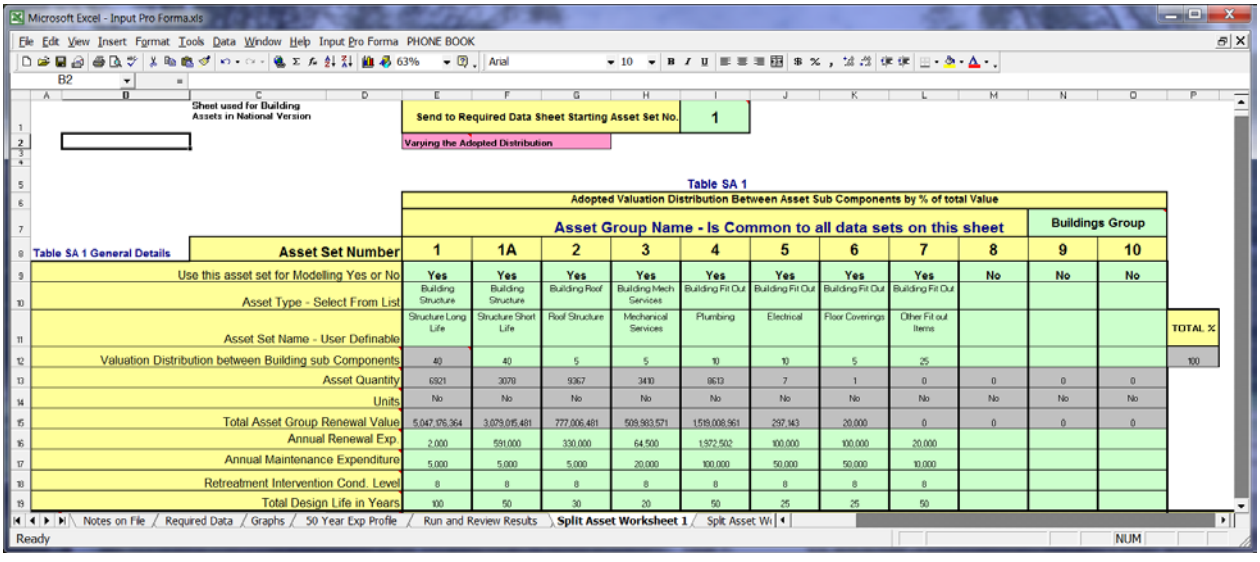



**Figure 9 Split Asset Set Table SA1**

This worksheet contains two tables. The first, as detailed above covers some general and overall matters. The asset group name is entered at Cell N7 while the location on the "Required Date" sheet where the first

of the 10 possible data sets will land is entered at I1. In this case the results will land in assets sets 1 – 8 because I1 has been nominated as 1 and there are 8 active sub sets nominated as being used.

For building assets, data sets 1 and 1A have been provided to cover a long life or short life building structure. If using both data sets then you MUST nominate an "N" in at least 1 or 1A for each asset.

NOTE

If you are splitting component 1 then you must use only one entry per asset within either asset set 1 or 1A

### 3.5.3.3 The Rows in Table SA1

| Row N$^{o.}$ | Description of Use |
|---|---|
| 9 | Yes or No – Is this data set being used |
| 10 | Using the pick-list, select an asset type. This is used to match the appropriate degradation curve to the asset type. |
| 11 | Supply a sub asset set name |
| 12 | Set the percentage of the total asset cost to be attributed to this sub set. |
| 13 | This is a Formulae generated field that counts the number of assets in the table below. It is subtotal formulae so will deliver the filtered number when the Auto filters are on. |
| 14 | Units of quantity - Number |
| 15 | This is a Formulae generated field that sums the total replacement value for the sub asset set. The figures come from Columns P – Z only after the sheet is updated |
| 16-19 | Expenditure details - Intervention level and asset life cycle information |

### 3.5.3.4 Split Asset Table SA2

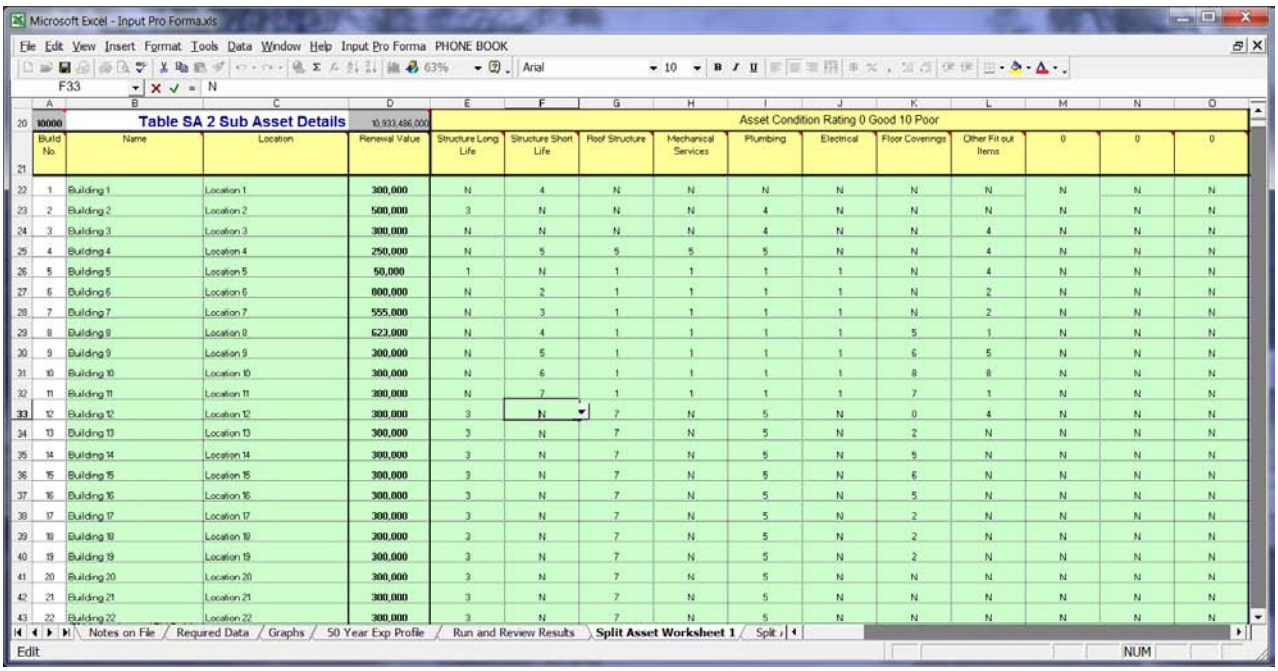



**Figure 10 Split Asset Set Table SA1**

Table SA2 contains the overall valuation and condition details for the assets (in this case buildings).

NOTES

You MUST have an entry within columns E to O for all buildings listed where you have nominated "Yes" in Row 9.

You MUST have an "N" within one of the Building Structure assets in columns E or F, as there can be only one type of structure for each building

The acceptable entries are a condition number from 0 to 10 or an" N" (a Null out Option). You MUST have an "N" within one of the Building Structure assets in columns E or F, as there can be only one type of structure for each building. The affect of placing an "N" within any other sub building asset set is to negate that asset set for that particular building. The valuation that would normally be allocated to the 'Nulled' out asset set then gets distributed on the same set ratios to the remaining asset sets.

You can "Null" out all but one component of the building if required. But you MUST leave at lease one building component active.

NOTE

You MUST leave at least one building component active

For example, an outdoor swimming pool does not fit neatly into the standard building asset class subgroups and may need to be treated differently. The asset could be broken down into two separate assets with each then being entered into the sheet on separate lines. The concrete shell might be a short life structure with all other components nulled out and the filters and pumps could be mechanical services again with all other components nulled out.

The sheet is designed to enable the listing of all of building assets with a single renewal valuation for the whole building in column D and then to set separate condition ratings on each of the 10 possible building sub components. The program then allocates the total renewal valuation between the building components as displayed in columns P to Z, in the distribution ratio as listed in Cells E12 to O12.

With separate valuations and condition ratings for each individual building component the program then can deliver a present condition distribution for each to the "Required Data" Sheet.

Notes

If you nominate "Yes" in Row 9, then you MUST have at least two lines of data entry in table SA2 for each nominated sub asset.

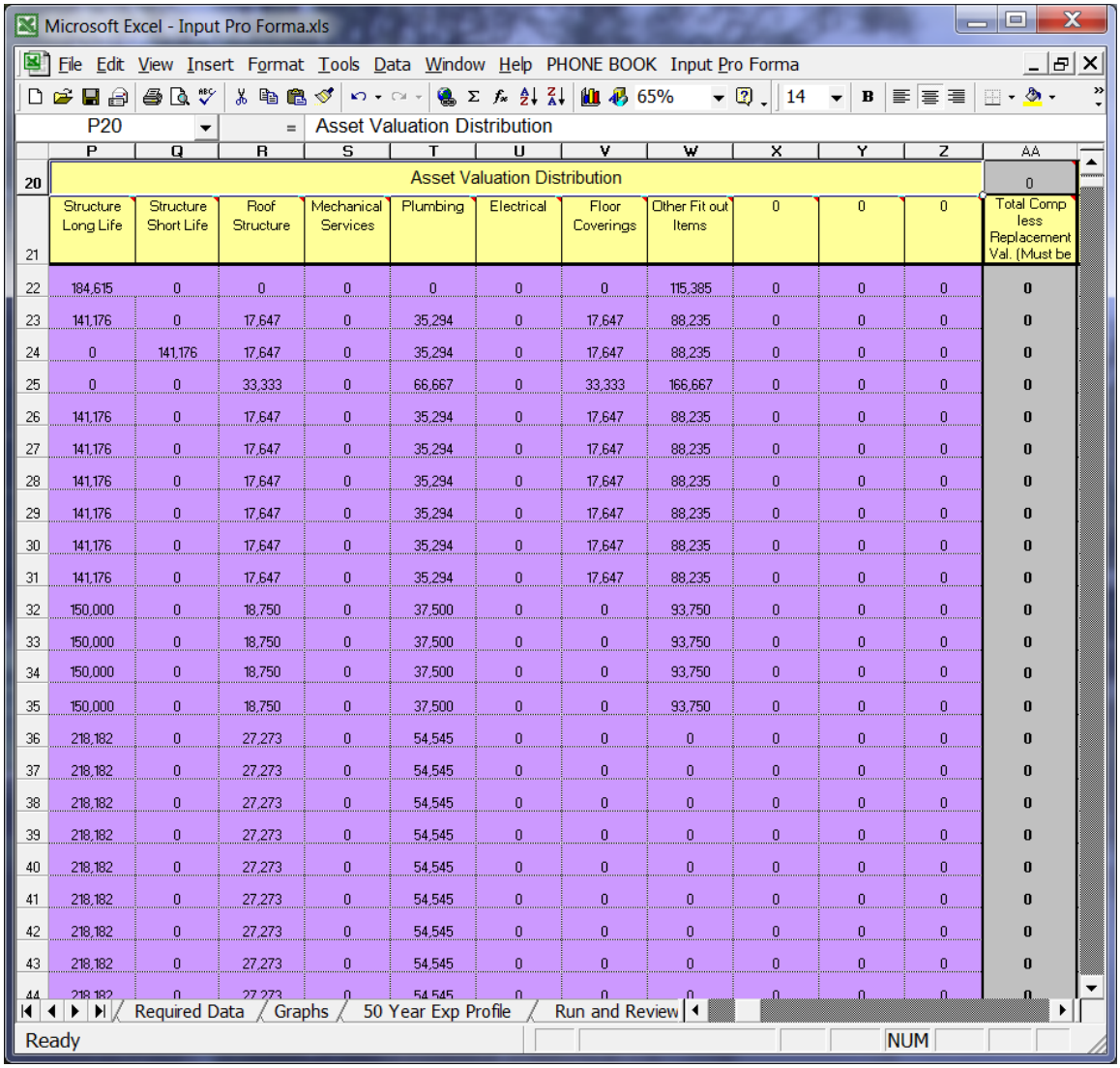



**Figure 11 Split Asset Set Table SA2 Part 2**

The second part of Table SA2 as illustrated above provides the valuation split up of the various sub components of the building in columns P – Z. Column AA provides a quick check that the total valuation in Column D has been properly distributed and in this regard Cell AA21 should equal zero or very close to zero allowing for some rounding errors.

Columns AB – AD (Not displayed above) provide some basic asset consumption information. Often information on the actual rate of asset consumption is not available and this section was added at the request of some users more as accounting figures than as a modelling output. However, it does provide some very interesting average renewal demand figures.

With all data entry completed, run the data validation check by going to the Menu:

`Input Pro Forma → Worksheets → Split asset Worksheet 1 → Check Data.`

You will be notified of any errors and the problem cells will be shaded red. Fix the errors and check again till you get the no errors message. Then use the following command to transfer the data to the to the "Required Data" sheet.

`Input Pro Forma → Worksheets → Split asset Worksheet 1 → Copy Data to Required Data.`

### 3.5.3.5 The "List Worksheets"

There are four List Worksheets with up to six sets of data available within each sheet delivering a maximum of 24 data sets that can be run through the system.

You may use as many, or as few, of the six list assets on each sheet as desired. In the example below, "List Worksheet 1" has been used for only two data sets relating to the bridge assets. Here bridges have been split into Long life (eg Concrete and steel Structures) and Short Life (Footbridges and timber bridges).

**Table LW1**

In Row 8 you identify if you are using that list asset. Here we have a Yes or No from a pick list. Row 9 determines where the results will be landed within the "Required Data" Sheet.

NOTE
Target locations do not need to be consecutive.

Row 10 Select the asset type from a pick list of 20 options (used to match the appropriate degradation curve).

Rows 11 & 12 are the asset group and asset set name while 13 & 15 are formulae linked to table LW2 below. Place your expenditure and other details in rows 16 – 19. Rows 6 & 7 are present to provide a quick reference check relating to asset unit rates and % of long term average demand being met. They can be of great assistance in finding errors in the data set.

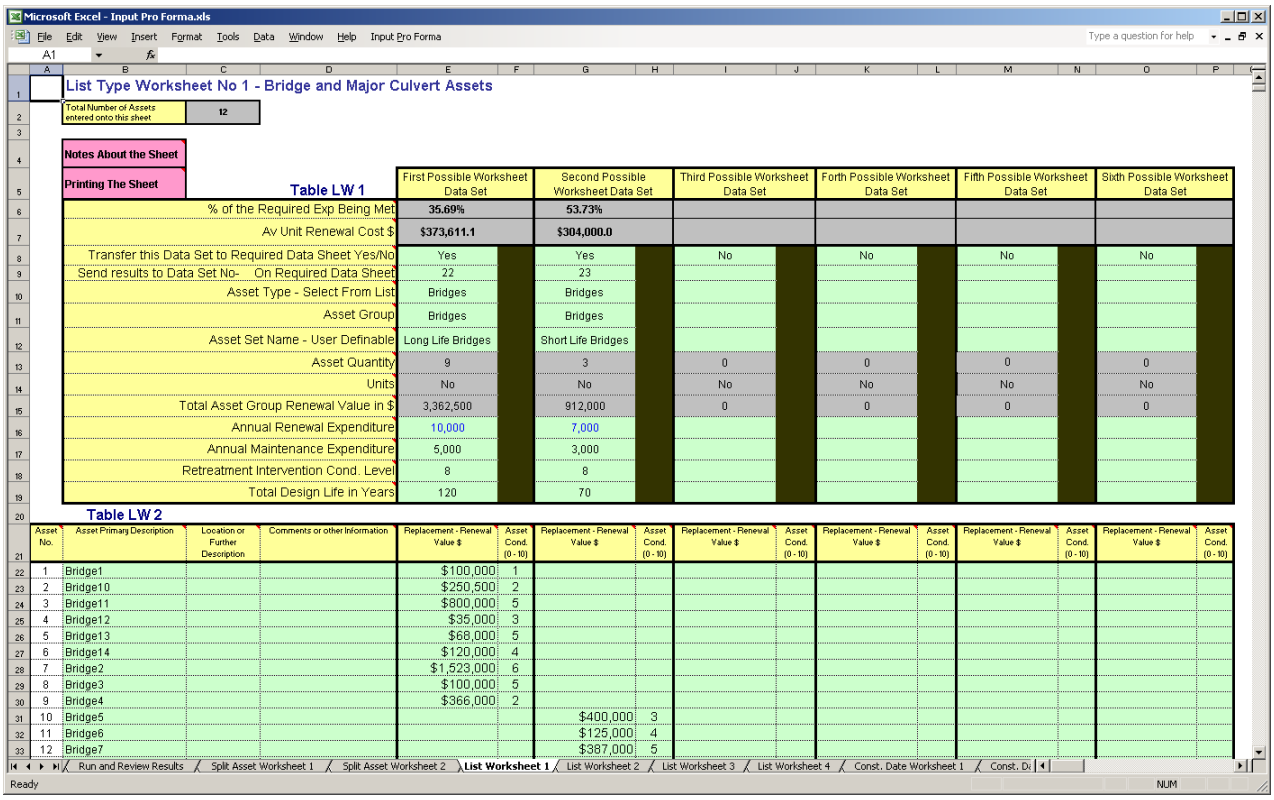



**Figure 12 List Worksheet Details**

**Table LW2**

Within table LW2 is place the list of assets that are to be included. In this case 12 bridges can be seen but the list table can contain up to 10,000 rows. Within the list you MUST have an entry within Column B for all rows of data, while C & D are optional additional descriptors.

NOTE
Within the list you MUST have an entry within Columns A & B. Columns C & D are optional.

Each asset entered requires a replacement value and an asset condition within table LW2. The table was set up with a single asset per line in mind but there is no problem with using the same line for different asset types. For example the sheet has been used as a de-facto road register where the road segment details were entered into columns B – D and then E – F used for pavement value and condition and G- H used for seal value and condition. It could be extended further to include kerb and or footpath if required.

With data entered use the program to check for errors.

`Input Pro Forma → Worksheets → List Worksheet 1 → Check Data`

Errors will be shaded red. Fix errors and then use this command to populate the required data sheet.

`Input Pro Forma → Worksheets → List Worksheet 1 → Copy Data to Required Data`

### 3.5.3.6 The Construction Date Worksheets

There are three Construction Date worksheets provided; each with the capacity for up to six data sets The sheets are designed to assist with the creation of an asset condition distribution for assets such as underground drainage where you may have the construction date of the assets but no real condition information.

There are two tables within the sheet. The top table, CD1, is similar in design to LW1 with the only difference being that rows 13 and 15 are not generated by the program and need to be manually entered. Refer to the above section on the List Worksheet for details relating to the remainder of the table.

Table CD 2 allows you to place into rows 23 – 32 (Columns E – J) the % of the assets that were built within the time frame as detailed within the cell Range C23 to D32. Note that Cell B21 provided you with the capacity to vary the interval range for the 10 time frame jumps. The number placed here MUST be an integer between 3 and 30. In the example below the interval is 8 Years so the first range becomes the current year 2012 back to 2004.

> NOTE
> Cell B21 provides the capacity to vary the interval range for the 10 time frame jumps.
> B21's value MUST be an integer between 3 and 30

While the sheet was designed for assets such as storm water pipes and pits, it could also be used for shorter term assets such as computers or office furniture to demonstrate the future renewal demand for these assets.

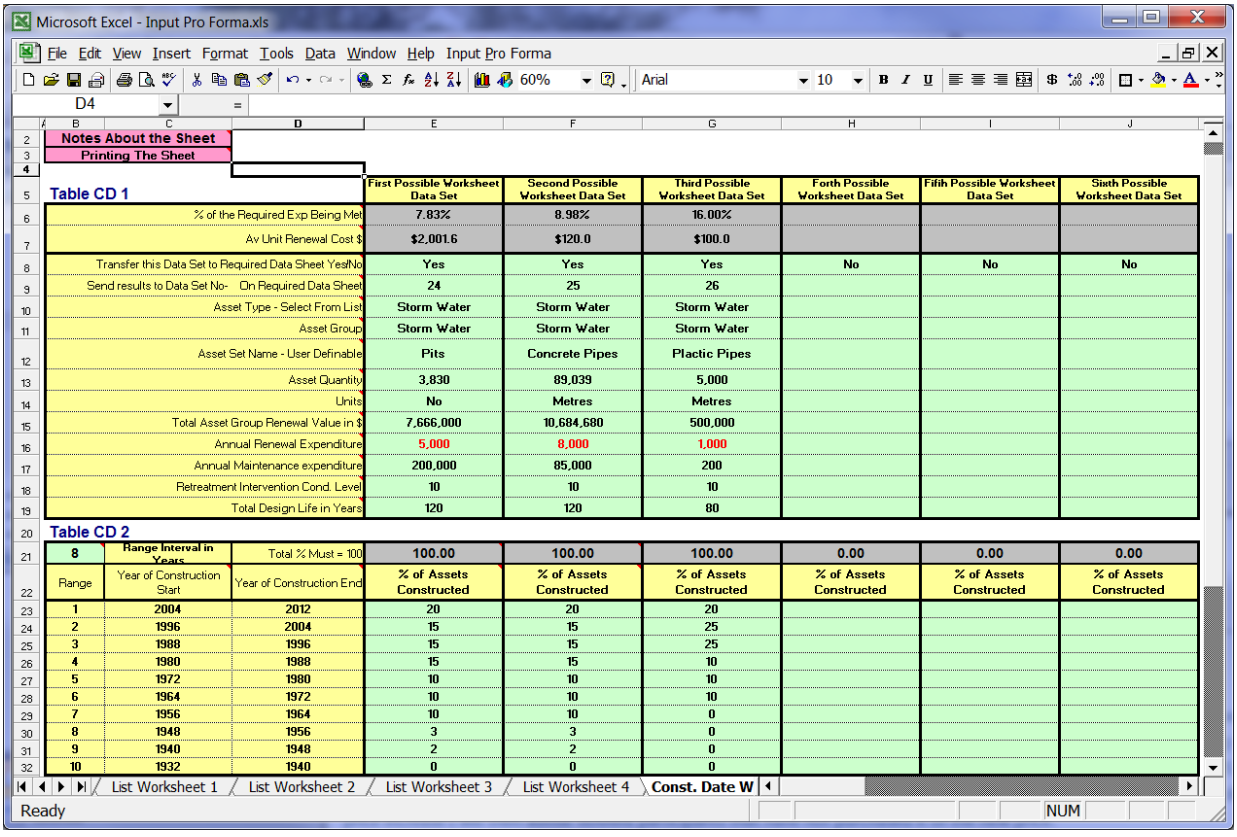



**Figure 13 Construction Date Worksheet Details**

## 3.6 Final Comment of the use of the Worksheets

The worksheets were originally designed for a specific purpose to cover most Local Government assets. Data entered into the sheets was retained for all asset sets. You now have the capacity to use the sheets for different purposes and to use the same sheet more than once.

If using a sheet more than once it would be a good idea to save the details to another file for later retrieval. If doing this it would be fine to copy the whole original sheet to another file. However, when later returning the data to the sheet, PLEASE JUST COPY ACROSS THE INPUT DATA WITHIN THE GREEN SHADED CELLS. There are many formulae and other hidden objects on the sheet that are needed for the program operation, which may be lost in bulk copying operations.

NOTE
Only copy across green shaded cells!

If you copy from an external Excel workbook and wish to paste into the green shaded cells within the Input Pro Forma.xls then this should be done with a "Paster Special / Values". You can access this operation in the normal excel way or use the special macro with a "Ctrl q" command.

Tip!
Use "Ctrt q" to Paste special - Values only when copying and pasting into the Green Shaded cells

One word of caution about retreatment intervention levels, your distribution may not have any real correlation to the suggested intervention condition levels. When setting the intervention level, set it such that the extent of the asset base presently at and above intervention is considered realistic. That is the extent over intervention is considered the extent than needs rehabilitation now.

## 3.7 Running the Program from "Input Pro Forma"

As indicated in Section 3.1.5 above the whole of the program can be run from the "Run and Review" sheet within "Input Pro Forma". Two actions are recommended to be undertaken before running the program once all of the data is properly assembled within the "Required Data" sheet.

- Check for data errors on "Input Pro Forma" `Input Pro Forma→ Required Data Sheet Operations → Check all Data on Required Data Sheet Before Running`
- To set up "Asset Graphs" and report on any conflicts between asset group numbers and names on the "Required Data" sheet - Click "Button 6" on the "Run and Review Results" Sheet.

Once you have fixed any errors that were found run the full program from "Button 5" of the Run and Review Results Sheet.

# 4 The "Model All" File

"Model All" is the heart of the Moloney predictive model. It can be used as a stand-alone financial modelling tool and is also integrated with other Moloney asset management modules. The Renewal Gap program can be run without any user interaction with this file at all, as it can simply operate in the background. However, for the more advanced user, access to "Model All" can greatly enhance the overall modelling outcome.

This section does not contain a detailed explanation of "Model All". There are two separate documents covering this area more fully. The first is titled "Model All Manual" and the second "Model All Explanation". The manual has a detailed explanation of the model and its operations while the Model All Explanation document covers the overall operation and function of the model in a more general way. Please refer to these documents if you need further information.

Detailed below is a brief reprise of how the model operates.

- It is a network-based model that looks at the expected financial performance of the total asset set.
- All assets within a given asset set MUST perform in a like manner with the same overall lifecycle
- Modelling commences with the present condition distribution of an asset set.
- The asset set is degraded with time in accordance with a user defined asset degradation curve that simulates asset decay with time
- There are two distinct modelling paths.

  Model N$^{o}$ 1 Proposed Capital Renewal Expenditure Model has a user defined 50-year proposed renewal expenditure profile and predicts future asset condition outcome.

Model N$^{o}$ 2 Predicted Capital Requirement Model has a user-defined asset Condition outcome and predicts the future renewal expenditure profile necessary to achieve this

- The future renewal funding gap or shortfall is delivered by taking the proposed expenditure profile in model N$^{o}$ 1 from the required expenditure profile in model N$^{o}$ 2.
- Both models track future asset condition and via user defined parameters enable the prediction of future "Consequential Maintenance" cost movements linked to asset condition change.
- The model tracks total cost by combining capital rehabilitation with the corresponding "Consequential maintenance cost" for both modelling paths
- Modelling results for Individual asset sets can be combined into aggregated financial forecast reports for up to 20 different asset sets.

NOTE
It MUST be remembered that all the model does is analyse your input data. If you enter poor quality data the model will deliver poor results.

## 4.1 Reviewing Modelling Results in "Model All"

When the user clicks "Button 1" on the "Run and Review" sheet of "Input Pro Forma" the first 20 data sets are loaded into "Model All". Within "Model All" you can then review and amend the modelling variables to refine your outcome. This is done by loading a particular data set into a special set of worksheets.

Warning
This paragraph is for advanced users

For example, to load data set 2, use the command:

```
Modelling → Load an asset set (1, 20)
From Data Storage for Modelling → Load
Asset Set 02
```

NOTE
In Excel 2007 and later, the Modelling ribbon is available via the "Add-Ins" menu

The above command will load data set 2 into the five individual modelling sheets within "Model All". With an asset set loaded for modelling you can then go to the "Modelling Variables" sheet and vary any of the seven modelling variables on the sheet followed by a "Ctrl k" to update the modelling results.

You can quickly view the affect of amendments to the intervention level, life cycle, level of proposed renewal expenditure etc. Once you have arrived at an endpoint for a particular asset set, click button "MV 1" on the "Modelling Variables" sheet to store the amended variables and to update the aggregate modelling results within "Model All". You may then load another asset set and repeat the process.

When you have amended all of the data sets that require attention within "Model All', click button "MV 2" on the "Modelling Variables" sheet to transfer all amendments back to the "Input Pro Forma" file. In this way the "Input Pro Forma" file will contain a full record of all amended modelling input information.

TIP
Save your work back to "Input Pro Forma" by clicking Button "MV2"!

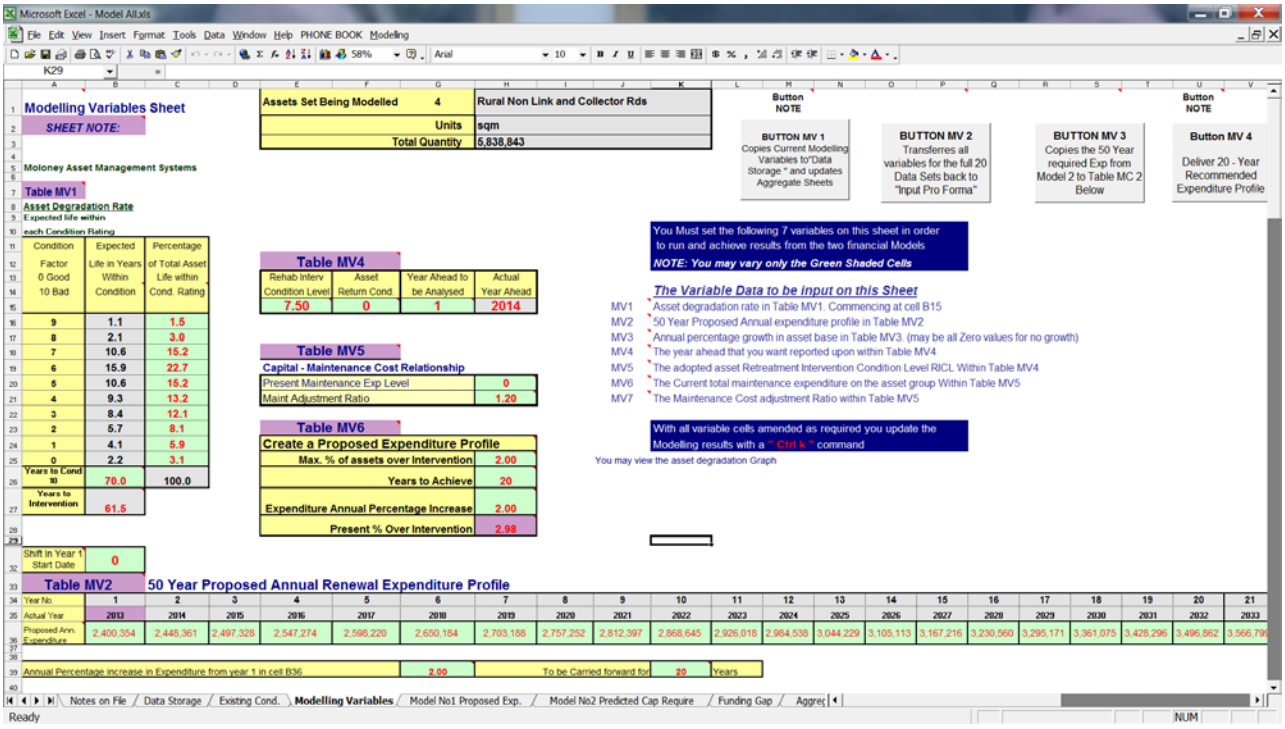


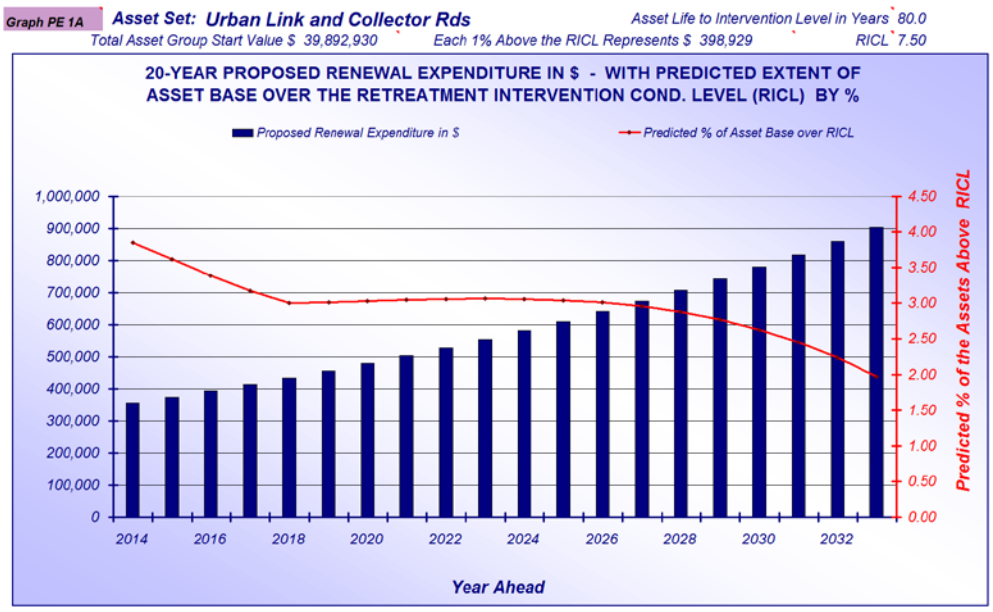

**Figure 14 Modelling Variables Sheet of "Model All"**

The figure above illustrates the seven possible modelling variables for each single asset set. All green shaded cells can be amended and there is a detailed Excel comment for each variable within column K.

Button MV3 was added in 2012 to enable the 20-Year required expenditure profile coming out of model No2 to be used as the Proposed expenditure in Table MV2 on "Modelling Variables".

Table MV6 was added in Jan 2013. This table contains 3 definable variables that are used to create a proposed expenditure profile within "Model No 1 Proposed Expenditure" based on your condition outcome requirements. At the bottom of the table is recorded the current extent of the assets at and above the selected intervention level, in this case 2.98%. You set the max. percentage that you want over intervention in cell H25 and the year that you want to achieve it by in Cell H26. Finally you can ramp up expenditure annually by the percentage you place within H27.

The process is an iterative one and it delivers a proposed expenditure profile within the "Model No 1 Proposed Exp" Sheet that will meet your selected requirements. Figure 14A below illustrates the outcome for the variables selected within figure 14 above.




NOTE

Used to deliver a steadily rising expenditure profile to achieve a selected condition outcome.

**Figure 15A Proposed Expenditure profile to meet a required condition outcome.**

This facility has always available within the "Model No 1 Proposed Exp" sheet but it required an iterative process to deliver the result. This program amendment undertakes the iterative process for you, based on your selected condition outcome. It has great advantages over "Model No 2 Predicted Capital Requirement" in that it enables you to phase in your planned asset condition improvement over a variable period and also enables a selected percentage to remain over intervention.

This process produces a far more realistic and achievable funding outcome by starting with a low expenditure and ramping it up with the understanding that condition improvement is gradual.

Button MV4 in figure 14 was added in May 2013 it takes the variables within Table MV6 on the "Modelling Variables" Sheet and applies them to all 20 data sets within the Model All file in one program operation. Overall results are presented within the "Aggregate Proposed Expenditure" Sheet and would normally be transferred to the "Input Pro Forma" file via Button MV2 and also then transferred to the "Asset Graphs" file from within the "Input Pro Forma" File from the R\"Run and Review" Sheet. (See Section 3.3.8 of the Model All Manual for more details).

## 4.2 Worked Example of Modelling in "Model All"

In this example we are modelling a set of High Traffic urban Rd Pavements. We have asked for a retreatment intervention level of condition 7, meaning that all assets at and above condition 7 need to be rehabilitated immediately or at least over the first 5 years. The predicted renewal demand is as detailed below from the "Model N$^{o}$ 2 Predicted Capital Requirement" sheet within "Model All".

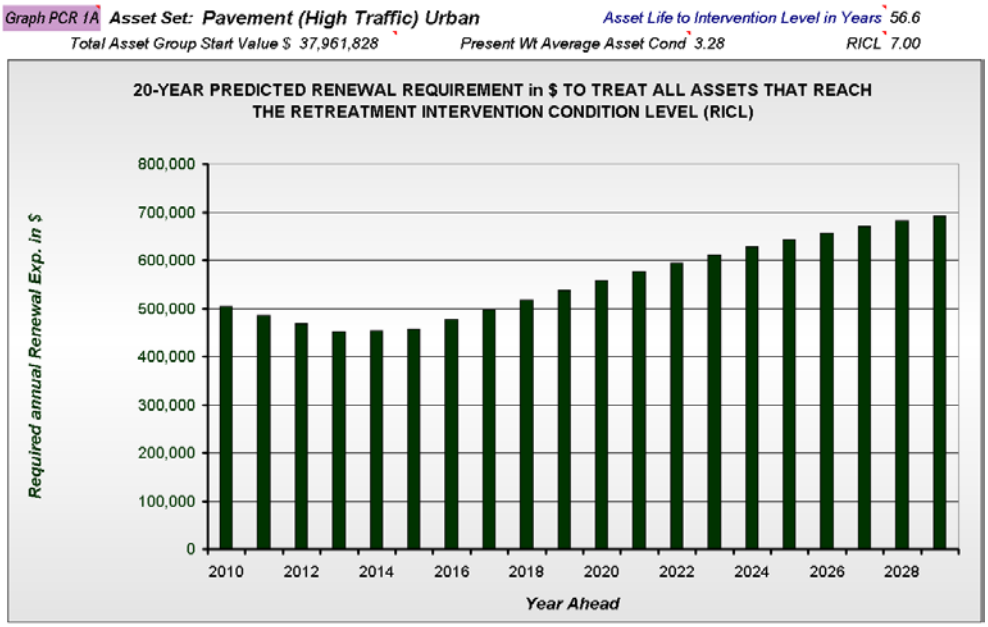



**Figure 16 Predicted Renewal Demand based on Intervention 7**

As can be seen from the above graph the present renewal demand is around $500,000/yr and predicted to rise to $700,000 over the next 20 years. If we were prepared to accept a lower level of service (Higher Intervention level) then we can see that result in seconds within "Model All".

Cell E15 of the Modelling variables sheet contains the Intervention level. If we changed it to 7.8 and then run the model with a "`Ctrl k`" we get the following predicted renewal demand at around $200,000 rising to $665,000 over the next 20 years.

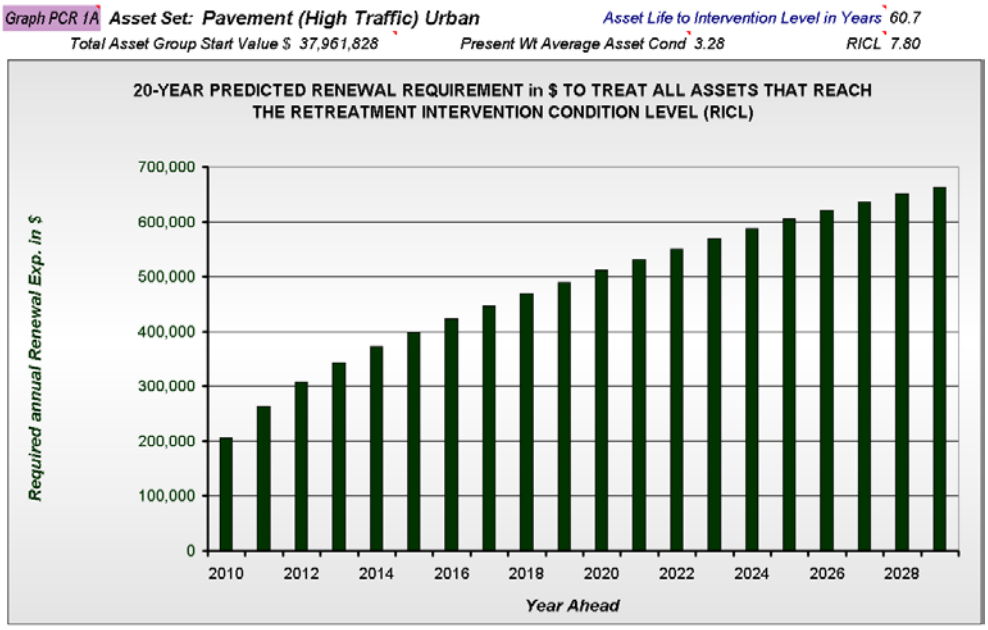



**Figure 17 Predicted Renewal Demand based on Intervention 7.8**

"Model All" provides a great way to quickly check the sensitivity of the model and to vary the modelling input parameters. It is quick and easy to use and will greatly enhance the overall modelling result if used with care.

NOTE
Handle With Care

The second modelling path is the "Model N$^{o}$ 1 Proposed Expenditure" model. Here you can see the predicted condition outcome for a selected proposed expenditure profile. Using the same data set as before with a flat expenditure profile of $350,000/yr the model predicts the following condition outcome with around 4.4% over intervention in 20 years.

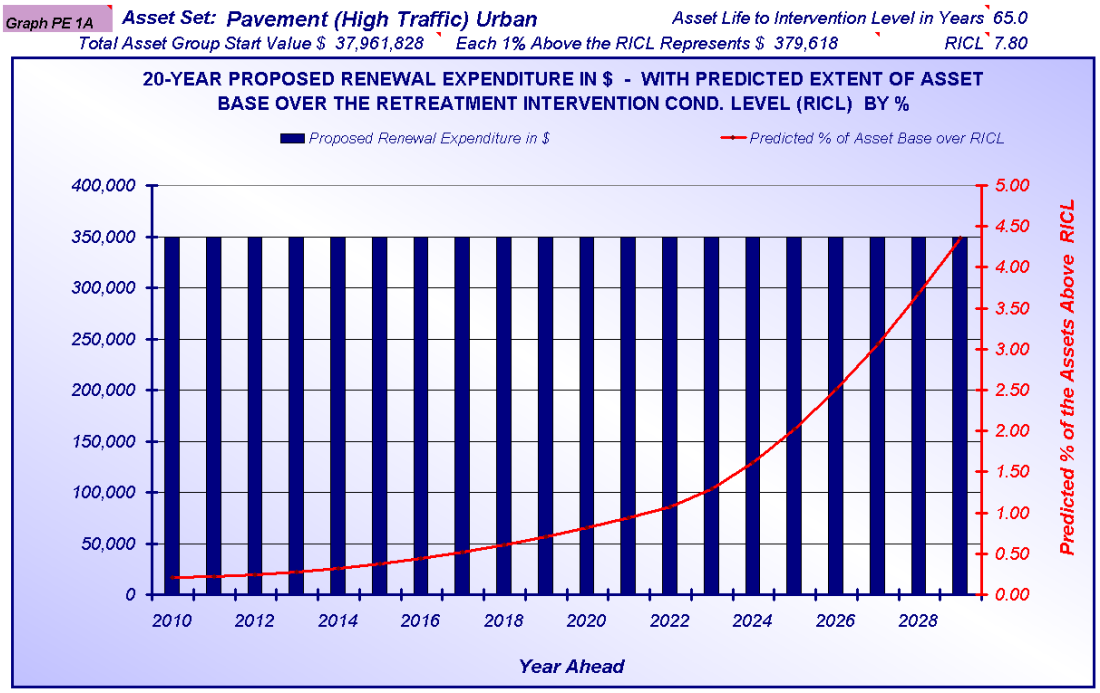



**Figure 18 Predicted future extent over intervention 7.8**

As can be seen above the existing expenditure level of $350,000 is not sufficient in the longer term as the extent over the intervention level continues to rise. If we were to accept that no more than 1.5% of the network climbed above the intervention level of 7.8 then we could achieve this with a 2% /yr cumulative rise in renewal expenditure resulting in a generally lower over all expenditure over the next 20 years as illustrated below.

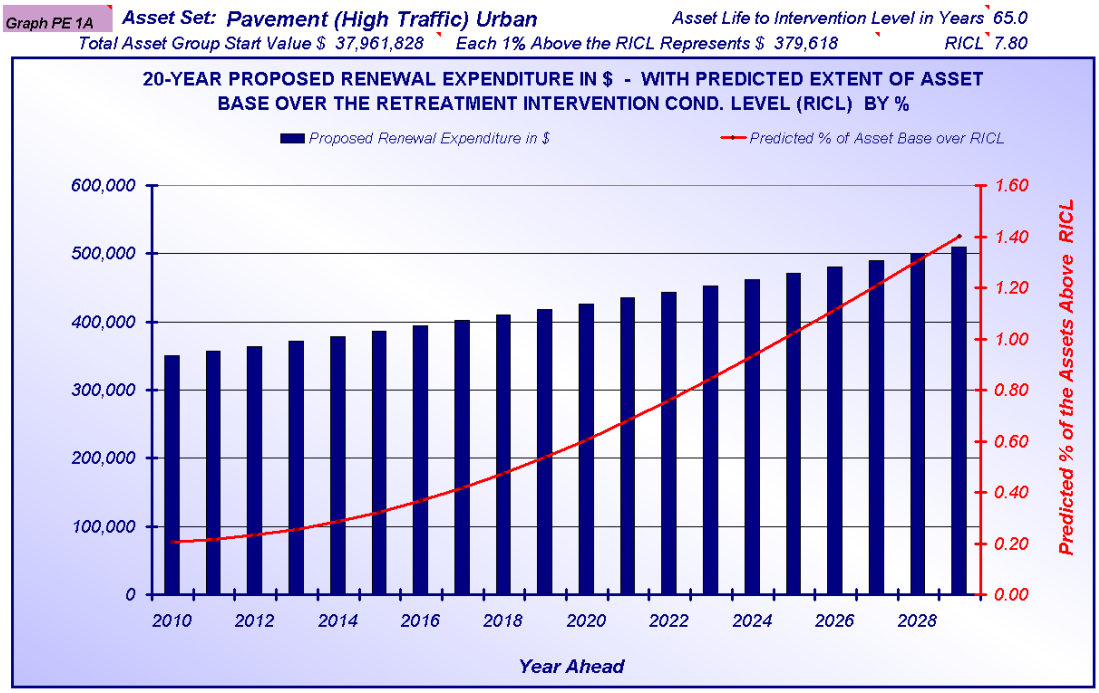



**Figure 19 Predicted future extent over intervention 7.8 with 2% Cumulative expenditure increase**

The straightforward use of the Renewal Demand model set to an ideal intervention level can lead to very high renewal demand. This may be delivering a standard well above that which currently existing. The intelligent use of both models particularly the Proposed Expenditure model can deliver sound long-term financial planning results.

In summary, be prepared to go to ”Model All” and experiment with all of the modelling variables to deliver a sound and practical outcome.

### 4.2.1 The transfer of amended data from “Model All”

Once settled on a set of amendments for a single data set click button “MV 1” on the “Modelling Variables” sheet. This sends all of the modelling variables back to the “Data Storage” sheet within the file and also sends the modelling results through to the three Aggregate sheets within the file. The affect of this action is to store both the amended variables and the modelling results for that single data set within Model All.

The process is repeated for all or as many of the 20 data sets within the Model All file as you need to amend. With individual data sets in Model All updated and stored (via the user of the “MV 1” button) click button “MV 2” to transfer all of the amended data back to “Input Pro Forma”.

NOTE
Use **MV1** to save a particular data set inside the Model
Use **MV2** to save all data sets back to “Input Pro Forma”

Once the amended data is stored back in “Input Pro Forma”, reports can be generated in “Asset Graphs” by using the control buttons on the “Run and Review” sheet of “Input Pro Forma”. Either run the whole set using “Button 5”, or use “Button 2” or “Button 4” depending on which of the 20 data sets are within Model All.

## 4.3 Funding Scenario Finder in “Model All”

Within figure 14 above you will see "Table MV6" within that table can be set the following variables

- The desired percentage of the asset base to be over intervention
- The Year by which you wish to achieve this
- Any annual percentage ramping up in expenditure that you require

The program will then find the expenditure profile that meets the above 3 criteria. It can be accessed for a single asset set within "Model All of the "Modelling" menu. Or it can be accesses off button MV4 around Cell U2 for all 20 data sets within the model all file.

The modelling process here is an iterative one that trials different funding scenarios and keeps trialling the result till it delivers the desired outcome. You can undertake the process manually as outlined above for a single data set but this process makes it very easy to establish a required renewal expenditure profile for any condition outcome you require over 20-data sets at a time.

The desired condition outcome field can also be a formulae linked to a relationship of the existing extent of over intervention assets (eg. 50% reduction across all 20 data sets). See the Model All Manual for more details.

# 5 The "Asset Graphs" File

"Asset Graphs" is a report file containing the overall modelling results for the 40 asset sets. There is minimal program functionality within the file as it is primarily designed to display results. The file presents overall modelling results in three formats.

- Modelling Results for each of the 40 possible individual base asset sets (eg "Sealed Road Pavements" within the larger Roads Group)
- Modelling Results at asset group level (eg the Roads Group)
- Modelling Results at a whole of organization level (all asset groups combined)

## 5.1 Sample of Asset Graphs Results

The Asset Graphs file allows you to start with the big picture, looking at the results for the whole of the organizations assets and work your way down to the individual asset components as illustrated in the three figures below.

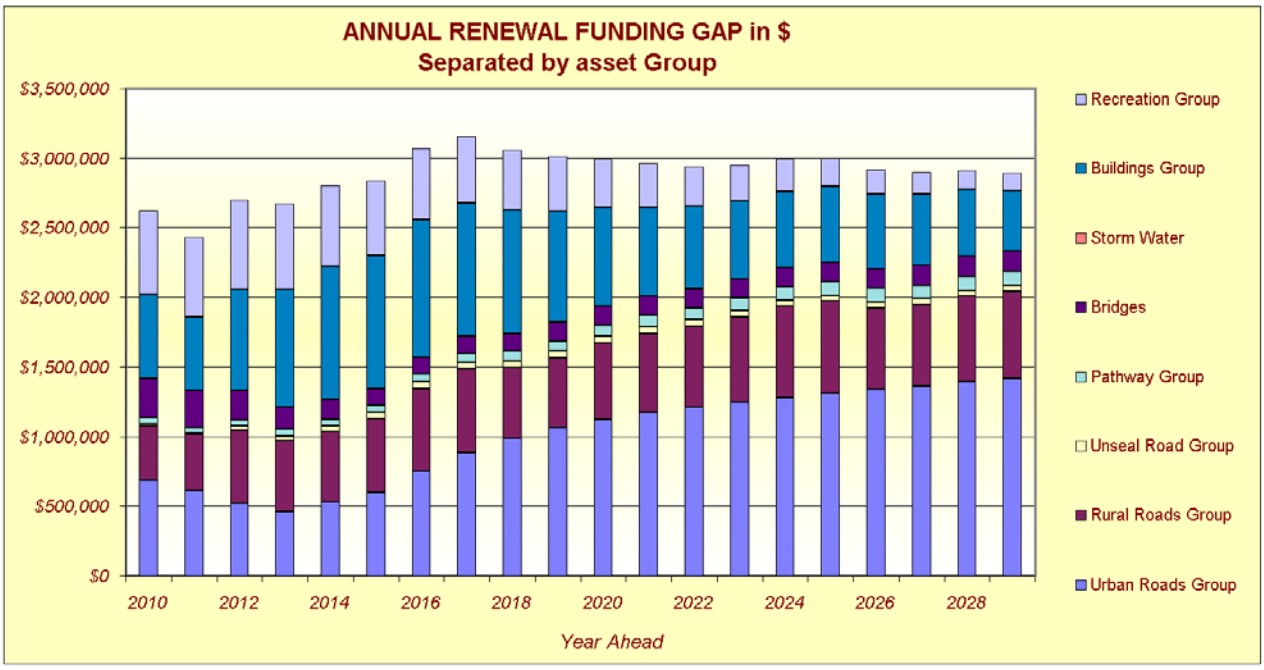



**Figure 20 Global view of Renewal Gap Prediction**

Figure 20 above is the high level global view of the renewal gap for all of the assets controlled by the organization. It contains seven asset groups and indicates that the total present renewal gap is estimated at around $2,600,000/yr

The model also predicts the renewal demand as detailed in the graph below with the renewal gap above generated by taking the proposed expenditure away from the renewal demand below.

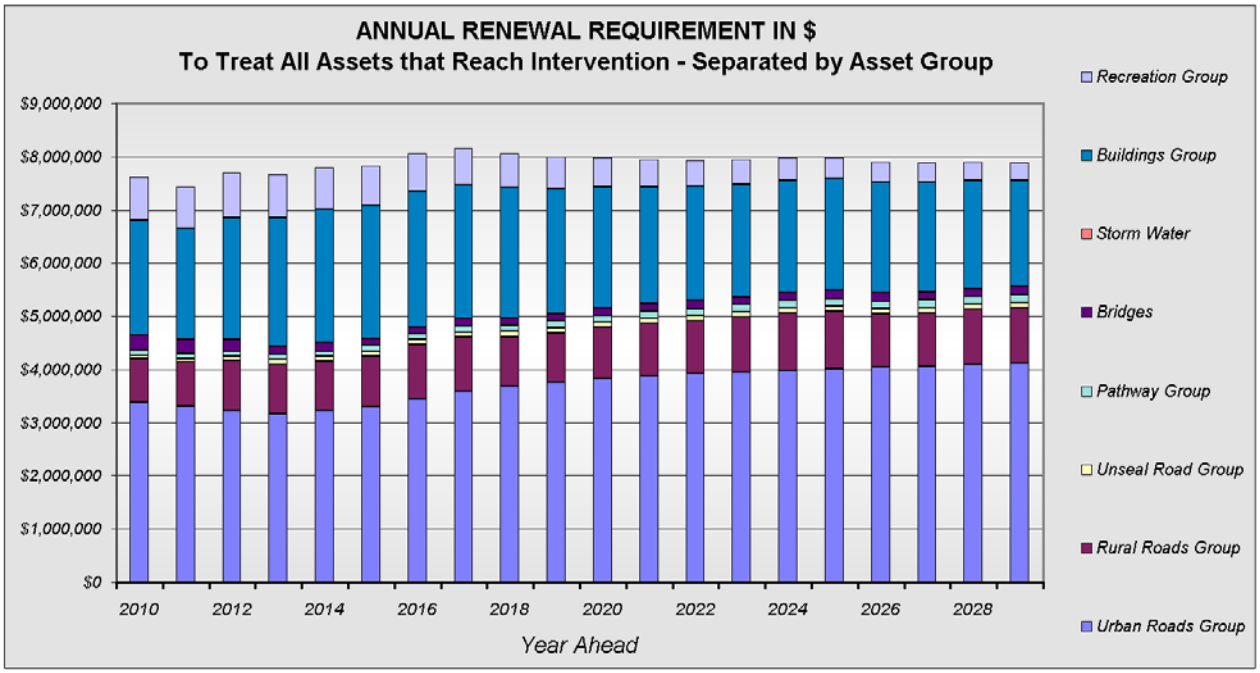



**Figure 21 Global view of predicted Renewal Demand**

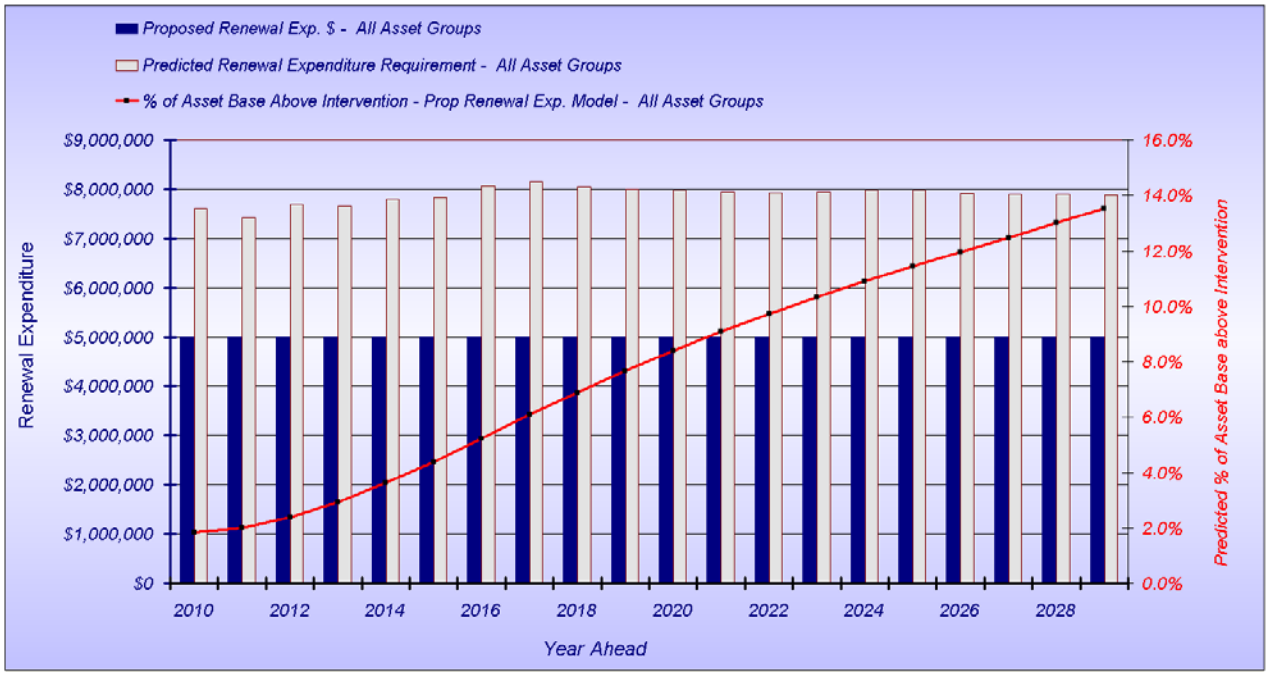



**Figure 22 Global view of Demand – Proposed Expenditure and Predicted condition Change**

The above three graphs come from the “All Assets by Asset Group” sheet within “Asset Graphs”. They are pitched at a very high, whole of Council level, to demonstrate the future trends and needs.

At the next level down we can examine one of the eight asset groups above. Detailed below is the Renewal Gap prediction for the Urban Roads Group. It is made up of seven sub components. The graph comes from the “Group 1” report sheet within “Asset Graphs”. The same three corresponding graphs as illustrated in

Figure 20, Figure 21 & Figure 22 as well as several others are also available at this next level down but we have only placed the first one into this document.

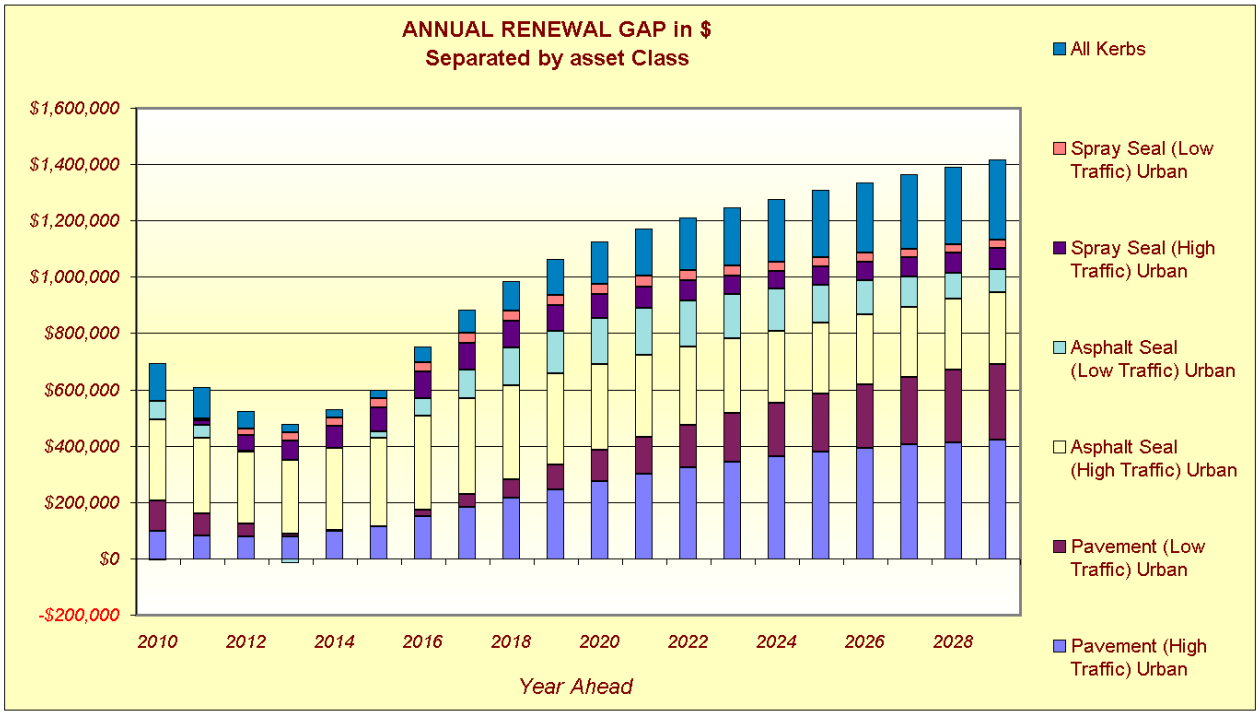



**Figure 23 Asset set Group Renewal Gap Prediction for the Urban Roads Group**

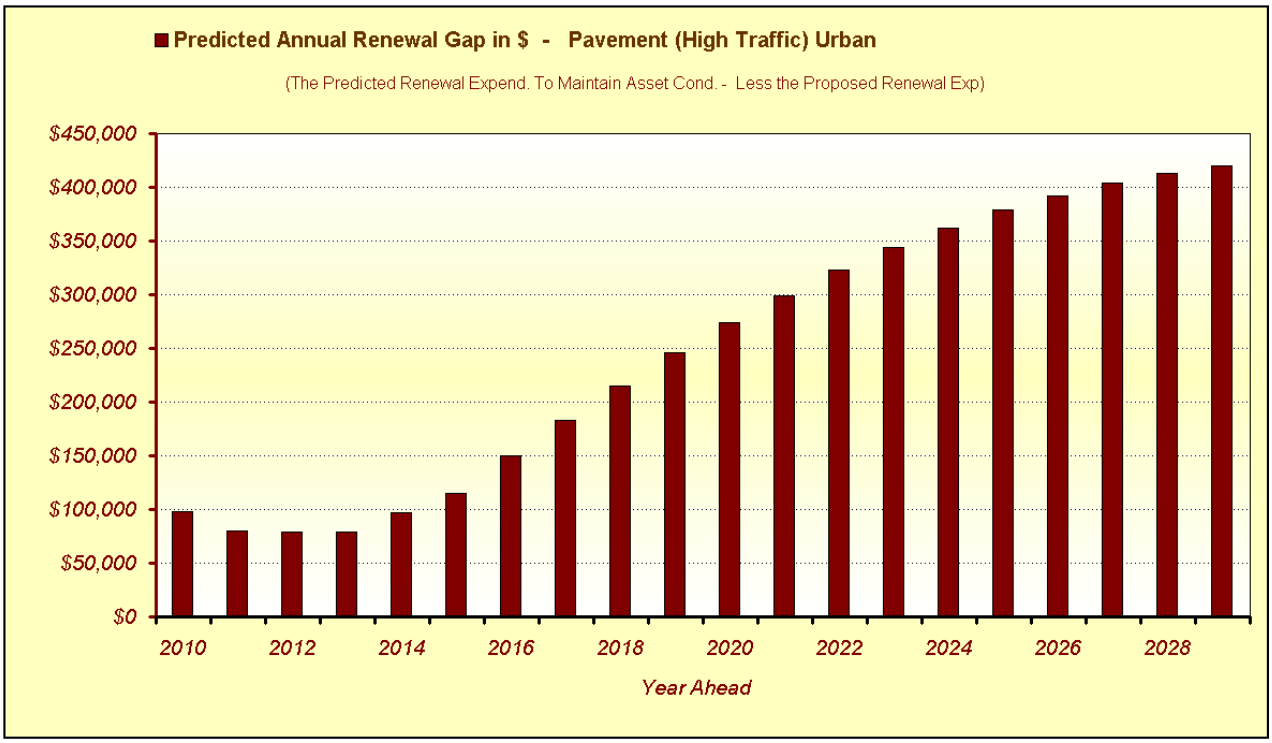



**Figure 24 Individual Asset set Renewal Gap Prediction for "Pavement High Traffic Urban"**

Note in Figure 23 that there are seven individual asset sets that go to make up the total Urban Roads Group. Finally within Figure 24 above we come down to the results for a single asset set that was modelled as one of the 40 data sets within the system. In this case it is the "Sealed Rd Pavements (High Traffic)

Urban" and here the present shortfall of around $100,000/yr is predicted to rise to $420,000/yr over the next 20 years.

As can be seen "Asset Graphs" allows you to start with the big picture and to move down to the individual asset set level. There are nine different graphical outputs at each of the three levels of presentation.

## 5.2 Sheets within "Asset Graphs"

There are 16 sheets with "Asset Graphs" divided into 4 sections:

- General Information – Notes on File & Program Amendments Sheets
- Results Presentation Sheets – 10 Asset group sheets and 1 overall sheet
- Funding Solutions Sheet – Single sheet to assist with budgeting to meet the renewal gap
- Individual Asset set sheets – 2 Sheets

The Notes on File Sheet, a standard sheet found in all Moloney Software, provides a basic explanation for the operation of the file. The Program Amendments Sheet is used to record major program amendments following the release of each program version.

### 5.2.1 Results Presentation Sheets

There are 13 results presentation sheets within "Asset Graphs":

- Sheets (Group 1 – Group 10) contain the modelling results for the asset groups as you have set them up within the "Required Data" sheet of "Input Pro Forma". Ref to section 3.3 for more details.
- All Assets by Asset Group Sheet – This sheet displays the combined results for all Asset Groups
- Individual Asset set Sheets – two sheets displaying the 40 individual asset set modelling results. You can scroll through the 40 data sets with the slider bar at the top of the sheet

### 5.2.2 Setting up an Asset Group Sheets:

This function is now undertaken automatically via the program when you run the full program from "Button 5" of the "Run and Review Results" sheet of "Input Pro Forma". If you are amending the asset groups then it is recommended that you use Button 6 on the "Run and Review" Sheet within "Input Pro Forma" to both set up the groups in "Asset Graphs" and to report on any errors. Refer to Section 3.3 above for further details on the set up of the asset group sheets.

### 5.2.3 All Assets by Asset Group Sheet

This report sheet provides details at a whole of organization level refer to section

### 5.2.4 Individual Asset Set Sheets 5.1 Above for more details.

There are two sheets within this group the first is the "Individual Asset Set Graphs" sheet and the second is the "Individual Print Out" sheet. The "Individual Print Out" sheet is linked to the first sheet and presents some key information from that sheet ready for printing in an A4 format.

The "Individual Asset Set Graphs" sheet presents the modelling results and other information for a single asset set. There is a slider bar around cell F1 enabling the user to switch between the 40 possible data sets and update the displayed data.

The sheet contains a table at the top followed by 8 graphs all housing information relating to the particular base asset group selected. The table and graphs are all linked to data sources at a lower level on the same sheet. The data within the sheet comes from two sources. Some is linked by formulae to two Hidden "Data Storage" sheets and other data is transferred to the sheet during the running of the macro that brings the modelling information in from the "Model All" File.

The data for all 40 base data sets sits in large tables with lookup formulae used to display the data set selected from the slider button at Cell F1. The sheet is designed to be used to examine the individual modelling results for each of the 40 base data sets and is of particular use when one of those results appears questionable.

NOTE

The sole purpose of the sheet is to provide a simple way to print out critical information relating to a single asset set.

The “Individual Print” sheet provides a single printable sheet with some, but not all of the information on the “Individual Asset Set Graphs” sheet.

### 5.2.5 Funding Solutions Sheets

This sheet is provided as means of delivering a global funding solution to a predicted renewal shortfall as well as providing a summary of the annual proposed expenditure by base asset type.

TIP

See the sheet notes for more details.

The sheet contains a graph plotting the present cumulative funding shortfall over a 20 year period together with two other fields for each of the 20 years. One plots the proposed additional annual renewal expenditure and the other the ongoing cumulative renewal shortfall less the proposed additional annual expenditure.

The outcome is a graph that illustrates a proposed additional expenditure profile that may not treat all assets that reach intervention but will result in an acceptable level of assets over the intervention level.

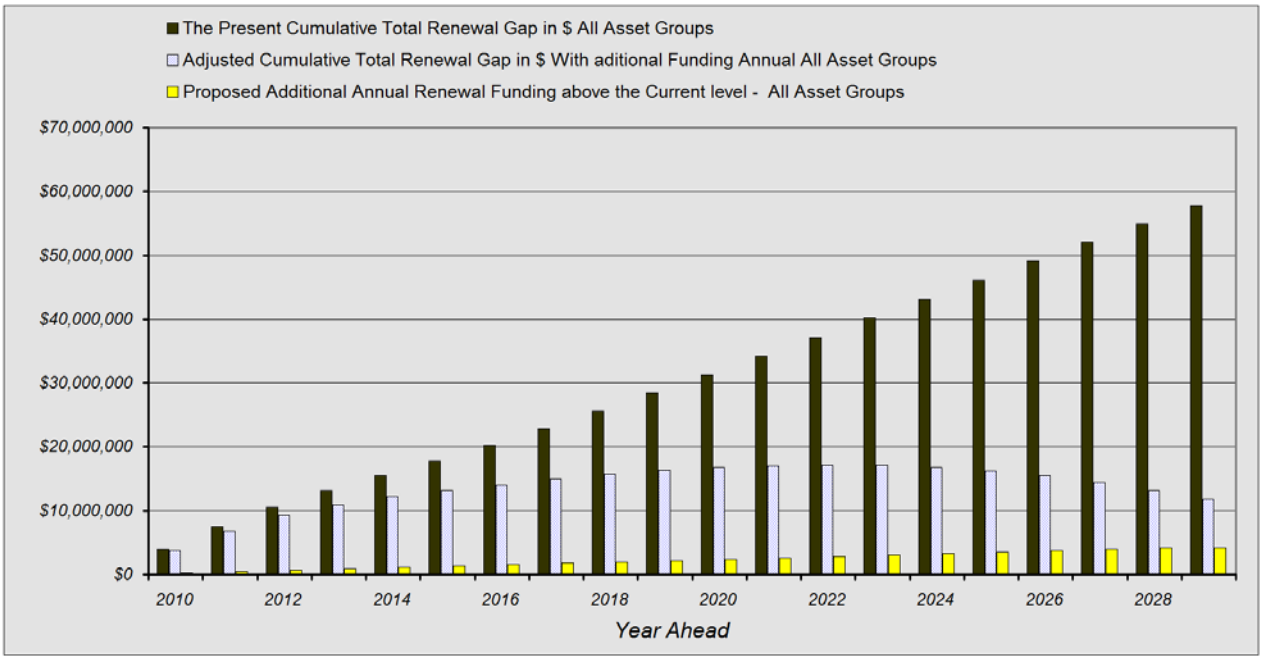



**Figure 25 Funding Solutions Graph**

To some extent the graph is closely related to the overall annual renewal gap funding graph on the “All Assets by Asset Groups” sheet. The profile here will solve the problem completely. But this sheet provides you with the means of experimenting with different expenditure patterns and controlling the extent of the asset base that is predicted above the intervention condition at any time.

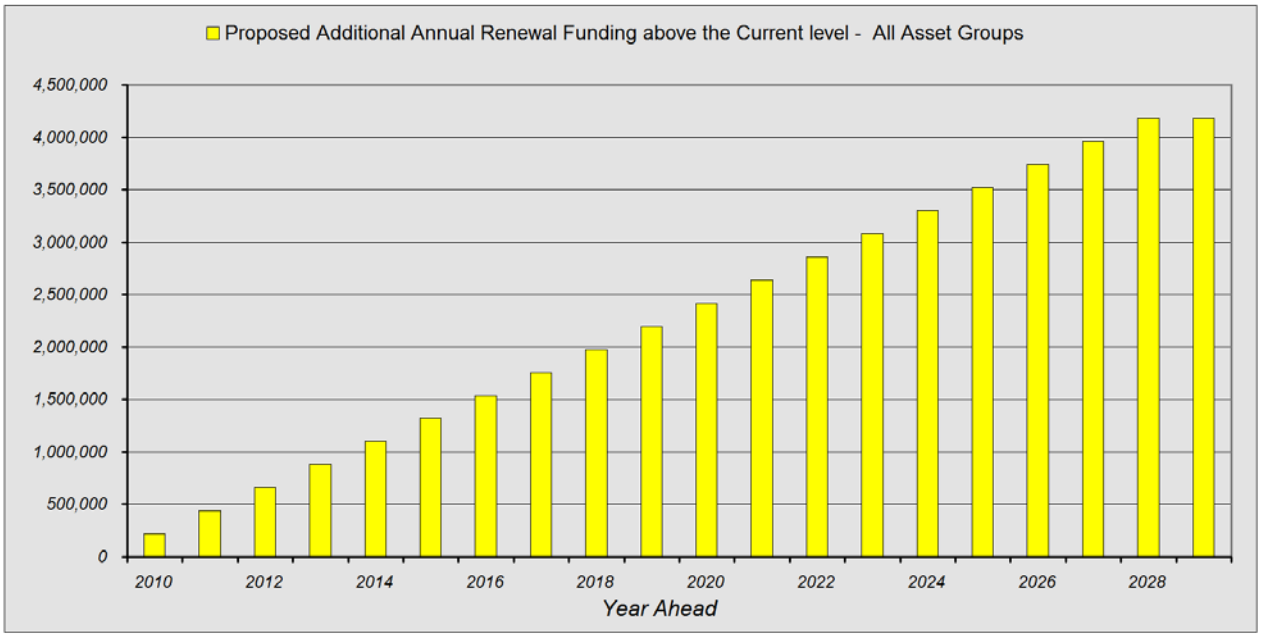



**Figure 26 Funding Solution Sheet Proposed Additional Expenditure profile**

## 5.3 Data Presentation options within “Asset Graphs”

There are two important options available within the "Asset Graphs" file that will enhance the presentation of results. Both are accessed from the top of the "All Assets by Asset Group" Sheet.

### 5.3.1 Setting the years of graphical display

The 10 asset group reporting sheets and the "All Assets by Asset Group' sheet each contain 9 individual reporting graphs. The model operates over a total time frame of up to 50-years but the number of years displayed within the graphs is user definable between 5 and 50 years. Place the number of years into cell G1 on the "All Assets by Asset Group" sheet then activate the button next to it in cell H1.

### 5.3.2 Modifying outputs to allow for inflation

All modelling is undertaken in today's dollars within the system. However, at the end of the process a basic function has been provided to enable the outputs to be modified to reflect the impact of future inflation, It is limited to one inflation percentage for the whole modelling period but it does allow findings to be modified for budgetary purposes.

The desired inflationary percentage is placed into Cell G2 on the "All Assets by Asset Group" Sheet within Asset Graphs and the set inflation button at Cell H2 is then activates. To restore to no inflation the Button at I2 will reverse the situation.

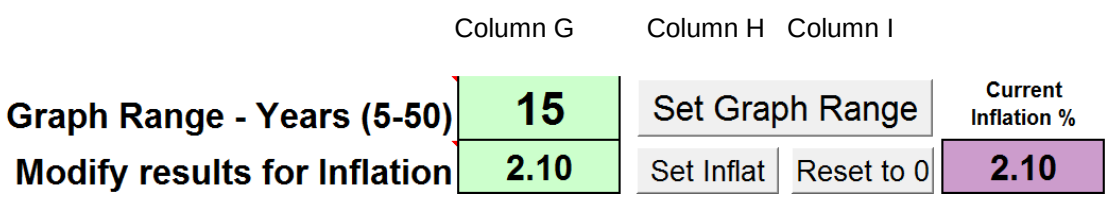



**Figure 27 Data Presentation Controls within Asset Graphs File**

# 6 General Program Operational Matters

## 6.1 Populate the “Input Pro Forma” from earlier versions

There are 2 buttons on the “Required Data Sheet of “Input Pro Forma” (Button 3 and Button 4). Button 3 will bring in data to this new N3 version from an older N2 “In put Pro Forma” that has been renamed as “Input” and is sitting within the same folder as the new file. Button 4 will do the same thing for another N3 version of the software.

## 6.2 Check Data in “Input Pro Forma” before Modelling

The aim of the data entry process within “Input Pro Forma” is to fully populate Tables 1- 4 of the “Required Data” sheet. This can be done in a number of ways but all green shaded cells within the four tables MUST be filled in for all 40 data sets. Even the ones you do not intend to use need to be fully filled in (see section 3.3.1 for more details)

Before running the program, use “Button 6” at Cell W2 on the “Required Data” sheet to check for data entry problems. Problem cells are shaded red. Fix the problems and recheck till you get the “all clear”.

There is a second check that should be done by clicking “Button 6” from the “Run and Review Results” sheet to check for consistency with the set up of the asset group names and numbers. This is really only necessary if you have amended the asset groupings on the “Required Data” Sheet.

## 6.3 Problem with Formulae not Updating

To have the program function within Office 2007 it was necessary to turn off the automatic formulae update function when the function was not being used. The function is normally turned back on at the end of program operations. However, if the program stops mid stream the automatic update can be left turned off.

The problem will appear as if your formulae or other linked functions are not working. To reset to automatic update we have provided a button in all three files located within the “Notes on File” sheets. Clicking this button will reset MS-Excel to automatic update. This formulae update problem also affects the slider controls within “Input Pro Forma” which are all operated by lookup formulae.

## 6.4 Consider Life to Intervention as the useable life within the model

The adopted total asset life to condition 10 in row 19 of the “Required Data” Sheet can be quite different to the life to reach the selected intervention level. For example you may allocate a total life of 100 years and an intervention level of 6. This could result in a useable life for modelling purposes of as little as 60 years if you have a straight line degradation curve as illustrated in Figure  below. Check all Degradation Curves with intervention level in mind and check that the life to intervention on row 20 of the “Required Data” Sheet is realistic. Life to intervention is reported here only after the program has been run.

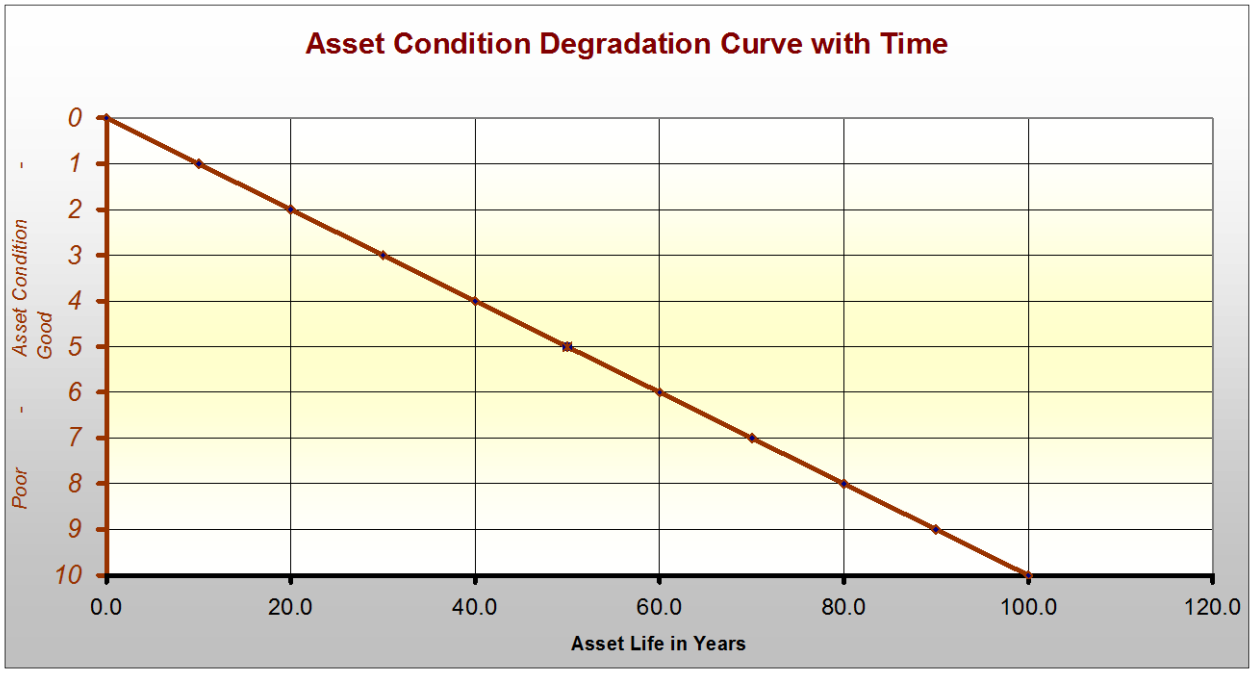



**Figure 28 Straight line degradation curve**

## 6.5 View the Condition Distributions for all asset groups

One of the key drivers in the modelling process is the starting point for the modelling process, the "Present Condition Distribution". Generally for large asset sets that have been constructed over a long period the distribution would be a normal or skewed normal distribution as indicated in Figure .

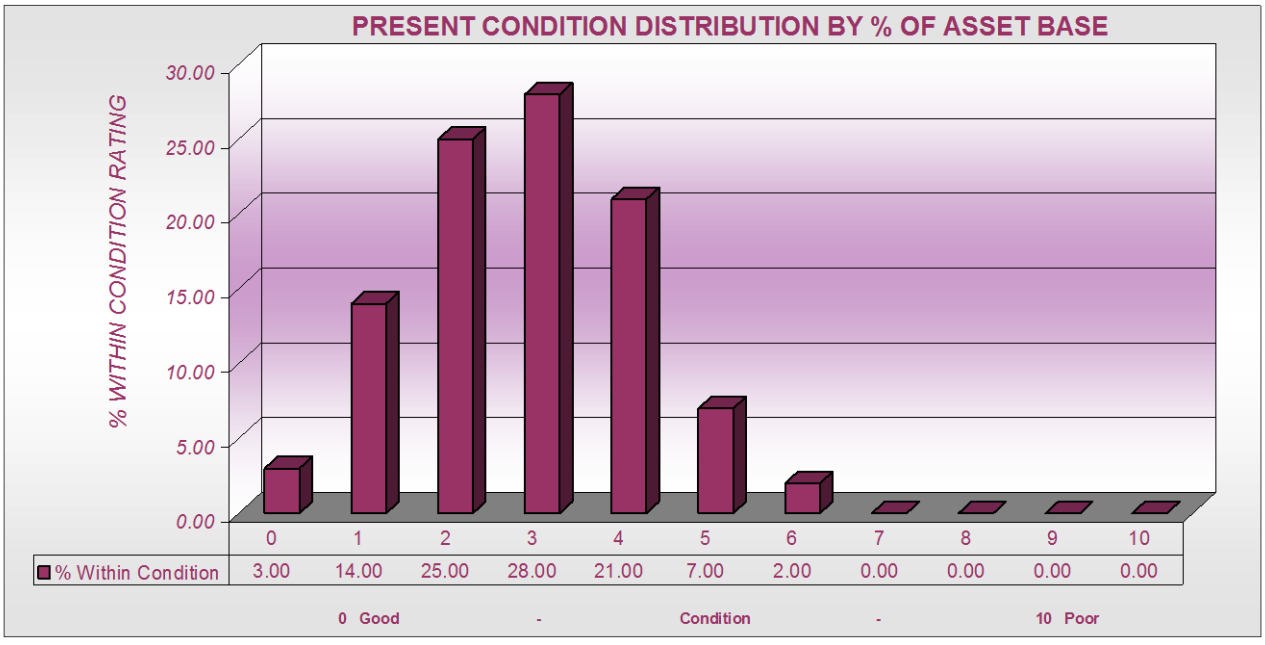



**Figure 29 Example of the expected for Condition Distribution – Long Life Assets in Good Condition**

Figure  is an example of a totally unbelievable distribution, if it is associated with a large asset set. If you have distributions like this you would be well advised to re-examine the condition information.

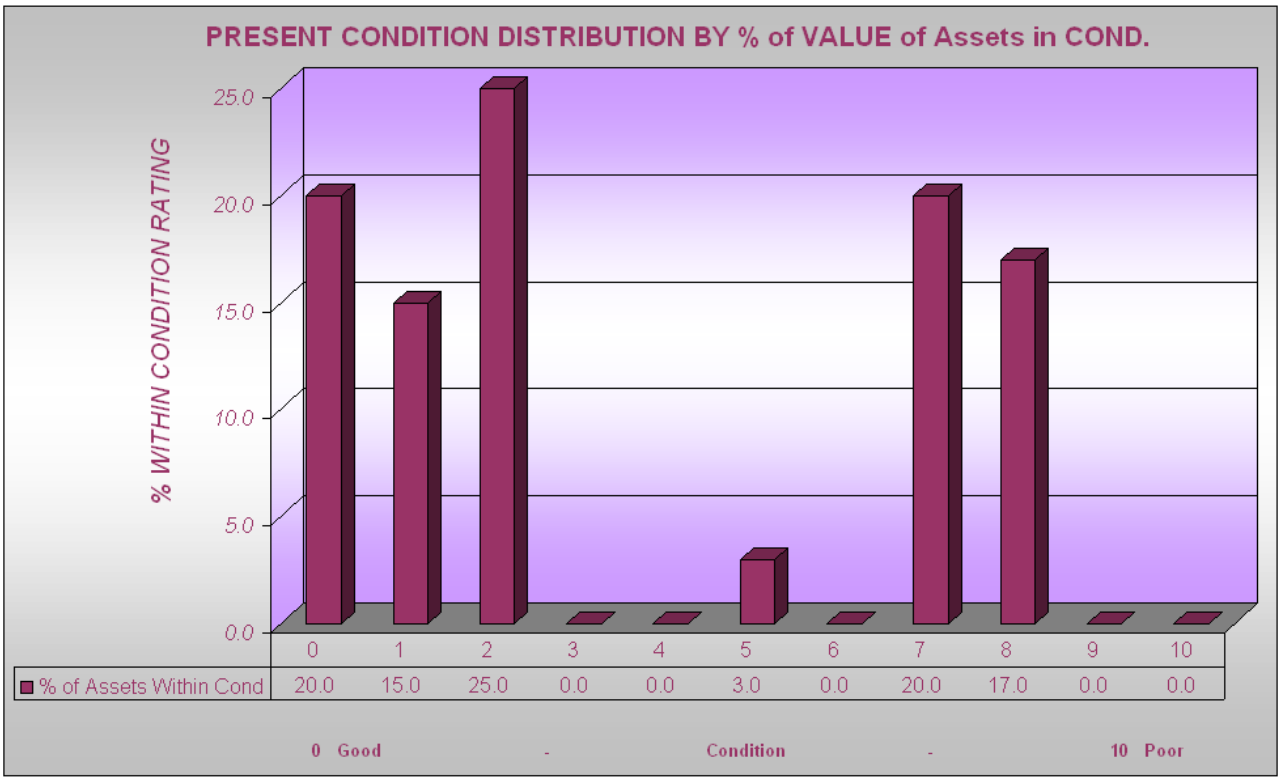



**Figure 30 Example of a most unlikely distribution**

Figure  is an example of a 5 scale distribution that has been simply shifted along the 0 – 10 scale. While the base data appears OK and has a normal type distribution the big gaps in the distribution will cause modelling problems. The distribution should have been treated through the “Condition Dist Converter” sheet in “Input Pro Forma”, to generate the distribution as seen in Figure

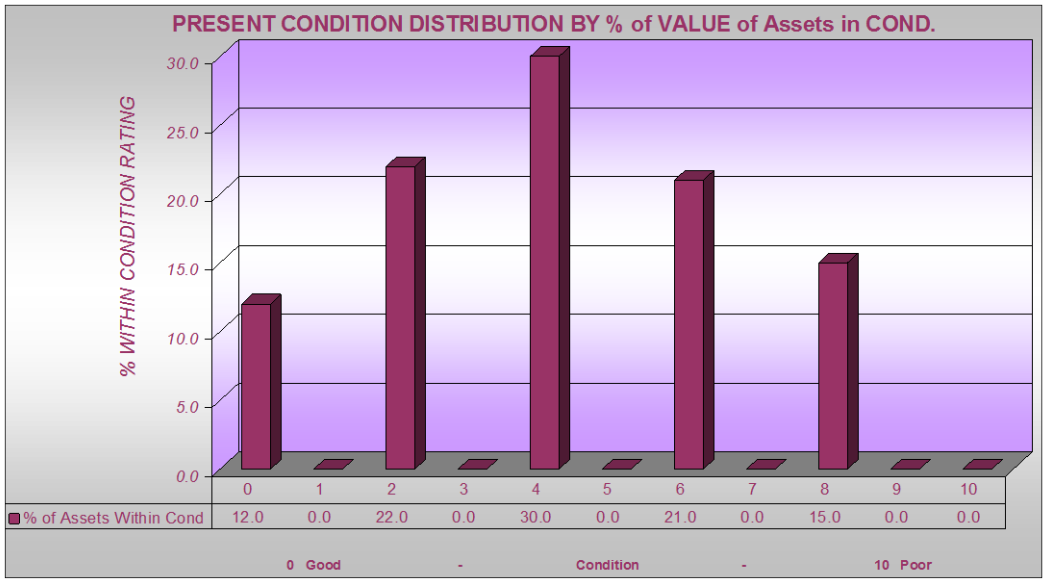



**Figure 31 Example of a distribution that should have been converted to 0 - 10**

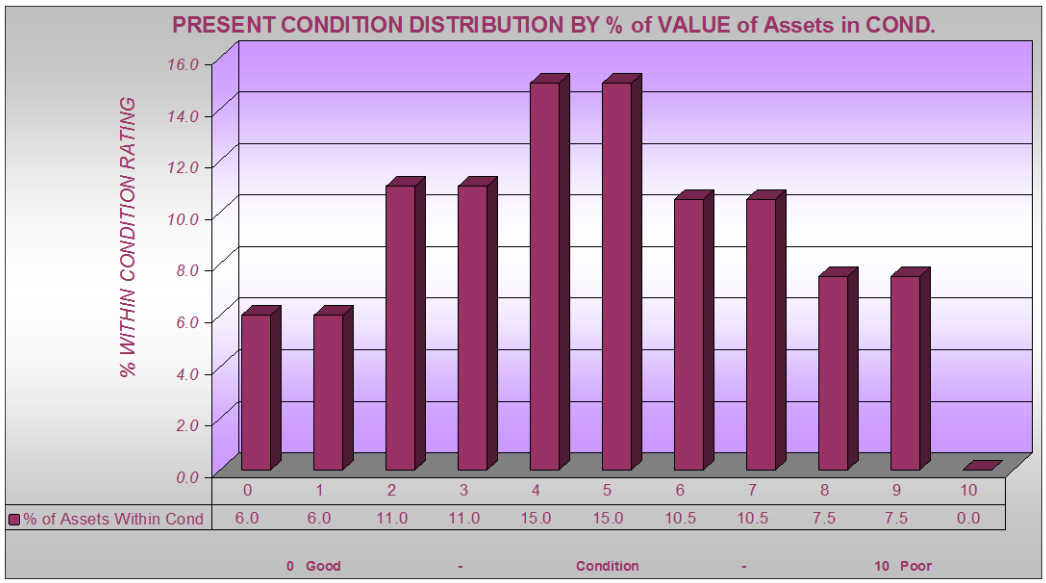



**Figure 32 Distribution in Figure above converted to 0 - 10**

You should carefully review all condition distributions as graphed in the "Graphs" sheet of "Input Pro Forma" and satisfy yourself that they do accurately represent the condition of your assets. If the assets are long term and the asset set has a large number of members, the distribution should approximate a normal distribution. The shorter the asset life the flatter the condition distribution often becomes.

NOTE
For long term assets, with a large data set the distribution should approximate a normal distribution

There are four suggested actions you could take to improve problem distributions in the short term. However, you should also look to address any structural problems back at the data source.

- Substitute your distribution with one of the default Condition Distributions built into the program
- Use the Condition Distribution Converter sheet where your scale is not 0 – 10
- Review what has been used to deliver your distribution
- Manually adjust some of the more unbelievable condition distributions.

## 6.6 Running the model from the "Run and Review Results" sheet

With all data filled in on the "Required Data" sheet for the full 40 data sets and having undertaken the above checks, go to the "Run and Review Results" sheet and click "Button 5". It is recommended that you close down all processes and open up a fresh copy of MS-Excel. This will assist with the performance of the program.

Make sure that the "Input Pro Forma" file is in the same folder as the "Model All" and "Asset Graphs" files and that the 3 files are all of a common version and update Date.

Version and Update information is located.

| | |
|---|---|
| "Input Pro Forma" file | - Cell C1 of "Required Data Sheet |
| "Model All" File | - Cell P1 of "Notes on File" sheet |
| "Asset Graphs" File | - Cell C1 of "Notes on File" sheet |

NOTE

The File Names MUST Not be amended if you want to run them again. The Program will report an error if the correct name is not assigned to the files.

## 6.7 Flowchart of Modelling operations:

The flowchart in Figure  indicates the transmission of the data through the three MS-Excel files involved and how the various Program Buttons are used to control the process.

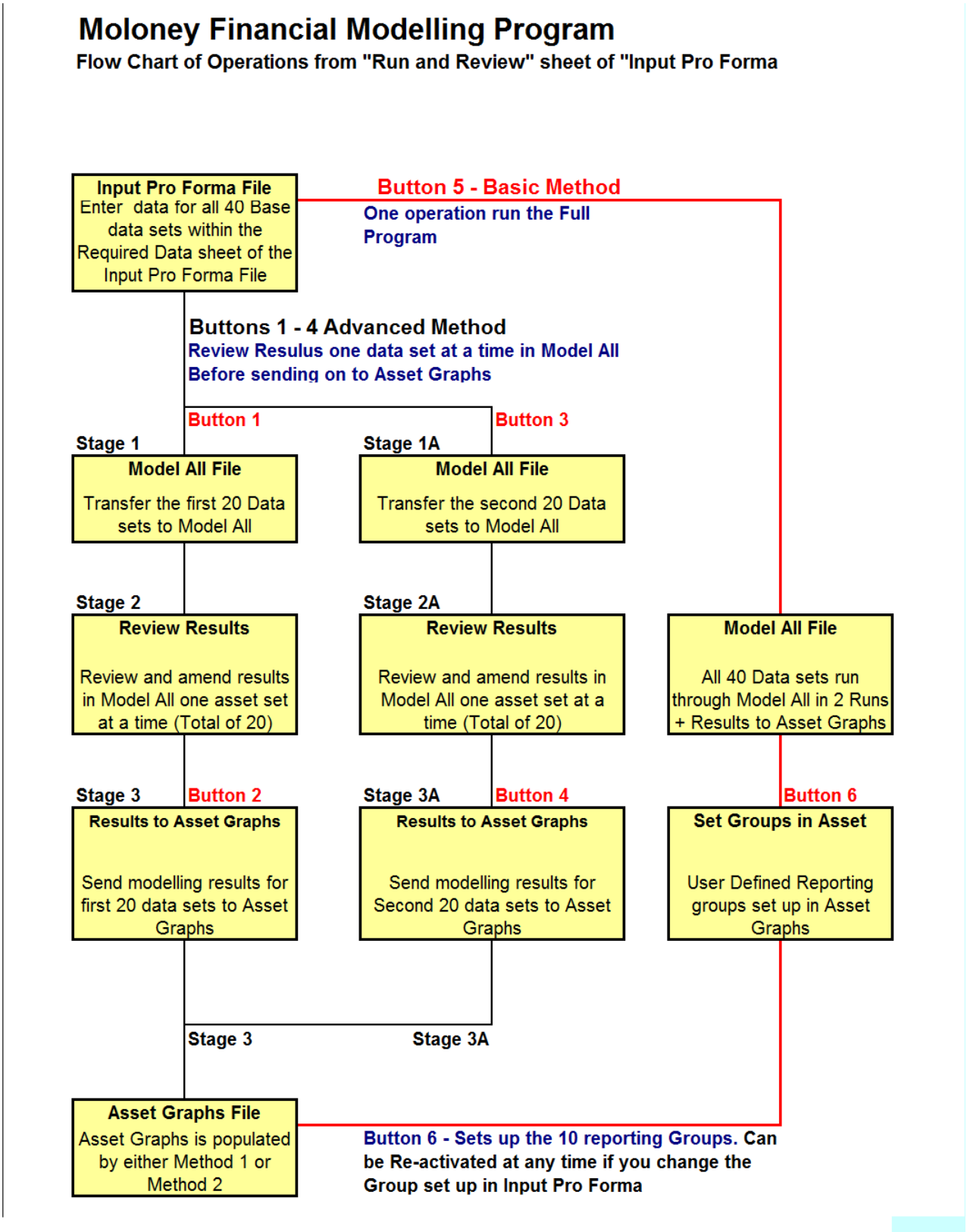



**Figure 33 Flow Chart of Program Operations through the Three Excel Files**

Figure  indicates there are two paths for the transfer of data and modelling results from “Input Pro Forma”, through “Model All” and finally on to presentation in “Asset Graphs”. Both methods take the raw data from “Input Pro Forma”, run it through “Model All” and present the final results within “Asset Graphs”. It is recommended that only experienced users with a sound knowledge of the operations of “Model All” undertake their amendments within “Model All”. However, this is by far the best way to get the most out of the system. Refer to Section 4.1above for more details on this process.

### 6.7.1 Method 1 the simplest method

Method N$^{o}$ 1 is the recommended approach for new users. Once your data set is completed within the “Required Data” sheet of “Input Pro Forma”, click “Button 5” on the “Run and Review Results” sheet and wait for the program to deliver the results within “Asset Graphs”. No further action is required to obtain your results.

### 6.7.2 Method 2 Run into “Model All” and review results there.

Refer to Section 4.1 for details relating to this method

Important summary of operations for the “Run and Review” method

- “Button 1” of “Run and Review Results” sheet takes first 20 data sets to “Model All”
- Load asset sets one at a time in “Model All” and amend the modelling variables as required
- Use button “MV 1” on “Modelling Variables” sheet to save modelling variable changes within “Model All” for each individual asset set
- Use button “MV 2” on “Modelling Variables” sheet to transfer all modelling variable changes for the 20 data sets in “Model All” back to “input Pro Forma”.
- Run amended results from “Model All” to “Asset Graphs” from “Button 2” of the “Run and Review Results” sheet of “Input Pro Forma”.
- Repeat the above steps for data sets 21 – 40 in “Input Pro Forma” using “Button 3” and “Button 4”.

# 7 Conclusion

Obtaining good results from the renewal gap program can be a long and involved process. However, it is dealing with very complex issues and a huge range of variable data. Depending upon how you approach the task the final outcome can be of great benefit to the organization at one end of the spectrum and quite misleading and of little use at the other.

There is no magic bullet for delivering a good outcome. The software simply analyses your input data. If you have good data and spend the time to present it in a realistic way, the program will reward you with a sound outcome. If on the other hand you populate the software with ill-considered numbers it will deliver rubbish that may be quite damaging and misleading to your organization.

NOTE
There is no magic bullet for delivering a good outcome
The software simply analyses your input data.

No process is perfect, just like no organization is perfect and it may be that one of the main outcomes from the early use of this software is an understanding of the deficiencies in your asset information systems.

The process is seen as an iterative process where the first draft may just highlight areas of information deficiency. The real key to the success of the software is sound input information. The aim should be to assemble the following information for each asset set to be modelled.

- Accurate condition information
- Unique degradation curves based on a statistical analysis of multiple condition assessments
- A sound understanding of the required level of service
- Sound data on unit renewal costs

You may not start with all of the above. But if you work towards acquiring the information you will be refining your predictions as you go and delivering better predictions with time.

**My Final comment is that this process is a multi discipline one and requires all areas of the organization to be involved and to take ownership of the process and outcomes. It is a great tool for both finance and operational areas of the organization and it requires input from all to deliver sound outputs.**

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