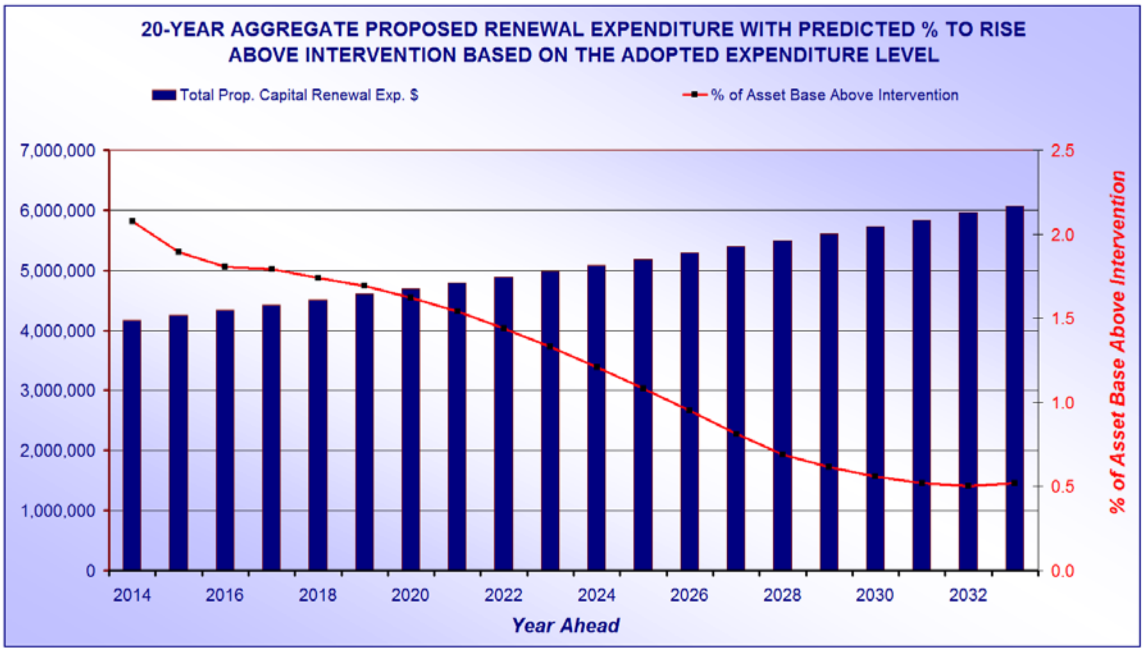
MOLONEY ASSET MANAGEMENT SYSTEMS

MAMS

MANUAL OF OPERATIONS



COVERING THE

Model All File

Last Updated May 2013

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Financial Modelling - Introduction

The Model All file was developed to enable the financial modelling of up to 20 different asset data sets and to provide the means of presenting a consolidated single report for all assets.

In recent times it has become more of a tool used within the broader Moloney Financial Modelling suite, which enables the modelling of up to 40 individual data sets as well as the grouping of those data sets into up to 10 asset-reporting groups.

The Model All file can still be used as a stand-alone model but its use within the broader financial modelling suite makes it a far more powerful tool

In broad terms the Moloney financial modelling package is a network-based system that has two separate modelling paths, both of which commence with the present condition distribution of the asset set. One path predicts the capital renewal expenditure requirement necessary to maintain the asset set within a selected condition. The other predicts future asset condition based on a proposed capital renewal expenditure profile.

1.1 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)

The modelling structure within the file is summarised below:

1. Asset sets or sub groups should only be modelled together if they share a similar life cycle.
2. The model can handle up to 20 different asset or sub asset sets.
3. The model is designed to function with asset sets that degrade with time and require rehabilitation or replacement at the end of their service life on a periodic basis.
4. The model commences with the present condition distribution of the asset set (see Fig 10 below).
5. There are 7 user defined modelling variables that can be applied to the model (see Section **Error! Reference source not found.**)
6. There are 2 basic modelling paths within the program. The first predicts future asset condition based upon the provision of a proposed future capital expenditure profile. The second predicts the future capital expenditure requirement based upon the selection of a Required Condition outcome.
7. The two modelling paths both track the future consequential maintenance cost structure. This is achieved via a user-defined link between asset condition and maintenance cost.
8. The modelling results for up to 20 individual asset or sub asset sets can be aggregated into a series of single reports.

> Note:
>
> There are only 2 sheets within the Model All.xls File with any user input functionality. They are the “Data Storage” Sheet and the “Modelling Variables” Sheet. And on these sheets only the Light Green shaded cells may be amended.
>
> All other sheets are report sheets only with no used functionality other than perhaps formatting the existing graphs.

2 Modelling File Structure

The modelling **Model All File** is best seen as having 4 different sections as summarised below.

1. Raw modelling Data storage sheet
2. User defines modelling variables sheet
3. Individual asset group modelling sheets (4 No.)
4. Aggregated asset group modelling sheets (3 No.)

In addition to the four above operational sections the file also contains a single sheet dedicated to an explanation of the operations and use of the file. This is the “Notes on File” Sheet and is found in all Moloney Excel modules. It is designed to provide sufficient detail to enable the user to operate the software without reference to other sources such as this manual. There are two further sheets one used as a temporary storage sheet during importing from our access format programs and the other contains a record of the program amendments.

2.1 Data Storage

The modelling file is designed to enable you to model up to 20 different asset sets and to aggregate the results of the individual modelling operations. The raw modelling data for the 20 asset sets is stored within the “Data Storage” sheet of the file. See section 3.2 below for details of raw data requirements. There is only one sheet within the file covering this section and that is the “Data Storage” Sheet.

2.2 Modelling Variables

The program allows you to apply seven modelling variables to the raw asset date. These modelling variables are all user defined and may be varied as required to check the predicted modelling outcome. The seven modelling variables are all located on the one sheet within the file (the **“Modelling Variables”** Sheet). This is the only sheet making up this section of the file.

2.3 Individual Asset Set Modelling Sheets

This section presents the modelling results for an individual asset set following loading of an asset set from “Data Storage”, the entering of the 7 variables above and the running of the model. It contains 4 individual sheets as listed below.

- Existing Condition
- Model No1 Proposed Expenditure
- Model No2 Predicted Capital Requirement
- Funding Gap

The last 3 of the above 4 sheets contain the details of the modelling results for the individual asset set. It could be said that the Existing condition sheet does not belong within this section as it represents a graphical display of the present or starting condition distribution for the asset set being modelled. However it is particular to the actual asset set being modelled and as such forms part of the modelling results section. See sections 0 to 3.6 below for more details relating to the modelling results section.

2.4 Aggregate asset group modelling Sheets

This section groups the modelling results for multiple individual asset sets and displays them as a single group. It contains 3 separate sheets, with each sheet relating to the aggregated results corresponding to the last 3 sheets in the above section dealing with a single asset set. The Aggregate sheets are as listed below

- Aggregate Proposed Expenditure
- Aggregate Capital Requirement
- Aggregate Funding Gap sheet.

The aggregate sheets present a single predicted outcome for multiple single asset sets.

3 Sheets within the File

There are presently Twelve Sheets within the Model All File as detailed below. Within this section a detailed explanation of each sheet and its operations will be undertaken.

- Notes on File
- Data Storage
- Modelling Variables
- Existing Condition
- Model No1 Proposed Expenditure
- Model No2 Predicted Capital Requirement
- Funding Gap
- Aggregate Proposed Expenditure
- Aggregate Capital Requirement
- Aggregate Funding Gap
- Access Temp
- Prog Amendments

3.1 Notes on File Sheet

Like other Moloney Modules, the Notes on File sheet of the **Model All** File contains some general information in relation to the operation of the File. The detail will not be as extensive as contained within this manual but should be sufficient to enable you to use the File.

Note that within the **Model All** file in addition to the details within the "Notes on File" Sheet there are extensive excel comments throughout the file at strategic locations which should be of great assistance. These excel comments are present in cells with a red dot within the top right hand corner of a cell. There will generally be a detailed comment at the top of each sheet and further comments within the headings for each table and graph within the sheet.

3.2 Data Storage Sheet

The data storage sheet holds the raw modelling data for up to 20 sets that can be modelled within the file. The modelling process requires surprisingly little raw data. But the data must be of a high quality if modelling results are to be accurate.

All that is required to commence the modelling process is a condition distribution for the asset set. The condition distribution must be in the following form.

- Must be a zero to ten-condition scale.
- Condition zero is perfect or new condition asset
- Condition 10 represents an asset in very poor condition with no remaining life.
- The distribution within each condition rating must be based upon the percentage of the total asset set within each condition and the total for the full condition range must come to 100.

All of the commencing data that is necessary for the modelling process is contained within table DS1 of the "Data Storage" sheet. Tables DS2 to DS6 below are optional tables and do not have to be filled in. These extra tables have been designed to hold the 20 sets of seven modelling variables that are entered into the "Modelling Variables" sheet. The idea being that once you have made decisions relating to the modelling variables you can store your default figures here and have them loaded into the model each time you load a particular asset set for modelling.

3.2.1 Data Storage Sheet - Loading Data

There are 20 locations within table DS1 of the "Data Storage" sheet for the housing of raw modelling data. Data storage will most probably be populated form the "Input Pro Forma" file within the broader Moloney Financial modelling suite these days.

However the Model All file can still be used as a single stand-alone modelling tool. If using it for this function you MUST populate table DS 1 on the data storage sheet for all data sets you intent to model. From there you can either populate the 7 modelling variables directly into the Data Storage sheet of more likely populate them into the Modelling Variables sheet one at a time as you load them for modelling.

> Tip
>
> Model All will most likely be populated from the Input Pro Forma File

There is a Button on the “Modelling Variables” Sheet that will transfer the 7 variables back to the Data Storage Sheet for later re use. The Button is Button MV 1 and is located around Cell M3. This is a great facility to use once you have decided upon a definitive set of Modelling Variables.

TIP

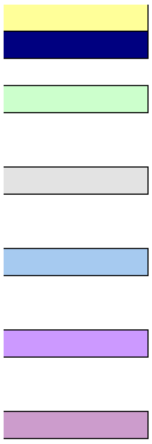
Button MV1 saves all modelling variables from Modelling Variables sheet back to Data Storage Sheet

3.3 Modelling Variables Sheet

The “Modelling Variables” Sheet is used to set all 7 modelling variables that operate within the model. With all 7 variables set the model is updated and the modelling results displayed within the modelling sheets.

The modelling variables if stored within the “Data Storage” sheet will be loaded into the “Modelling Variables” sheet each time you load an asset set for modelling. The variables on the sheet can be amended as required and the modelling results updated, based upon those new variables.

All seven modelling variables are located within light green shaded cells within the sheet. The general convention throughout the Moloney software is that you may amend data within a green shaded cell. Detailed below is a summary of the cell shading convention used within the file.



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 explinations but the key ones are shaded

The basic principle is amend only the cells that are shaded green.

Figure 1 File Cell Shading Convention

The same seven variables are used in the modelling of all assets. They do not specifically relate to any one asset set but have been selected as a set of standard variables that will apply to any infrastructure asset set that decays with time and requires renewal or rehabilitation at the end of its useful service life. An explanation of each of the seven modelling variables is detailed within the seven sub sections below.

Note:

You must load a data set to Modelling Variables from Data Storage from the Modelling Menu. Don’t try to fill it all in on Modelling Variables.

3.3.1 Modelling Variable No1 – Asset Degradation Rate

This variable defines the rate of capital consumption of the asset set. It is expressed within the system in the form of the number of years that an asset is expected to remain within each of the 0 to 10 condition ratings. The total asset life thus becomes the total of all of the individual life cycles within each condition rating.

There are 2 user-defined variables that deliver the above age profile within Table MV1 of the Modelling Variables sheet. The first is the total expected asset life in years to reach condition 10, which is entered into cell B26. The second is the percentage of the total asset life that is expected within each condition rating. This data is entered within cells C15 – C25. With these two variables entered the in built formulae then deliver the expected life in years within each condition rating into cells B15 – B25.

The shape or profile of the asset degradation is represented by the percentage of the total asset life allocated within each condition rating. The actual years within each condition rating are then determined by formulae by distributing the total life according to the percentage allocation. This system allows you to maintain the same relativity within the distribution and to make one amendment to total asset life to reflect changes within each asset condition rating.

Note that if you determine an asset should be replaced or rehabilitated at condition 8 then the allocation of asset useful life at and above condition 8 will have no impact on the outcome of model No2 "Predicted Capital Requirement". This is because, as the asset hits condition 8 it will be returned as a capital expenditure requirement irrespective of the life you have allocated above that condition level. Asset life above the adopted condition 8 will still impact on model No1 "Proposed Expenditure" Model.

Table MV1

Asset Degradation Rate

Expected life within each Condition Rating

Condition Factor 0 Good 10 Bad	Expected Life in Years Within Condition	Percentage of Total Asset Life within Cond. Rating
10	0.0	0.0
9	0.0	0.0
8	2.0	2.0
7	8.0	8.0
6	13.0	13.0
5	16.0	16.0
4	17.0	17.0
3	16.0	16.0
2	13.0	13.0
1	10.0	10.0
0	5.0	5.0
Years to Cond 10	100.0	100.0
Years to Intervention	90.0	

Note:

Asset service life is the life to the Intervention level and not the total live to condition 10

Figure 2 Table MV1 – Asset Degradation Rate

Figure 2 represents the expected rate of asset condition loss. This is Table MV1 on the "Modelling Variables" Sheet and it shows the expected life of the asset within each of the condition ratings.

Within the modelling process this information is used to degrade the asset set with time. For example in the table above the asset life within condition 1 is 10 years. The model would thus degrade 10% of the assets within condition 1 each year and move them to condition 2. This same degradation process would go on over the whole of the condition range for the full modelling period of 50-years.

The Years to condition 10 field is 100 meaning that the expected total life to condition 10 is 100 years. However, the life to the selected intervention condition of 7 is only 90 years. Thus the required expenditure model will be delivering its results on an effective life of 90 years.

The "Modelling Variables" sheet also contains a graphical representation of the above table within Graph MV2. Graph MV2 is displayed in Figure 3 below. The graph illustrates the expected age condition relationship for the asset set.

Graph MV2

Asset Degradation Curve (Time Condition Relationship) for ***Pavement (Sealed Collector Rds)***

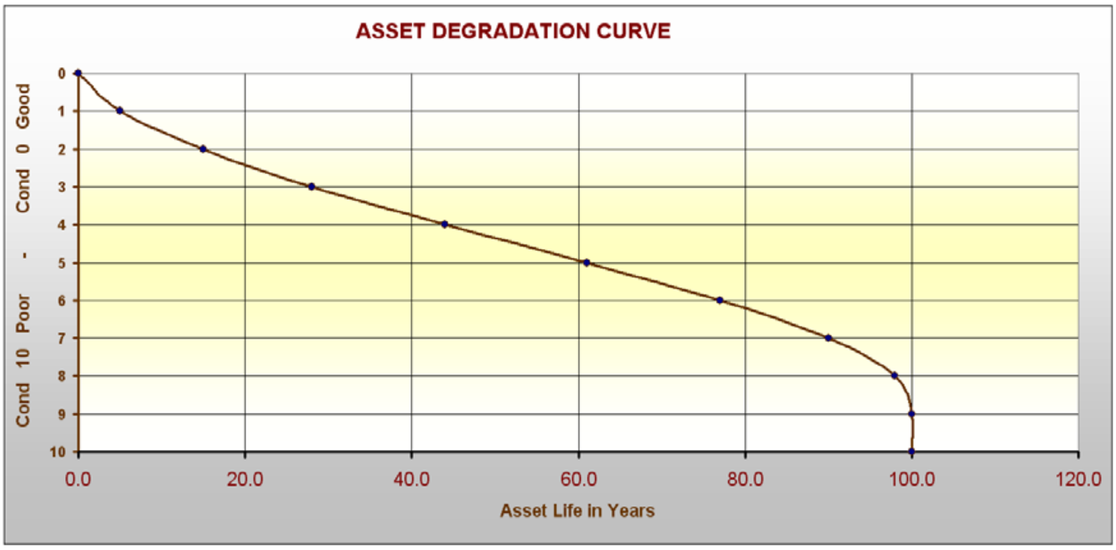


Figure 3 Graph MV2 – Asset Time Condition Relationship

You may amend the degradation curve as you wish within Table MV1 by changing the percentage of the total life within each condition rating or the total asset life in years.

Initially the degradation rate may need to be a best estimate. However, a statistical analysis of the condition change between two successive asset condition surveys will deliver a unique degradation curve. Moloney Systems has software available for this purpose.

3.3.2 Modelling Variable No2 – 50-year Proposed Expenditure profile

Shift In Year 1 Start Date	0										
Table MV2	**50 Year Proposed Annual Capital Expenditure Profile**										
Year No.	1	2	3	4	5	6	7	8	9	10	11
Actual Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Proposed Ann. Expenditure	100,000	105,000	110,250	115,763	121,551	127,628	134,010	134,010	134,010	134,010	134,010
Annual Percentage increase in Expenditure from year 1 in cell B36						5.00	To be Carried forward for			6	Years

Figure 4 Table MV2 – Proposed Capital Expenditure Profile

Within table MV2 is placed the 50-year proposed expenditure profile. Figure 4 above displays only the first 11 years of the total 50-year profile. The proposed expenditure is used only within model No1 (Proposed Expenditure Model) where the amount of asset to the value of the proposed expenditure is taken off the poor condition end of the condition distribution each year and returned as new condition assets in condition zero.

Note that this process has nothing to do with the required Retreatment Intervention Condition Level RICL. Model No1 will take off an amount of the poorest condition assets to the value of the proposed expenditure each year irrespective of the actual condition rating and will deliver a prediction of future asset condition.

There are three other variable cells within this table. The first two are not modelling variables but are provided to assist with filling in the proposed expenditure profile. They enable you to increase the present capital expenditure level within year 1 by a fixed percentage (5% here) for a given number of years (6 here). The third variable enables you to shift forward or back the starting year for reporting (Cell B32 on the sheet).

> Tip - You can shift the first reporting year forward or back within Cell B32

3.3.3 Modelling Variable No3 – Asset base growth Factor

This modelling variable enables the expansion of the asset base by a defined annual percentage each year. It was added to the modelling function at the request of an outer metropolitan council that was experiencing substantial annual growth in the asset base due to new subdivisions being created by developers.

Table MV3 — Adopted Growth in Asset base Value (Place Zero's in row 51 for no asset growth)

Year No.	1	2	3	4	5	6	7	8	9	10
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Annual % Growth	1.0	1.2	1.5	2.0	1.0	1.0	1.0	1.0	1.0	1.0

Figure 5 Table MV3 – Asset Base Growth Factor

The asset base growth factor is expressed as a percentage of the existing asset base. It is structured within the model such that the initial capital cost of the additional assets is not added to the cost liability structure. This is because the modelling factor has been designed to be used primarily for assets that will be initially constructed by developers and then become a Local Government responsibility for ongoing maintenance and rehabilitation.

New assets added to the asset base under this variable are thus added at no capital cost and are placed into the system in condition zero (perfect condition). The assets will be subject to the appropriate annual additional maintenance cost for assets in condition zero and will begin to be degraded in line with the degradation curve as outlined in 3.2.2 above.

The assets will eventually become a capital rehabilitation liability when they reach the RICL via the degradation process. Short-term assets such as sealed surfaces will demonstrate an increased capital rehabilitation demand within a relatively short period.

3.3.4 Modelling Variable No4 – Reporting Year for Model No1

Model No1 "Proposed Expenditure" Model is used to predict the future asset condition based upon the application of an adopted capital expenditure profile. The model produces a new predicted asset condition distribution for any future year up to 50 years ahead. This variable sets the year ahead for the predicted asset condition distribution. See section 3.4.1 for more details.

Table MV4

Rehab Interv Condition Level	Asset Return Cond.	Year Ahead to be Analysed	Actual Year Ahead
7.00	0	20	2032

Figure 6 Table MV4 – Year Ahead and Replacement Intervention Condition Level

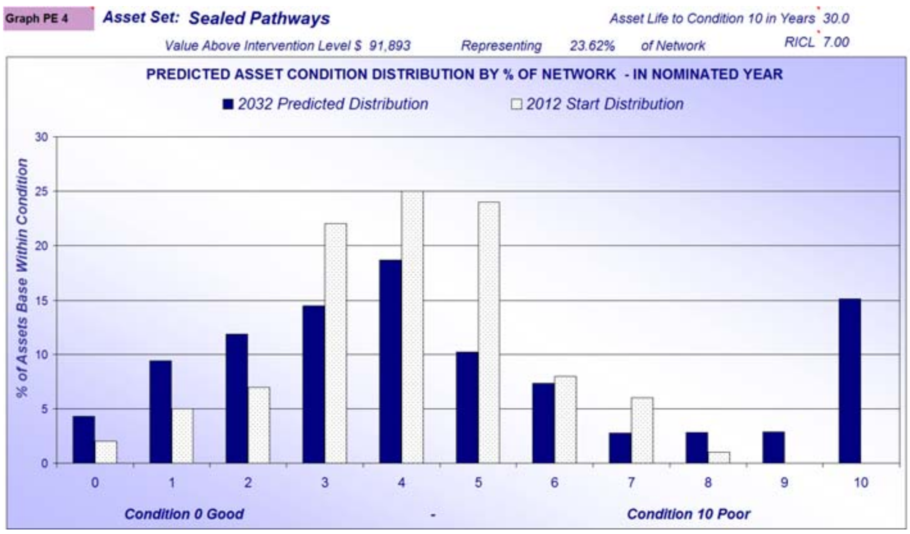


Figure 7 Predicted condition Distribution in 2032

In table MV4 above the year ahead to be analysed is nominated as 20. Thus the future reporting year is 20-years from the current year and is recorded as 2032. The Year Ahead variable applies only to Model No1 "Proposed Expenditure". The asset return condition allows you to return an asset after rehabilitation to a condition other than zero. This can be used in situations where a particular treatment is used on a group of assets that brings them from say condition 8 to condition 4. Be aware that you will only be using the asset life then between condition 4 and 8.

3.3.5 Modelling Variable No5 – Replacement Intervention Condition Level RICL

This variable applies to both models but applies primarily to Model No2 "Predicted Capital Requirement". The RICL is the asset condition level at which it is considered the asset should be replaced or rehabilitated.

Model No2 uses this variable as the trigger to require an asset to be rehabilitated. That is, as an asset is degraded in accordance with the degradation curve established within Modelling Variable No1 above it would eventually reach the RICL. Say this were condition 8. Then every time an asset hit condition 8 it would be returned as a capital expenditure requirement. The model assumes that the renewal works were undertaken and returns that amount of asset as new condition assets in the following year while removing them from the condition 8 rating.

This rolls on for the full 50-year modelling period and delivers a 50-year capital expenditure profile that will treat all assets that reach the RICL.

Within Model No1 "Proposed Expenditure" Model the extent of the asset base that rises above the RICL is reported upon each time a new predicted condition distribution is prepared.

IMPORTANT NOTE RELATING TO THE "RICL": Care MUST be taken when modelling, to understand the affect of the RICL. If for example you have 5% of your asset base presently above condition 8 and you select 8 as the RICL, then the whole of the 5% will be returned as an immediate renewal demand. You are effectively asking for a higher standard than the one that presently exists. To have 5% above cond. 8 you may need to select a RICL of 8.5 – 9.0.

3.3.6 Modelling Variable No6 – Current level of Annual Maintenance Expenditure

Both models have been set up to track the predicted movement in future maintenance cost. The starting or reference point for this prediction is the current level of annual maintenance. The figure would be taken from the annual accounts from the last full financial year or preferably averaged over the last several years.

The figure simply represents the reference starting point for the present maintenance expenditure that will be lifted or dropped within the model depending upon predicted asset condition movement.

Some thought could be given to the separation of fixed and condition dependent maintenance expenditure. This matter will be further discussed in the next section.

Table MV5

Capital - Maintenance Cost Relationship

Actual Total Maintenance Exp in $ from last years records	**258,000**
Maintenance Cost Adjustment Ratio for each whole number Change in Overall Asset Condition.	**1.50**

Figure 8 Table MV5 – Capital Maint – Cost Relationship

3.3.7 Modelling Variable No7 – Maintenance Cost Adjustment Ratio.

This variable factor applies to both models and is the user-defined variable that links asset condition to maintenance cost. The factor must be a number greater than or equal to 1.0 and will generally peak at 1.8.to 1.9.

The factor represents the amount by which you expect the maintenance cost to vary, for each whole number rise or fall in asset condition. For example if an asset in condition 4 were allowed to degrade to condition 5 a "Maintenance Cost Adjustment Ratio" of 1.5 would result in a maintenance cost of 1.5 times the rate for the asset in condition 4. (See Table MV6 Below).

Table MV7

Maintenance Cost - Condition Relationship

Av. o/a Cond.	1	2	3	4	5	6	7	8	9	10	**Units**
Mtce. Cost	82	122	184	275	413	619	929	1,162	1,355	1,525	$ Cost Per sqm
Total Quantity	736	736	736	736	736	736	736	736	736	736	Quantity in sqm

Figure 9 Table MV7 –Maintenance Cost – Condition Relationships

Figure 8 above comes from the “Modelling Variables” sheet. The table represents the adopted cost structure for maintenance over the whole asset condition range. The maintenance cost – condition relationship is set up as follows.

Total present maintenance cost is taken as the figure entered into table MV5 above, as one of the modelling variables.

The program then uses that total figure to spread it across the condition range in accordance with the adopted “Maintenance cost Adjustment Ratio” such that when the actual present condition distribution quantities for the asset set are multiplies by the maintenance unit costs in table MV6 within each condition rating and then summed the result equals the total maintenance spend placed into Table MV5.

In other words the program takes the total maintenance figure and creates unit maintenance costs across the whole condition range such that the unit cost rise between whole condition numbers is equal to the adopted “Maintenance Cost Adjustment Factor” (in this case 1.5).

The program softens off the maintenance cost adjustment factor after condition 7 as it is felt that beyond that point the maintenance cost does not continue to rise at such a steep rate.

The creation of the maintenance cost – condition relationship is an iterative process and is achieved within excel using their scenario finder. The quantity of assets within each condition rating multiplied by a sliding maintenance cost which varies by (in this case) 1.5 times for each whole condition rise must sum to the total present maintenance expenditure.

Or to put it another way, a cost – condition relationship is set up that spreads the present maintenance expenditure over the whole asset group based on two variables. The amount of the asset base within each condition rating and a lift in unit maintenance rate for each whole condition number based on the adopted “Maintenance cost adjustment factor” selected.

With a maintenance cost – condition relationship set up for the present situation the model then applies that relationship to future condition change within the model. If overall asset condition improves maintenance cost will fall, if it declines it will rise.

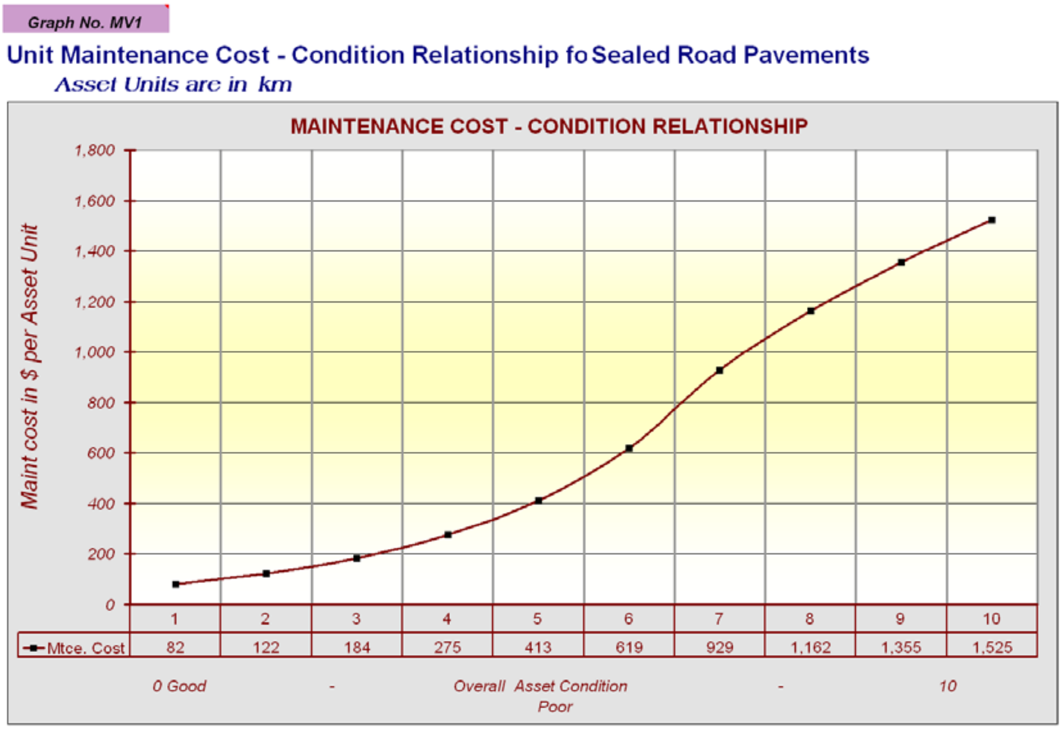


Figure 10 Table MV7 – Graph MV 1 Unit Maint. Cost – Condition Relationship

Figure 10 above is a graphical representation of the adopted asset condition – maintenance cost relationship. Once established this relationship is then used within the program to predict the movement in future maintenance cost based upon the modelling predictions for movement in asset condition.

3.3.8 Table MV6 – Create an expenditure profile to meet a required condition outcome

This program amendment was added in Feb 2013 and the three variables that are used within the program are entered here.

Table MV6	
Create a Proposed Expenditure Profile	
Max. % of assets over Intervention	**2.00**
Years to Achieve	**20**
Expenditure Annual Percentage Increase	**5.00**
Present % Over Intervention	**4.11**

Figure 11 Table MV6 – The 3 variables used to create an expenditure profile

The Proposed Expenditure model starts with your proposed expenditure profile and predicts the future condition outcome. The capacity has always been there to create a proposed expenditure profile that delivered a desired condition outcome but it is an iterative process. The Feb 2013 amendment to the software allows you to set your condition outcome criteria and the program undertakes the iterative process to deliver the expenditure profile that will achieve it.

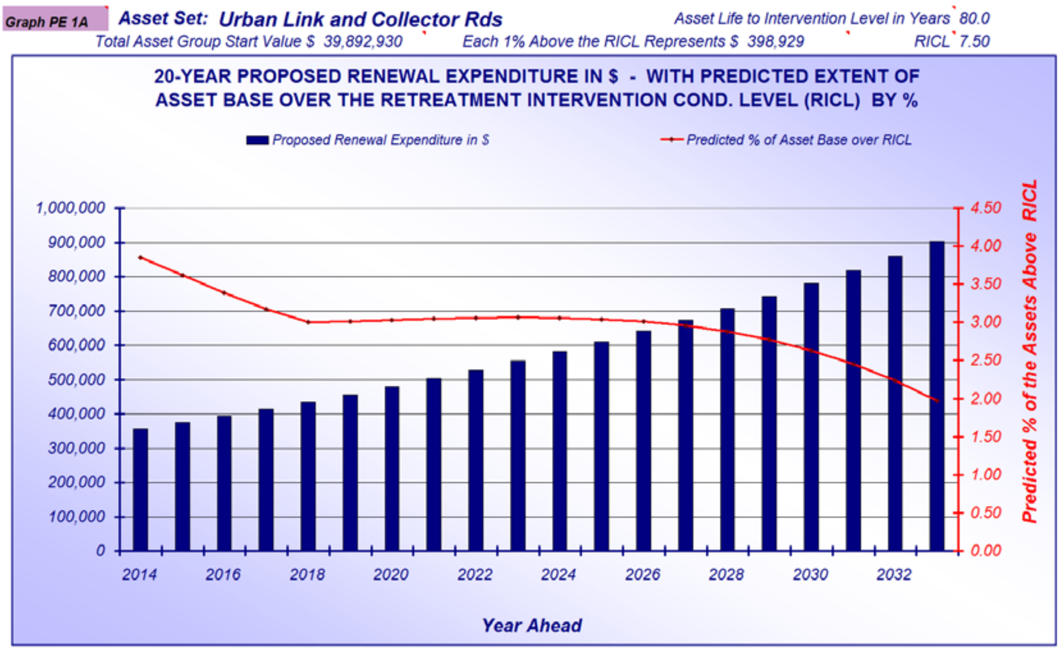
The condition outcome within the proposed expenditure model is expressed as the extent of the asset base at and above the selected intervention level. The 3 variables that can be set are as detailed below.

- Maximum permissible percentage of assets over intervention
- Years to achieve the condition outcome
- The desired annual percentage increase in renewal expenditure

Within figure 11 above the present extent of the asset base over the selected intervention level is 4.11% (this is calculated when the program is run based on the condition distribution and the selected intervention level).

The 3 variable inputs have been set as detailed below

- The maximum percentage of the asset base to be over intervention – 2.0%
- The number of years to achieve this – 20-years
- The desired annual % increase in annual renewal expenditure 5%



Tip – Fig 11 is updated via the "Ctrl j" command within Model All or off the Modelling menu

Figure 12 The developed expenditure profile to deliver the desired condition outcome

Figure 12 shows the resulting expenditure profile over the next 20-years to achieve no more than 2% of the asset base at and above the intervention level by 2033.

This feature within the software provides a valuable tool that enables you to create funding scenarios to match any situation. In the above example there was an existing extent of over intervention assets of 4.11%. this was reduced gradually to 2.0% over a 20-year period. The commencing renewal expenditure requirement was lowered in year 1 by accepting a 5% pa annual funding increase. If 0.0% increase had been selected then annual expenditure would have been flat and the year 1 expenditure would have been higher at around $550,000 pa.

3.3.9 Modelling Variables Sheet - Program Operations

There are five program operations associated with this sheet that can be accessed off the "Modelling" menu. The Modelling menu is a program menu that has been developed within the file to assist with program operations. See section 4 below for more details.

The First level of the Menu allows you to bring to the Modelling Variables Sheet any of the potential 20 data sets that you have within the Data Storage Sheet. The Modelling Variables Sheet has it's own menu level with 5 items attached. These five items deal with updating the model for an individual asset set and populating the proposed expenditure details in table MV2.

There four program operation that are Button activated within the sheet. The Buttons start around Cell M3. Button MV 1 is also available on the Modelling menu. It copies the modelling variables on the sheet back to the data storage sheet within the file as well as updating the modelling results to the aggregate sheets within the file.

In practice you would refine the modelling results for a single asset set by varying the inputs on the modelling variables sheet. Once satisfied with the results Button MV1 saves the amended modelling variables back to the "Data Storage" sheet within the file and also updates the modelling results to the aggregate sheets within the file.

Button MV 2 is used in conjunction with the Input pro Forma file and transfers the variable data all 20 data sets back to the Input Pro Forma File. This function is used if you are refining your modelling results within the Model All File while working more broadly within the full Financial Modelling Suite of 3 Files.

Button MV 3 Copies the 50-year required expenditure profile for a single asset from the “Model 2 Predicted Cap Requirement” sheet to table MV2 on the “Modelling Variables” Sheet. It effectively makes the proposed expenditure for Model 1 equal to the required expenditure in Model 2.

Button MV4 is used in conjunction with the running of the “Create a Proposed Expenditure Profile” operations attached to table MV6. See section 3.3.8 for more details, but this button runs all 20 data sets within the Model All file through the process that develops a proposed expenditure profile based on the condition outcome as dictated within Table MV6. If using this facility you will loose all existing proposed expenditure details as they will be replaced with the new predicted ones.

This facility is great when operating at a global level with your assets and can very quickly deliver required funding outcomes for different scenarios. For example, a full set of road related assets may be made up of 20 individually modelled data sets and the total extent of the asset base over the desired intervention level may be say 6%.

Scenarios could be run with a single activation of Button MV4 to reduce the 6% of over intervention assets to say 2% (or any other percentage) within a selected time frame of 1 – 20 years.

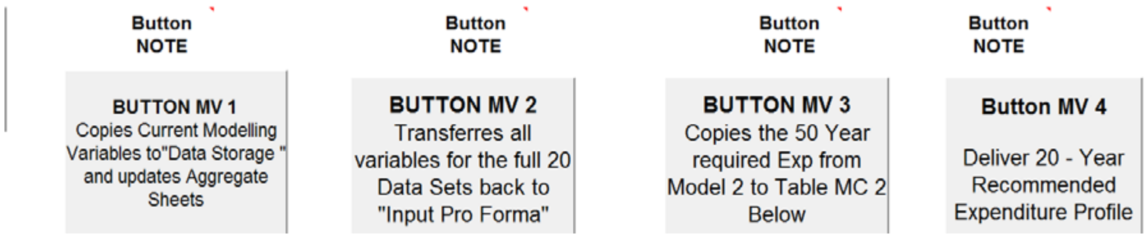


Figure 13 The four buttons on the modelling variables sheet

3.4 Existing Condition Sheet

This sheet is the first sheet in a series of four that act together to perform the modelling function for the file. The sheet graphs the existing condition spread of the asset group under consideration. When you load one of the 20 possible asset groups from the “Data Storage” sheet to the modelling sheets the condition distribution profile within table DS1 of the “Data storage” Sheet is transferred to the “Existing Condition” sheet and a graphical representation of the condition spread of the assets is displayed.

There are two condition distribution graphs. One is based upon the percentage of the asset base within each condition rating and the other is based upon the value of the assets within each condition rating. The two graphs are essentially the same accept that one expresses the extent of the asset base within each condition rating as a percentage of the total network while the other uses the rehabilitation or renewal value of the assets within each condition rating. There is no permitted interaction with this sheet it is simply used to display the present condition distribution of the assets being modelled.

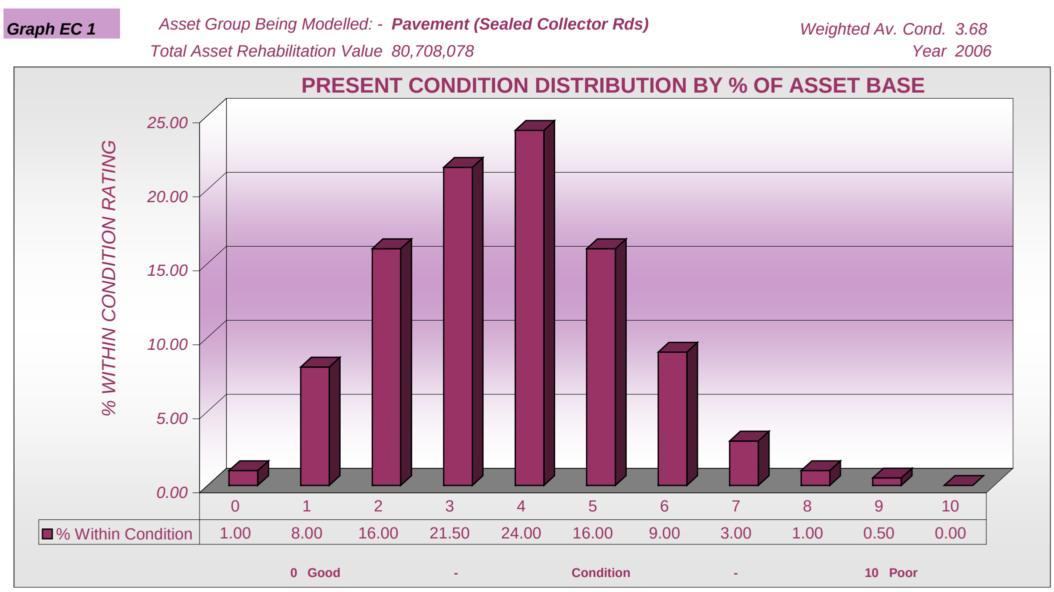


Figure 14 Graph EC1 – Graph of Existing Condition Distribution

Figure 14 above is an example of the present condition distribution as detailed within the "Existing Condition" Sheet. Figure 15 below is the same data set in tabular form. The weighted average asset condition is derived by multiplying the condition rating by the value within that rating, then summing those figures before dividing by the total asset valuation. Thus the weighting is based upon the valuation of the asset within each condition rating.

Cond Rating 10 Bad 0 Good	Value Within Cond. Rating in $	% Within Condition	Weighted Average Cond Calculation
10	0	0.00	0.00
9	403,540	0.50	3631863.66
8	1,210,621	1.00	6456646.50
7	3,631,863	3.00	16948695.75
6	10,895,590	9.00	43582362.00
5	23,808,883	16.00	64566465.00
4	43,178,821	24.00	77479752.00
3	60,531,057	21.50	52056708.00
2	73,444,350	16.00	25826586.00
1	79,900,997	8.00	6456646.50
0	80,708,078	1.00	0.00
	80,708,079	100	3.68

Figure 15 Table EC2 – Graph of Existing Condition Distribution

The existing condition distribution represents the modelling starting point for both modelling paths. It is imperative that the data supporting this distribution is of a high quality as it represents the reference point for the modelling process.

3.5 Model No1 Proposed Expenditure Sheet:

The file has two modelling paths the "**Predicted Capital Requirement**" path, which shall be dealt with in the next section and the "**Proposed Expenditure**" path, which is represented in Model No 1.

Basically the "**Proposed Expenditure**" model commences with the present condition distribution. It then requires a 50-year proposed expenditure profile to be supplied and from that data delivers a prediction of future asset condition. With future condition established the model is able to predict the movement in maintenance cost based upon the details as outlined in section 3.2.8 above.

The modelling process within the "**Model No1 Proposed Expenditure**" Sheet is summarised below.

- The model commences with a present condition distribution of the asset set as detailed within Figure 14 above.
- A degradation process is applied to the distribution as outlined within section 3.2.2 above.
- This process degrades the asset base with time in accordance with a user defined degradation curve and effectively simulated the passage of time on the assets.
- If no other intervention were to take place then all assets would end up within condition 10 at some future date.
- The model takes the user defined 50-year proposed capital expenditure profile as detailed in 3.2.3 above. It then removes from the poor condition end of the distribution an amount of asset equal in value to the proposed expenditure for each year. That amount of asset is then returned as new condition asset in the following year.
- The process of replacing poor condition assets with new to the value of the proposed expenditure goes on for the full 50-year modelling period.
- The primary outputs from the model are a predicted future condition distribution at any nominated year between 1 and 50 and a prediction of the extent of the asset base that will rise above the intervention level with time.

3.5.1 Model No1 Outputs

Figure 16 below represents one important output from the "Proposed Expenditure" Model. The graph presents the present condition distribution in light shading with the predicted condition distribution in the year 2021 superimposed in a dark shading.

Above the graph is recorded some of the basic modelling information such as the total life cycle for the asset set and the adopted Retreatment Intervention Condition Level RICL. The model also reports upon the extent of the asset base that is predicted to be above the RICL. In this case there is 14.29% of the asset base with a total value of $11,529,767 above the RICL.

At the bottom of the graph there are details supplied in relation to the extent of the proposed and required expenditure as well as the predicted movement in weighted average asset condition. Note that the proposed average capital expenditure over the next 20 years is $571,000 while the required expenditure is $1,430,994 PA. The required expenditure is simply the replacement value or total renewal value of the entire asset set divided by the total adopted asset life in years.

The weighted average asset condition reported at the base of the graph is the condition weighted for the value of the asset within each condition rating. It is therefore a very useful indicator of overall asset group condition performance. Here the asset condition is predicted to decline from its present value of 3.68 to condition 4.82 over the next 15-years.

There is an extensive amount of information but the thrust of the graph is the predicted future condition distribution. The distribution can be obtained for any future year ahead between 1 and 50 years.

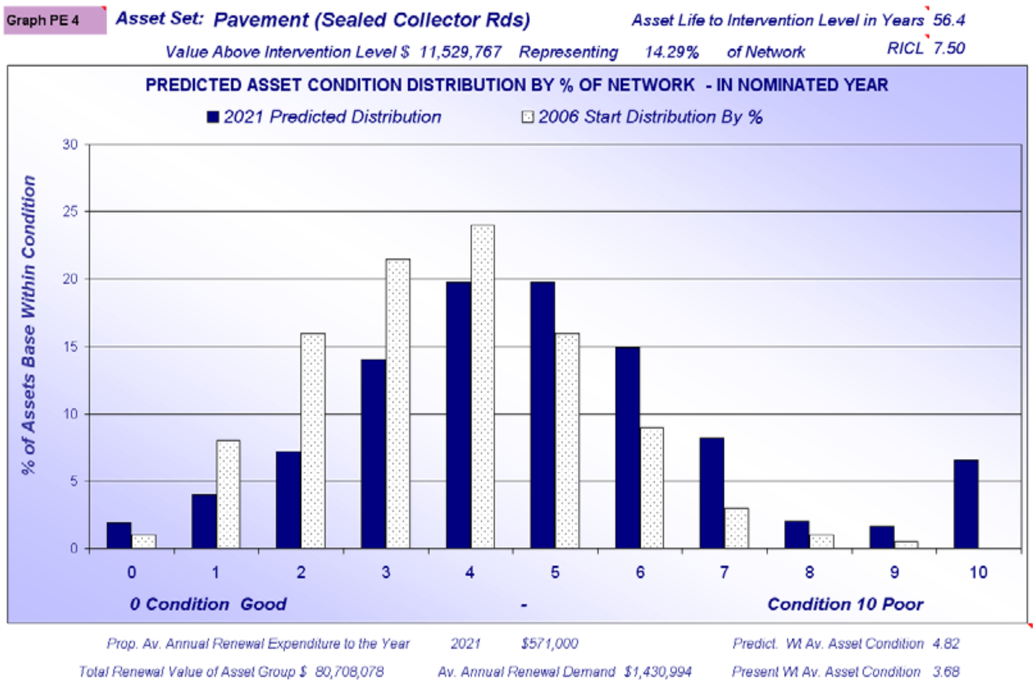


Figure 16 Graph PE 4 – Predicted Future asset condition distribution

As expected with such a low sustained capital renewal expenditure level, asset condition has declined dramatically over the 15-year forecast period. Both the weighted average asset condition and the predicted extent of the asset base over the RICL are dangerously high.

Figure 17 below is a second graphical output within the “Proposed Expenditure” Model. It is similar to Figure accept that this graph presents only the predicted future condition distribution without the present distribution as a reference.

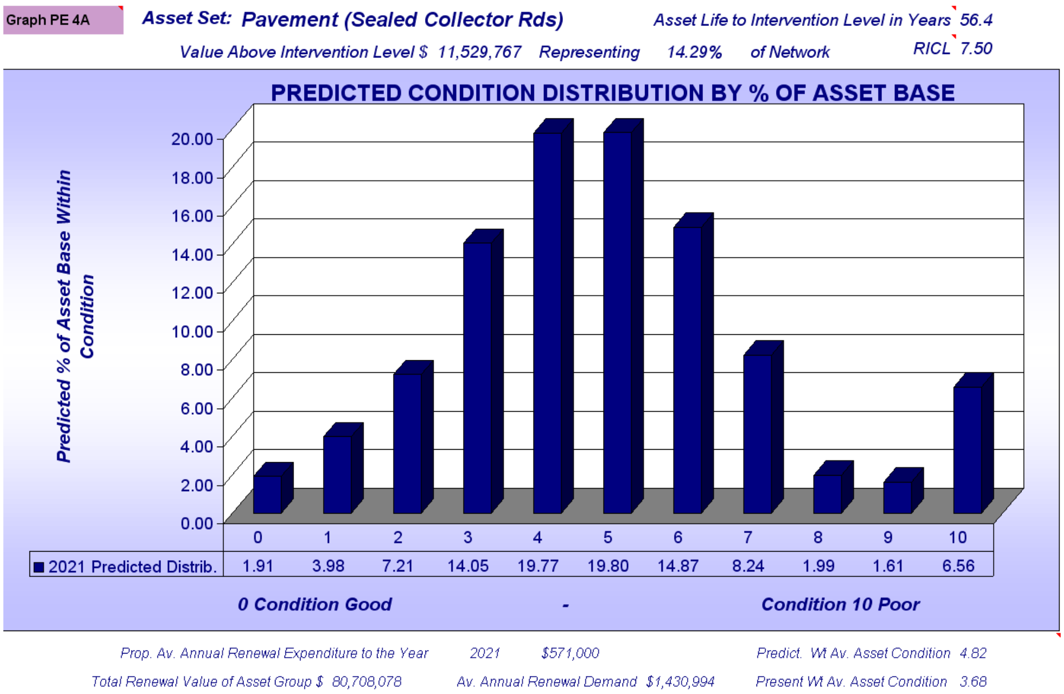


Figure 17 Graph PE 4A – Predicted Future asset condition distribution

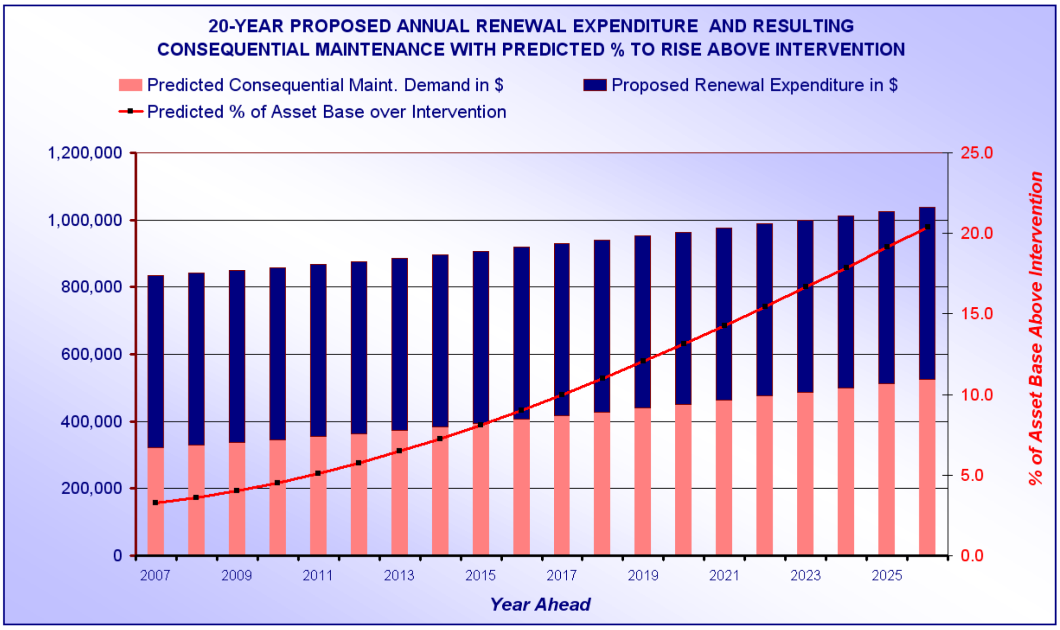


Figure 18 Graph PE 5A – Predicted Maintenance Expenditure

Model No1 “Proposed Expenditure' predicts future asset condition. Within section 3.2.8 above the details of the link between asset condition and predicted maintenance cost was explored. The model uses the maintenance cost – asset condition relationship to produce a 50-year consequential maintenance cost prediction based upon the adopted capital expenditure profile.

Figure 18 above represents the predicted 20-year consequential maintenance expenditure resulting from the adopted 20-year capital expenditure profile that is also displayed within the graph. Note that with low early capital expenditure, maintenance cost is predicted to rise steadily.

The other very important output from this graph is the predicted extent of the asset base to rise above the selected intervention level. With lower than required renewal expenditure asset condition declines with time and the % over intervention rises from 4% in Year 1 to 20% in year 20.

The model basically tracks predicted future asset condition. But with the link between asset condition and maintenance cost established the model also produces a prediction of the consequential maintenance cost requirement

The predicted asset condition can be presented in three ways. The first is as detailed in Figure 16 and Figure 17 above where the future predicted condition distribution for any single year is presented. This is very useful but a long-term view of asset condition against time presents a more useful picture.

To achieve a graphical representation of asset condition movement with time a single measure of the asset group condition each year needs to be provided. This is achieved in two ways within the model. The first is displayed in figure 14 above and is a plot of the proposed capital expenditure against the extent of the asset base predicted to rise above the RICL. The extent of the asset base above the RICL is a very good indicator of overall asset group condition movement with time.

The second approach is to present the movement in the Weighted Average Asset Condition WAAC. The range of this variable will be much more limited than the 0 to 10 overall condition scale as movements of one whole condition number on a weighted average scale will be a very significant condition movements. The two approaches to plotting future asset condition are both valid but it is felt that the percentage above the RICL provides the best reference.

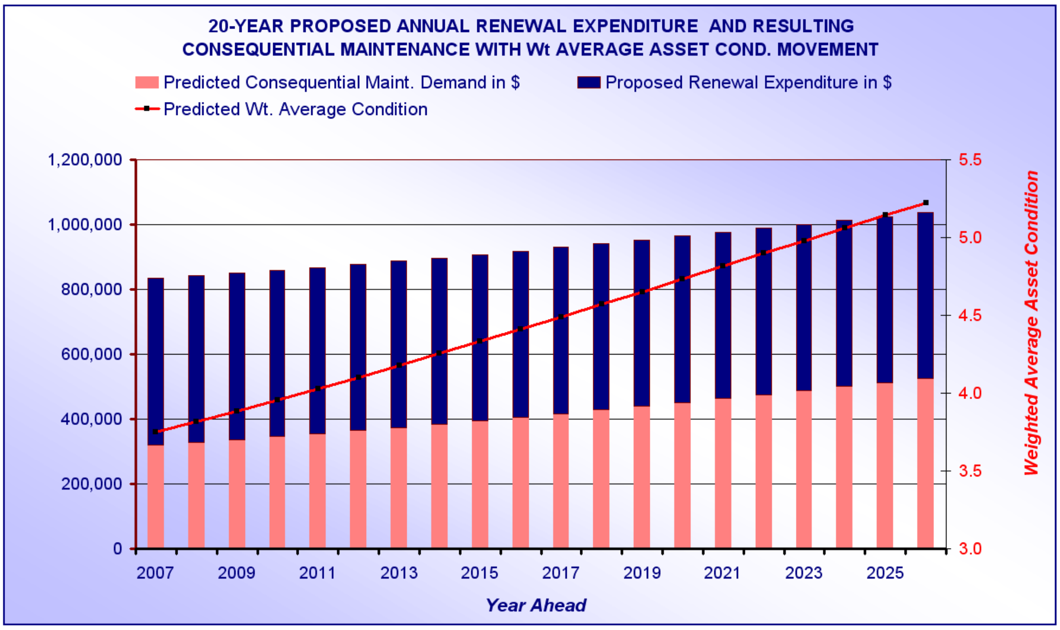


Figure 19 Graph PE 6A – Predicted Movement in WAAC

Figure 19 above illustrates the predicted movement in the Weighted Average Asset Condition WAAC, based upon a proposed 20-year capital renewal expenditure profile. Asset condition declines steadily due to a lower than required expenditure profile. The WAAC can be traced within both modelling paths and as such provides a good reference between the performance in both areas.

Model No1 Summary

The “Proposed Capital Expenditure Model” is summarised below.

- It commences with the present condition distribution of the asset set.
- A used defined 50-year proposed capital renewal expenditure profile is applied.
- Present asset group maintenance cost in input
- The model then predicts both future asset condition and consequential maintenance cost movement

3.6 Model No2 Predicted Capital Requirement Sheet:

This is the second of the Modelling methods within the program. The “Predicted Capital Requirement” Model as the name implies is designed to predict the capital renewal requirement necessary for the maintenance of asset condition to an adopted standard.

The modelling process within the “Predicted Capital Requirement” Sheet is summarised below.

- The model commences with the present condition distribution of the asset base as detailed within Figure 14 above.

- A degradation process is applied to the distribution as outlined within section 3.2.2 above.
- This process degrades the asset base with time in accordance with a user defined degradation curve and effectively simulated the passage of time on the assets.
- If no other intervention were to take place then all assets would end up within condition 10 at some future date.
- From here the model requires the nomination of a Retreatment Intervention Condition Level RICL. That is the condition level at which it is considered that an asset should be rehabilitated or replaced.
- The model then returns all assets that reach the RICL through the degradation process as a capital expenditure requirement. It assumes that the assets have been rehabilitated and thus returns that extent of the asset base as new condition zero assets in the following year
- This process continues on for the full 50-year modelling period with the primary outcome being a 50-year required capital renewal expenditure profile.

So the Required Capital Expenditure model delivers the minimum capital renewal expenditure necessary for the ongoing capital rehabilitation of the asset set to a desired condition outcome.

3.6.1 Model No2 Outputs

Figure 20 below represents the predicted capital renewal expenditure requirement for the same sealed road pavement asset set that was modelled in the "Proposed Expenditure" Model in section 3.4.2 above.

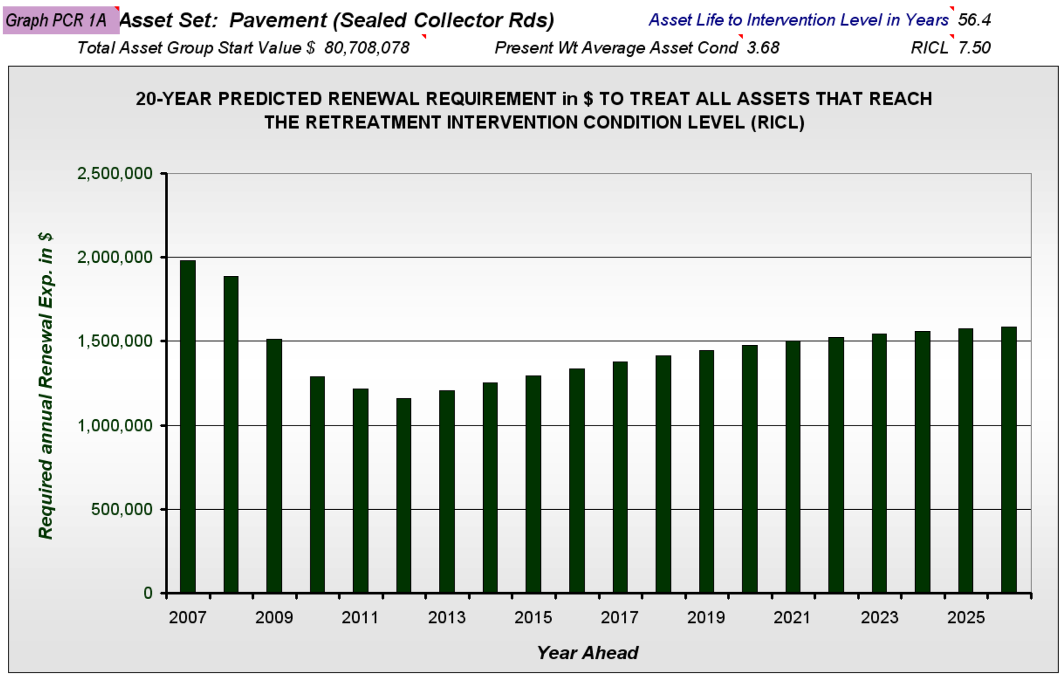


Figure 20 Graph PCR 1A – 20-year Predicted Capital Renewal Expenditure Requirement

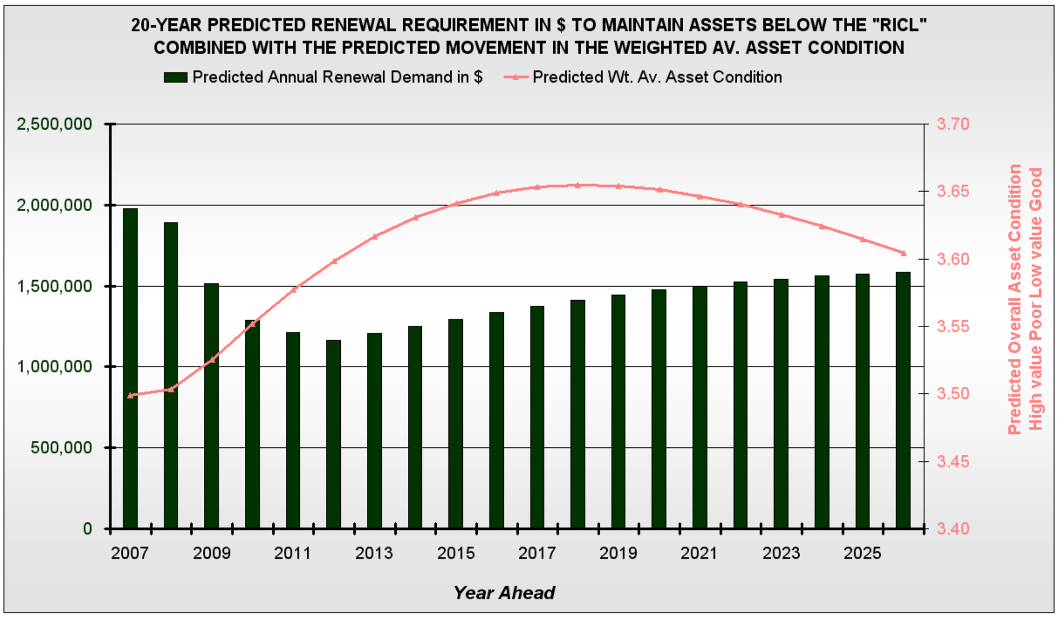


Figure 21 Graph PCR2A – 50-year Predicted Capital Expenditure Requirement with predicted movement in weighted average Asset Condition

The two graphs above represent two of the modelling outputs from the “Predicted Capital Requirement” Model. The graphs are very similar accept that the second one also plots the predicted movement in the Weighted average asset condition. Note that with the additional capital expenditure within Model No2 the weighted average condition decline has been slowed down quite noticeably.

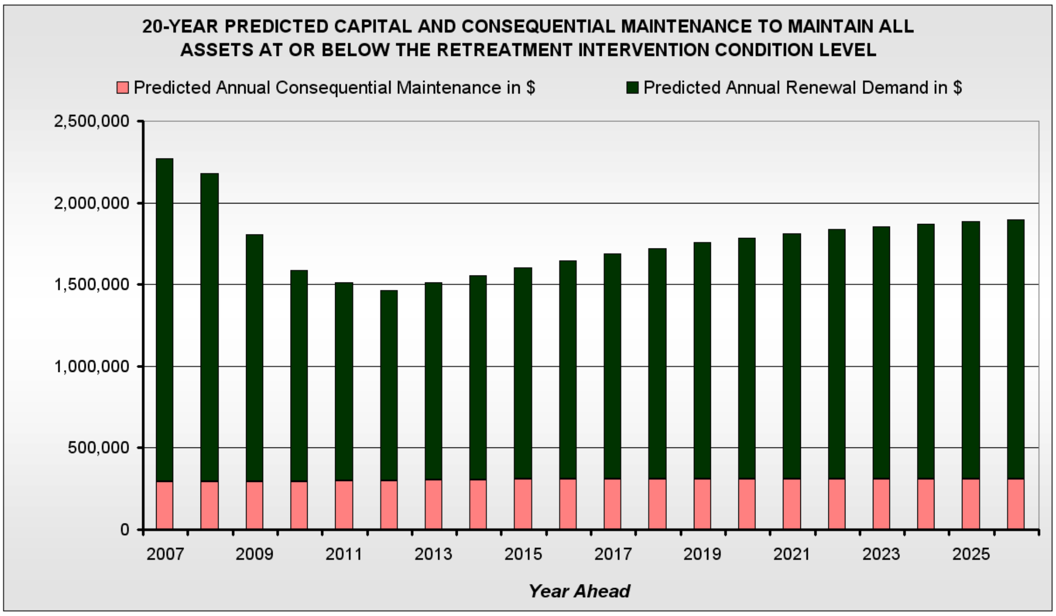


Figure 22 Graph PCR 3A – 20-year Predicted Consequential Maintenance Cost

Figure 22 contains a plot of the predicted future maintenance cost based upon the adoption of the required capital expenditure profile. With the increased level of capital expenditure within this model the consequential maintenance cost is far more contained than within model No 1 above.

The link between consequential maintenance cost and capital expenditure is the same as within Model No 1 and more details can be found within section 3.2.8 above. But essentially the model tracks the predicted asset condition based upon the capital expenditure levels. It then has a user-defined link between asset condition and maintenance cost that predict the movement in future maintenance cost.

3.6.2 Model No2 Summary

The "Predicted Capital Requirement Model" is summarised below.

- The model commences with the present condition distribution of the asset set.
- The user then defines a Retreatment Intervention Condition Level RICL that the model will not allow the assets condition to decline beyond.
- The model delivers a 50-year required capital renewal expenditure profile to treat all assets that rise above the RICL.
- The model also delivers the predicted movement in future maintenance cost based upon the adoption of the required expenditure profile.

3.7 Funding Gap Sheet:

The program has two financial models that act on the same asset data set, as detailed within the section 3.4 and 3.5 above. The funding gap sheet demonstrates the difference between the two modelling paths.

The sheet is designed to illustrate the long-term financial effects of sustained low capital renewal expenditure. It does this in two ways. First it presents a 20 and a 50-year graph of the capital renewal-funding gap between the proposed expenditure profile in Model No1 and the required profile in Model No2. It then tracks the difference in the consequential maintenance cost between the two models.

If your proposed expenditure profile is appropriate and is close to the required profile then the reported gap will be low or may even be negative. However, the sheet is designed for use when the proposed funding level is lower than the required. In such situations the sheet not only reports on the capital renewal funding gap but it also details the predicted additional maintenance cost that will result from the lower than required capital expenditure.

The "Funding Gap" Sheet reports on the difference between the outcomes of the two financial modelling paths.

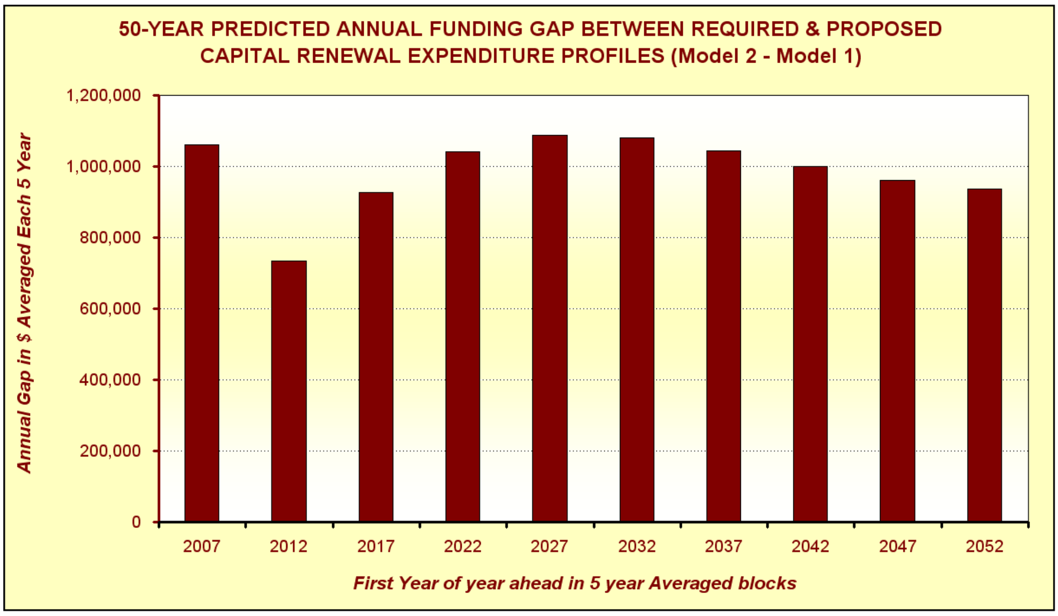


Figure 23 Graph FG1 – 50-year Funding gap between Required and Proposed Capital Expenditure profiles

Figure 23 above represents the capital-funding gap between the proposed capital expenditure profile in section 3.4 and the required in 3.5 above.

> Note: - The Model All file has both 20 and 50-Year reporting graphs for all reports. We have displayed 50-years graphs in this section but 20-year are also available.

The proposed capital expenditure profile was lower than the level delivered within Model No 2 the "Predicted Capital Requirement". As a consequence the capital funding gap above is high and indicates that the short fall will reach $1,087,000 by the year 2027.

As seen within Section 3.4 above the low capital expenditure profile will also result in additional maintenance expenditure. Another graph within the "Funding Gap" sheet illustrates the difference in predicted future maintenance expenditure between the required and proposed expenditure profiles.

In this graph the predicted maintenance requirement within Model No 2 "Predicted Capital Requirement" is taken from the predicted maintenance requirement from Model No 1 "Proposed Expenditure".

The result being, the predicted additional consequential maintenance expenditure necessary due to the adoption of the proposed capital expenditure profile rather than the required expenditure profile.

In this case the proposed capital expenditure profile was lower than the required profile and so the maintenance-funding gap is all positive. If proposed capital expenditure were higher than the required level then the graph would demonstrate the predicted saving in consequential maintenance cost by presenting a negative gap.

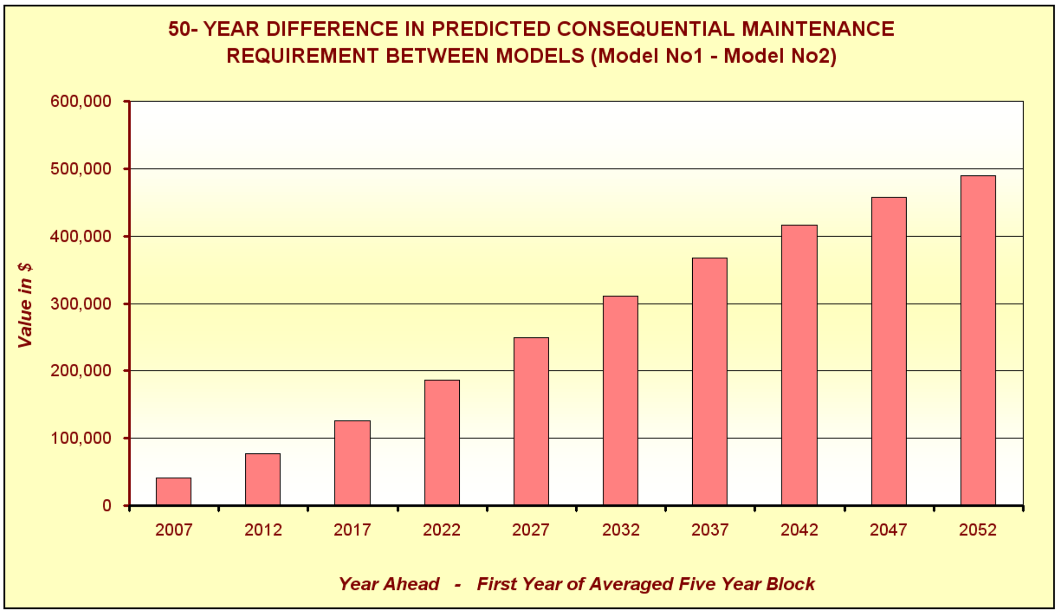


Figure 24 Graph FG3 – 50-year Predicted Maintenance Gap between Models

Figure 24 indicated that the additional maintenance expenditure resulting from the lower then required capital expenditure profile will reach $489,000 PA within 50-years.

The third graph from the "Funding Gap" Sheet (Figure 25 below) presents the results of two modelling paths, side by side. It also plots the predicted extent of the asset base that will rise above the RICL under Model No 1. In this case proposed expenditure is very much lower than the required expenditure level and so the model predicts an increasing extent of the asset base above the RICL with time.

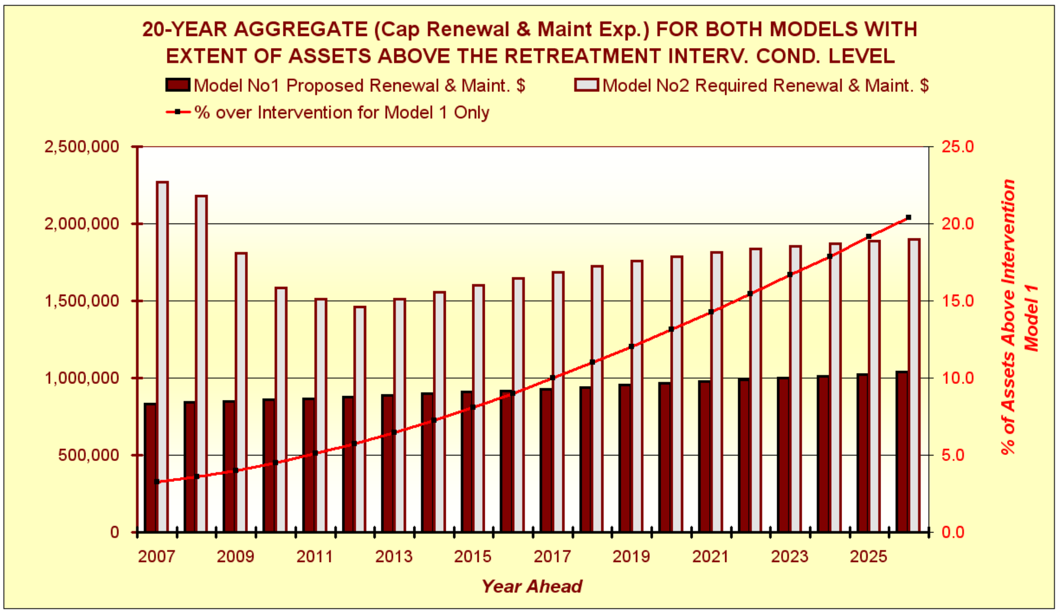


Figure 25 Graph FG 5A – 20-year Capital and Maintenance with Extent over RICL

3.7.1 Funding Gap Sheet Summary:

The "Funding Gap" sheet provides a comparison between the two financial models. Model No 2 the **"Predicted Capital Requirement"** model can be seen as the benchmark or the ideal world model. Within this model all assets that reach the RICL are treated as and when they're declining condition dictates.

Model No 1 the **"Proposed Expenditure** "Model can be viewed as the real world or trial model. Here you can trial any proposed capital expenditure profile and check the predicted asset condition and maintenance cost outcome.

The **"Funding Gap"** Sheet presents the difference or gap in the capital and maintenance outcome between the two models and is very useful in presenting the real funding shortfall in a graphical way. The sheet is updated each time you amend the raw data within the "Modelling Variables" Sheet and then update the model from the Drop Down Menu or use the shortcut key operation Ctrl "k"

3.8 The Aggregate Sheets (3 Number)

Within Sections 3.4 to 3.6 above we have dealt with the modelling outputs for Model No 1, Model No 2 and the funding gap between the two models.

The Aggregate sheets allow you to aggregate the modelling results of up to 20 individual asset sets into a single financial report. There are 3 Aggregate sheets corresponding to each of the sheets dealt with in sections 3.4 to 3.6 above. The table below indicated the correlation between the aggregate sheets and the three modelling sheets.

MODELLING SHEET NAME	CORRESPONDING AGGREGATE SHEET
Model No 1 Proposed Exp.	Aggregate Proposed Expenditure
Model No 2 Predicted Cap Requirement	Aggregate Capital Requirement
Funding Gap	Aggregate Funding Gap

3.8.1 The Aggregate Proposed Expenditure Sheet

There are 15 individual graphs within this sheet detailing the aggregate values for up to 20 sets of data for both proposed capital and consequential maintenance expenditure. Figure 26 below is the second graph in the series and represents the planned or proposed capital expenditure profile over the next 50-years

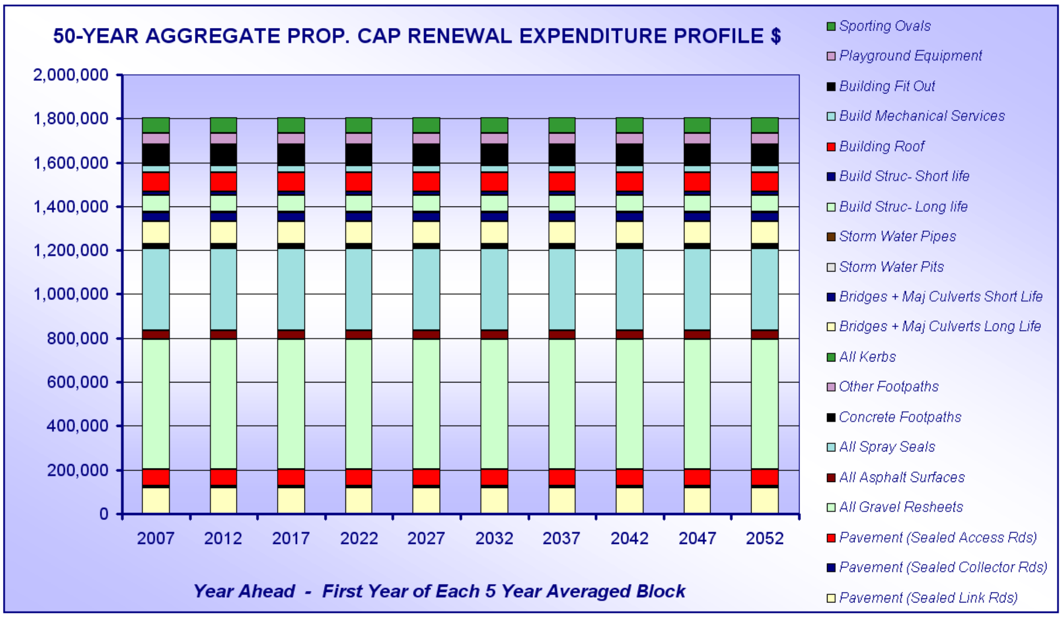


Figure 26 Graph APE 2 – 50-year Aggregate Proposed Expenditure Profile

The aggregate proposed expenditure profile can be presented in a 20 or 50-year profile as can all graphical presentations within the model. It can also be presented as above separated into sub asset type or as a single bar graph. Figure 26 above uses all 20 available asset locations and is a useful way of viewing the impact of each asset component on the whole outcome.

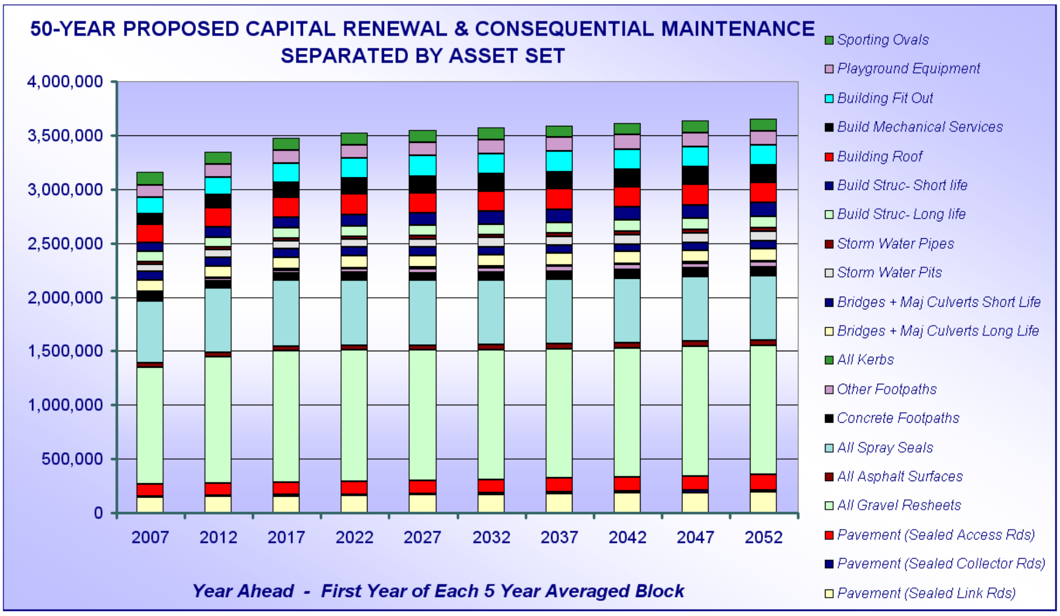


Figure 27 Graph APE 4 – 50-year Proposed Cap & Consequential Maintenance

Figure 27 above combines the predicted movement in consequential maintenance with the proposed capital renewal expenditure. In this case the proposed renewal expenditure was flat so the entire rise in the expenditure level comes from an escalating consequential maintenance cost.

The Aggregate Proposed Expenditure sheet provides an aggregation of the individual results obtained within the Proposed Expenditure sheet.

3.8.2 The Aggregate Capital Requirement Sheet:

As with the above sheet this one represents the aggregation of the individual modelling results for the "Model No 2 Predicted Capital Requirement" Sheet. The format is the same as for the "Aggregate Proposed Expenditure" Sheet and by way of example the same two graphs have been presented below.

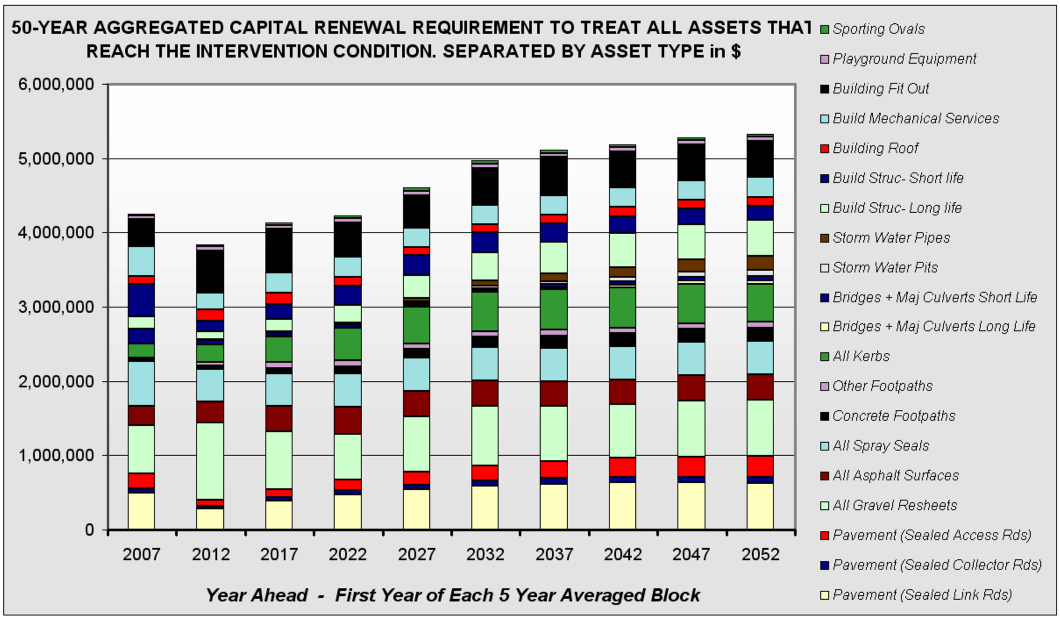


Figure 28 Graph APE1 – 50-year Aggregate Capital Requirement

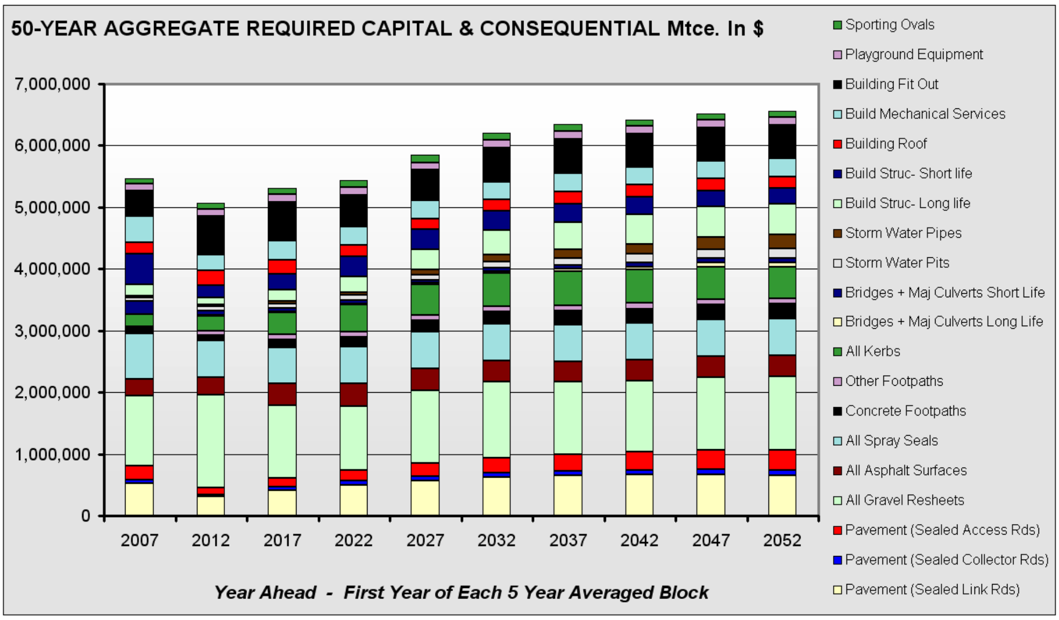


Figure 29 Graph APE 4 – 50-year Required Cap & Consequential Maintenance

3.8.3 The Aggregate Funding Gap Sheet:

This sheet represents the Aggregation of the individual results from the “Funding Gap” Sheet.

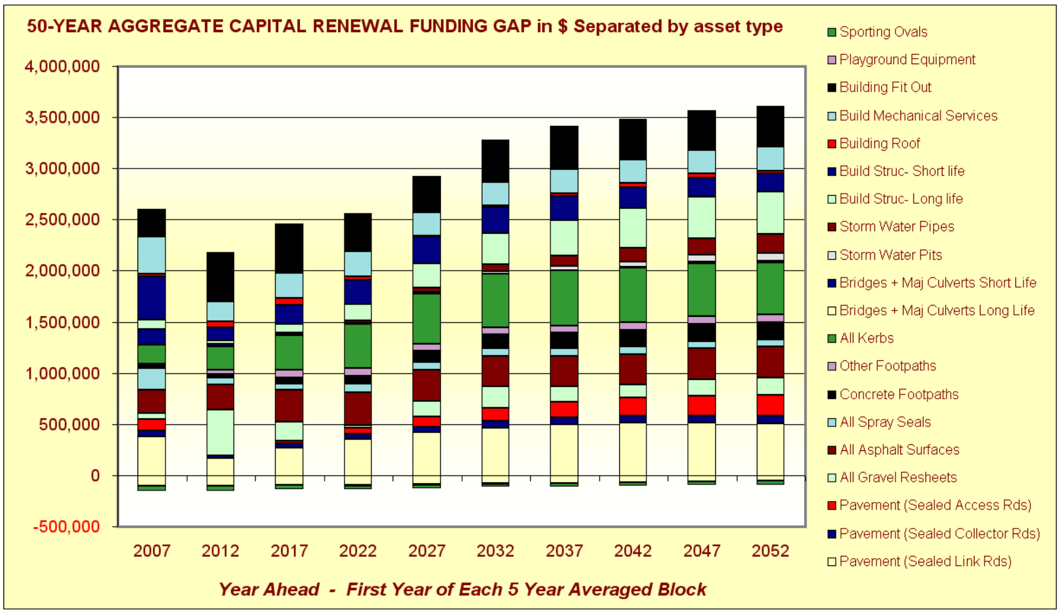


Figure 30 Graph AFG 3 – 50-year Capital Funding Gap

Figure 30 above represents the aggregation of the individual capital funding gap results from the “Funding Gap” Sheet. Where negative gaps are reported this equates to the proposed capital expenditure exceeding the minimum capital expenditure requirement at that point.

The sheet provides the option of presenting the capital renewal gap separated into sub asset type as detailed above or a single bar for all assets combined.

If the proposed expenditure profile is higher than the required profile then not only will the capital funding gap be reported as a negative but the maintenance gap will also be negative. (See Figure 31 below)

The funding gap and the aggregate funding gap sheets are designed for use in situations where the proposed capital expenditure profile if less that the required capital profile. In these situations the sheets report on the total capital funding gap as well as the additional predicted maintenance expenditure resulting from the capital under funding. Where the proposed expenditure is close to the required then these sheets will have only limited relevance. Although they can be used to demonstrate maintenance cost savings in situations where asset condition is poor and maintenance expenditure high. In such cases increased capital expenditure can result in lower maintenance costs.

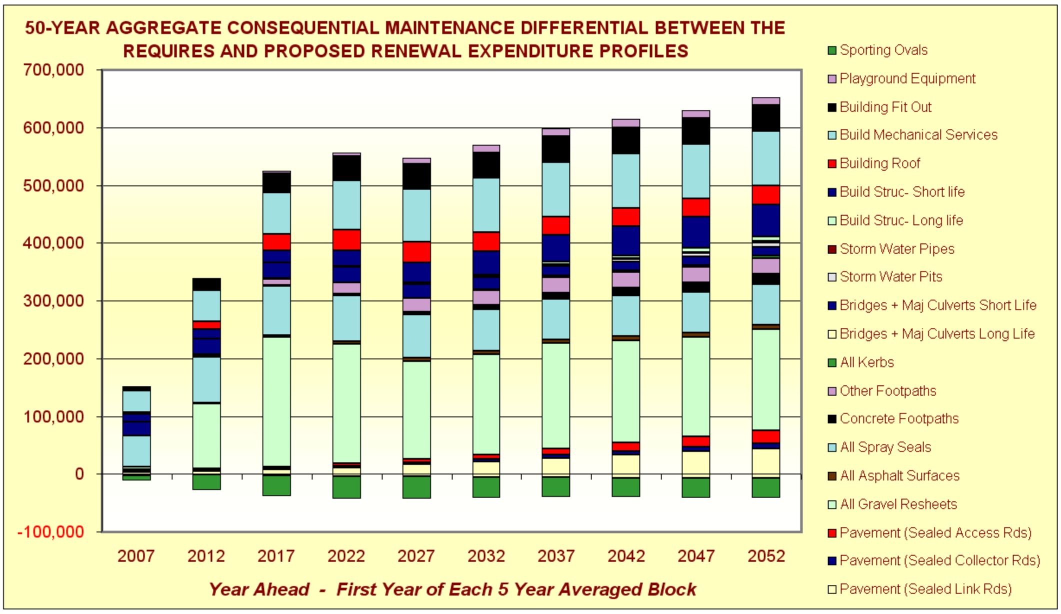


Figure 31 Graph AFG 4 – 50-year Maintenance Funding Gap

Figure 31 above predicts that in the long term the proposed capital expenditure profile will result in long term higher maintenance costs of around $650,000 PA

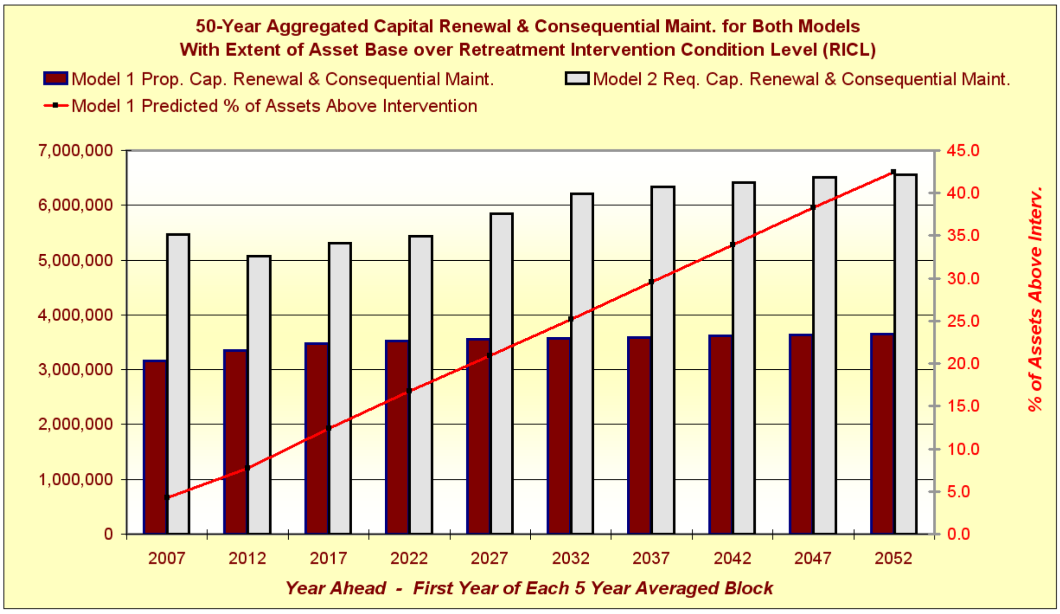


Figure 32 Graph AFG 6 – 50-year Aggregate Capital & Maintenance for Both Models

Figure 32 above is a summary of the overall outcome of the two modelling paths. It plots the Required Capital Expenditure and Consequential Maintenance necessary to maintain all assets within the RICL on the grey bars (the Required Capital Model). It then plots the Proposed Capital Expenditure and Consequential Maintenance on the brown bars (Proposed Expenditure Model). The red line represents the extent of the asset base predicted to rise above the RICL under the Proposed Expenditure Model. Remember that no asset rises above the RICL under the Required Expenditure Model as treating all these assets is the basis of that model.

In this case the proposed expenditure is lower than the required level and so an increasing extent of the asset base is predicted to rise above the RICL. The graph dramatically illustrates the long-term affect of under funding the capital rehabilitation requirement.

3.8.4 The Aggregate Sheets Summary

The three aggregate sheets each relate to the three individual modelling sheets. Once modelling is completed for an individual asset set the results can be aggregated into these 3 sheets so that a full picture for a total asset group can be presented.

See section 4.1.3 below for information relating to how to add and remove individual assets from the Aggregate sheets.

To some extent the upgrading of the financial modelling module to a 3-file system with the display file "Asset Graphs" has superseded the need for the aggregate sheets, as the display in "Asset Graphs" is far more flexible. However. The aggregate sheets are still used within the broader financial modelling 3-file system to store results before they are transferred to the "Asset Graphs" file as the Model All file analyses only one of its possible 20-data sets at a time and the results of each modelling operation need to be stored.

3.8.5 Aggregate Sheets – Program Operations

The Aggregate Sheets have their own Menu item on the MODELLING menu. This allows you to add the current modelling set to the aggregate sheets, remove the last asset set added or remove all data sets from the 3 Aggregate sheets. See section 4 below for more details.

4 File Operations

The file has a number of automated program operations, which are accessed from the special Drop Down menu titled **MODELLING**. The Modelling file can be used as a stand-alone modelling tool where you manually place the raw data into the "Data Storage" Sheet. However with the creation of the Moloney 3 file Financial Modelling tool it is most unlikely to be used in this way in the future.

This section will work through the MODELLING Drop down menu and provide an explanation of program operations.

4.1 The MODELLING Drop Down Menu

Located next to the Help Menu on the Excel Menu bar (Excel 97 to 2003 versions) and Within the Add-Ins tab in Office 2007 and later versions is the Moloney MODELLING Menu. The menu has five sub levels as detailed below.

1. Load an asset set (1 – 20) from "Data Storage for Modelling. Level 1
2. Modelling Variables Sheet Level 2
3. Aggregate Sheets Level 3
4. Protection Level 4
5. Data Storage Sheet – Clear Data Level 5

4.1.1 Level 1- Load an Asset set (1 – 20)

This menu item has 20 sub items which allow you to load each of the 20 data sets that are stored within the **"Data Storage"** Sheet into the "**Modelling Variables**" Sheet ready for modelling. See the sections below for how to import the data to the "**Data Storage**" Sheet but once data is present within the sheet this menu level enables you to load one of the 20 data sets ready for modelling.

The "**Data Storage**" Sheet is a holding sheet that contains all of the raw modelling data and also allows you to store each of the 7 modelling variables that are used on the "**Modelling Variables**" Sheet for all 20-asset sets.

This menu operation allows you to switch between any of the 20 asset sets that you have stored and to load all of the necessary modelling data into the modelling sheets.

4.1.2 Level 2- Modelling Variables Sheet

This Menu level accesses the three program operations associated with the "Modelling Variables" Sheet. All three operations can also be accessed via short cut key operations which will probably be the way you end up accessing these programs in the long term as they are frequently used items in the modelling process.

The three items on this menu level are:

1. Update all modelling results following sheet amendments "Ctrl k"
2. Create a Proposed Expenditure Profile "Ctrl j"
3. Copy year 1 Proposed Expenditure in Cell B36 for 50-yaer period "Ctrl d"
4. Increase the Expenditure by the % in Cell G39 Annually "Ctrl i"
5. Transfer Current Modelling Variables to "Data Storage Sheet

Item 1 above updates all of the individual modelling sheets following amendments to any of the 7 modelling variables. Item 2 develops a proposed expenditure profile to meet your desired condition outcome (see section 3.2.9 Above for more details. Item 3 & 4 are provided to assist you with filling in the details of your proposed 50-year capital expenditure profile.

Item 3 duplicates the figure in Cell B36 (Year 1 proposed capital expenditure) for the full 50-yaer period. Item 4 increases the figure within Cell B36 by a designated annual percentage (Cell G39) for the number of years detailed within cell K39. At the end of the designated number of years in cell K39 the program carries the last value for the remainder of the 50-year period.

Item 5 allows you to transfer the modelling variables within the Modelling Variables sheet back to the Data Storage sheet. This would be done if you were happy with some amendments you had made within the sheet and wanted those same variables to come up next time you loaded the asset set from data storage. This can also be done from Button MV1 on the sheet.

4.1.3 Level 3- Aggregate Sheet

This menu level deals with adding and removing data sets from the three aggregate sheets. There are three program options on the menu.

1. Add the current modelling results to the Aggregate Sheets
2. Remove last item from Aggregate sheets
3. Clear all variable data from Aggregate sheets.

These three program options deal with adding and removing the individual modelling results to and from the 3 aggregate sheets.

The 3 aggregate sheets each relate to one of the individual modelling sheets. Each time an individual asset set is modelled the results can be aggregated to the corresponding 3 aggregate sheets. In this way you can model all of your infrastructure assets one at a time and aggregate the results to provide a single report detailing the modelling results for your whole infrastructure asset group.

4.1.4 Level 4- Protection

This menu level has 4 sub levels dealing with the adding and removing of protection to all or a single sheet within the file. See also the short cut keys on the menu for protecting and unprotecting

Ctrl Shift "P" – Protects the active sheet

Ctrl Shift "U" – Un - Protects the active sheet

4.1.5 Level 5- Data Storage sheet – Clear Data

Here you can choose to remove the last data set or all 20 data sets from the Data Storage Sheet

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