

Moloney Asset Management Systems MAMS



Report Following the Survey of
Road Assets
for Southern Mallee District Council
Jul-2015

Report produced by Moloney Asset Management Systems
exclusively for Southern Mallee District Council

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Section 1: Report Summary

This report provides a summary of the major findings following the road asset condition survey, undertaken in Jul-15 for Southern Mallee District Council by Moloney Asset Management Systems MAMS.

This summary aims to provide an overview of the important findings coming out of the survey as well as a snapshot of the overall asset condition and financial Modelling results, it is in three parts as detailed below.

- 1.1 Overall Report Findings
- 1.2 Summary of Asset Condition Findings
- 1.3 Summary of financial Modelling results

1.1 Overall Report Findings

The following are the major findings coming out of the condition survey and analysis of results within this report.

1.1.1 Major Report Findings

1. *Southern Mallee District Council has managed its road assets well since the last condition survey in 2010 with a strong condition improvement on the rubble roads, but the sealed roads have declined quite measurably.*
2. *The total present renewal shortfall or backlog in over intervention assets for the whole roads group is estimated at \$2,894,644 representing 5.24% of the total road asset valuation. This is considered to be at the upper end of the desirable range and should not be permitted to rise further.*
3. *The planned renewal expenditure level of \$887,000 pa is considered to be at an appropriate total level for the next 20-years provided additional funding is made available to counter affect of inflation.*
4. *Southern Mallee is one of only a hand full of councils that we have analysed in recent years where the planned average renewal expenditure over the next 10-years is considered to be at an appropriate total level.*
5. *The Unsealed or rubble road pavement assets were found to be in very good overall condition and had experienced a quite measurable condition improvement since 2010. Funding may need to be lowered on this asset class in future years and redirected to areas of greater need.*
6. *The sealed road pavements were found to be in good overall condition but had declined in condition quite measurable since the last survey. With a zero level of renewal expenditure over the last 5-years asset decline is to be expected and funding does need to be lifted.*
7. *The sealed surface assets (Reseals) were found to be in very poor condition with a massive condition decline recorded since 2010. Funding needs to be lifted urgently*
8. *Kerb assets were found to be in very poor overall condition with a heavy condition decline recorded since 2010. Funding needs to be lifted in the longer term but this is not as urgent as the sealed surfaces.*
9. *The footpath assets were found to be in fair to poor overall condition and had experienced an overall condition improvement since 2010. The assets are currently being funded at what is considered to be an appropriate total level.*
10. *The resheeting of the unsealed (rubble) roads does appear to have a high priority within the Council budget. But this report along with the last one in 2010 has concluded that council is putting out pavement material on the network at a faster rate than it is being lost. Average pavement depth in 2007 was 110 mm, in 2010 it was 119 mm and in 2015 it was 128 mm. Over the same period the sealed road network has suffered a heavy condition decline and consideration needs to be given to a shift in funding priority for 3-5 years*

11. *The road assets within Southern Mallee District Council as a total road group remain in good overall condition but the sealed roads and the kerb assets do need additional funding either from an increased total pool or the shifting of funding priorities within the road sub asset classes.*

1.1.2 Other Important matters covered within the report

1. *Unique degradation curves have been produced based on actual condition change between the 5 surveys in 2001 and 2015.*
2. *Key performance indicators have been developed at a sub asset level that accurately quantify asset condition change since the 2010 survey*
3. *The same key performance indicators have been used to benchmark Southern Mallee District Council against the other 59 councils assessed by MAMS.*

1.2 Summary of Asset Condition Findings

SUB ASSET DESCRIPTION	Overall Condition Change	Comments
Sealed Pavements	Worse	All indicators have declined in condition
Sealed Surfaces	Worse	All indicators have declined in condition
Unsealed Pavements	Better	Very strong improvement in overall condition
Kerbs	Worse	Strong decline in all Condition Indicators
Footpaths	Better	Strong improvement in overall condition

Figure 1.1 Summary of asset condition change between surveys

The above table provide a very simple assessment of how asset condition has changed since the time of the last condition survey. For a far more detailed assessment please refer to the series 2 figures within each of the sub asset sections below commencing at Section 5.

Results within Figure 1.1 are a little mixed with improvements to the unsealed or rubble roads as well as the footpaths, but strong condition declines in all other areas.

1.3 Summary of financial modelling results at whole of roads group level

The Moloney financial modelling tool has two distinct modelling paths. One predicts future renewal demand based on a desired condition outcome, the other predicts future asset condition based on a proposed renewal spend.

Reporting within this section and more broadly within this report will deliver the following outcomes.

- Figure 1.1 Prediction of renewal expenditure demand to maintain all assets strictly within a desired condition range (Ideal funding pattern if there is no limit on funding)
- Figure 1.2 Prediction of future asset condition based on the continuation of the current levels of renewal expenditure (Where you will be, if you maintain the current funding levels)
- Figure 1.3 Prediction of future asset condition based upon a recommended renewal funding pattern (gets to the desired condition over a longer period and costs less up front)

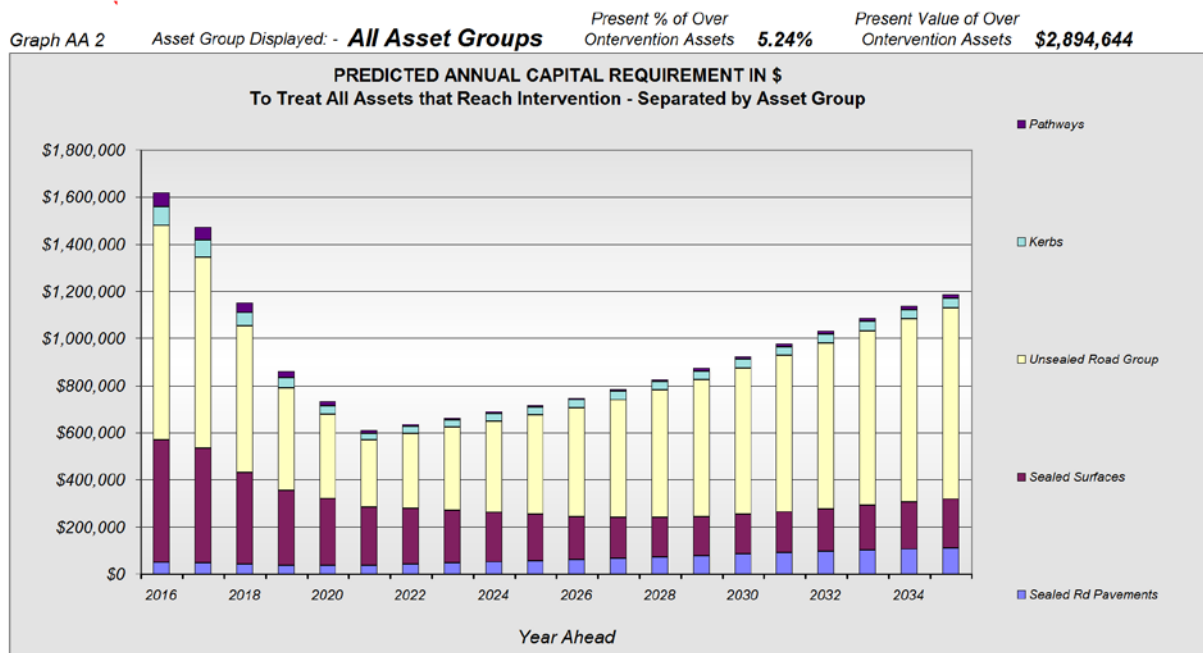


Figure 1.1 Predicted Renewal Demand to treat all assets that reach the Intervention level in future years

Figure 1.1 Represents the cost to treat all over intervention assets within 5-years with the bulk of them treated within the first 2 years. This scenario can results in very high early renewal demand if there is an existing backlog of poor condition assets and is frequently a demand pattern that simply could not be funded.

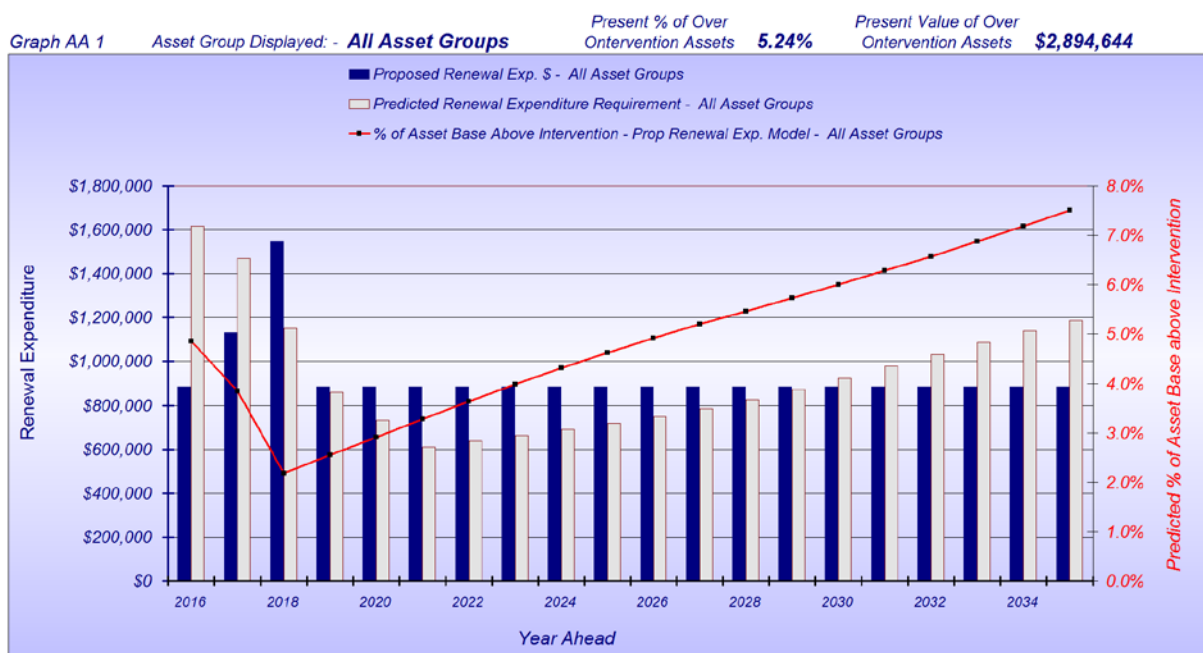


Figure 1.2 Future Predicted Condition Based on Continuation of Present Renewal Expenditure

Figure 1.2 presents the predicted future asset condition (red line expressed as the predicted % of the asset base above the selected intervention level) based on the continuation of the current level of renewal expenditure (Blue Bars). The grey bars represent the required expenditure profile to treat all assets that reach intervention (same total figures as Figure 1.1).

The present extent of over intervention assets (backlog) on the whole roads group is estimated at \$2,894,644, which represents 5.24% of the network. This is a high figure by industry standards and should not be permitted to rise further.

Figure 1.2 indicates that the planned renewal funding program over the next 20 - years will result in a steady rise in the extent of over intervention assets within the whole roads group. However, this is more a result of holding the present funding split between the road sub asset sets over that period than the

adequacy of the total funding level. The higher levels of renewal funding within years 2017 and 2018 relate to the additional road to recovery funding that is due within those two years.

Figure 1.3 below uses the Moloney model to better allocate the total funding level, based on demand and delivers a better condition outcome. Note that in years 2017 and 2018 there is a combined \$900,000 additional roads to recovery allocation that has been allocated between the sealed surfaces and the unsealed road pavements as per the councils plan. The \$900,000 was simply added to modelling results within figure 1.3 after it had been run to reduce the present extent of over intervention assets to 30% of the present level of 5.24%. It resulted in a further reduction of around 0.6% after 20-Years to 1.0% of over intervention assets.

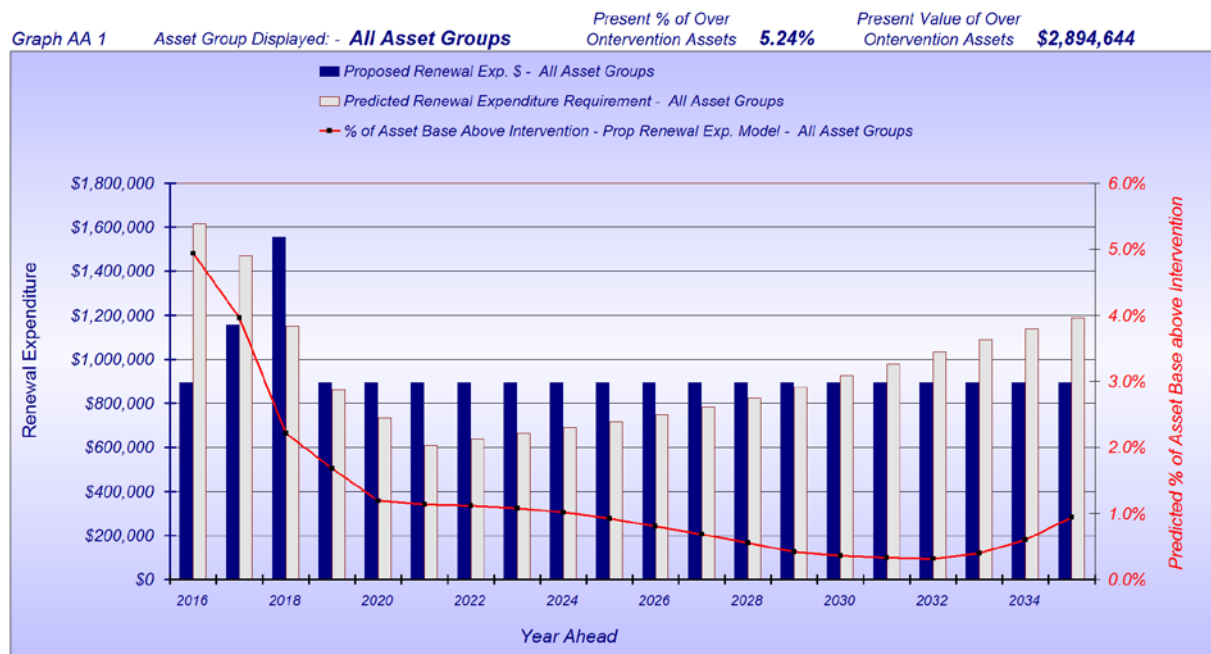


Figure 1.3 Recommended future funding profile with future predicted extent of over intervention assets

Figure 1.3 comes from the same modelling process as Figure 1.2. Accept that here a recommended total renewal expenditure profile has been developed that will achieve a desired condition outcome within a designated period of time.

The Moloney financial modelling software has the capacity to develop a recommended renewal funding profile that will deliver a nominated extent of the asset base to be over the selected intervention level within a selected time frame. A global outcome can be set for the whole roads group. In this way the model is used to allocate funding based on need rather than the historic expenditure level. There are 3 variables that are input and in most cases the same 3 variables are used for all of the road sub assets, however this can be varies between sub asset sets if required.

We normally attempt to commence the year one expenditure with council's present expenditure level (at a whole of roads group level). In this way we can deliver an achievable outcome. If additional funding is required then it will come as an annual percentage increase. If total funding is sufficient then there may be some reallocation between asset classes based on need.

The three Variables used for the full roads group modelling are as detailed below:

- Desired extent of over intervention assets - 30% of present level of - 5.24%
- Time to achieve this - 20 - Years
- Annual percentage increase in renewal expenditure - 0%

Figure 1.3 represents the minimum annual renewal expenditure to achieve the desired condition outcome within a nominated time frame. This modelling approach is designed to deliver an achievable outcome that accepts a small percentage of over intervention assets as remaining and hence often delivers far lower expenditure profiles than Figure 1.1 where all over intervention assets have to be treated.

Figure 1.3 indicates that council's present average present renewal expenditure level of \$887,000 pa if maintained for the next 20-years will result in a 70% reduction in the total level of over intervention assets. Note also that in years 2 and 3 the planned expenditure within figure 1.2 has a total additional sum of

\$900,000 from the roads to recovery pool. With this factored into Figure 1.3 as an additional expenditure the predicted level of over intervention assets after 20-years is further reduced by an additional 0.6%.

The roads to recovery additional funding has been treated as a bonus that will deliver a better outcome, rather than a means of reducing the council effort. This is in line with the spirit of the federal allocation.

1.5 Recommended Renewal Funding levels for the next 5 - Years

Figure 1.4 below contains 3 sets of figures relating to renewal expenditure levels for the asset sets under consideration. The first covers the present actual renewal expenditure as committed by Council for the current financial year. The second is the full-required expenditure to treat all assets that are at the selected intervention level in year 1 (the ideal scenario). The third is the recommended funding level coming out of the year 2 value within figure 1.3 above (without the actual boost in renewal expenditure that has already occurred).

The recommended expenditure profile in Figure 1.3 may not treat all present over intervention assets within the first 2 – 5 years as is the case with Figure 1.1. But what it will do is allow you to reach a desired extent of the asset base to be above intervention within a selected time frame. In this way it can ease in and ramp up expenditure into the future, to achieve the desired goal within a reasonable time frame.

In this case the total present funding level was found to be at an appropriate overall level and the model reallocated funding between the road sub asset classes based on need, with the result being the same total expenditure level as planned but with better overall condition outcome.

Note:

- 1. That all modelling has been undertaken in today's dollars and that it will be necessary to lift the recommended annual expenditure to cover the additional costs resulting from inflation.*
- 2. That the average planned renewal expenditure over the next 5-years at \$1,066,000 includes and additional \$900,000 over two years coming in as additional road to recovery expenditure. With this figure removed the average planned expenditure would be the same as the recommended funding level of \$887,000.*
- 3. The additional \$900,000 in roads to recovery will provide a strong early boost and is predicted to improve the overall outcome after 20-years by a further reduction in the extent of over intervention assets of 0.6%.*

Sub Asset Description	Average Planned renewal expenditure next 5 Years	Annual Depreciation or Average Long term Annual Demand	Present Capital Renewal Demand From Modelling	Peak Capital Renewal Demand From Modelling	Year of Predicted Peak Demand	Recommended Average Funding level for the next 5-years
Sealed Pavements	\$0	\$215,398	\$50,000	\$112,000	2035	\$75,000
Sealed Surfaces	\$201,000	\$250,635	\$520,000	\$520,000	2016	\$215,000
Unsealed Pavements	\$845,000	\$860,530	\$910,000	\$910,000	2016	\$537,000
Kerbs	\$0	\$59,088	\$80,000	\$80,000	2016	\$38,000
Footpaths	\$20,000	\$31,765	\$59,000	\$59,000	2016	\$22,000
Totals	\$1,066,000	\$1,417,416	\$1,619,000	\$1,618,000	2016	\$887,000

Figure 1.4 Recommended Annual Renewal Expenditure levels

Section 2: Introduction

2.1 The Condition Survey and what it has delivered

The Moloney Asset Management system “Roads Module” covers the road sub asset groups of:

- Sealed Surfaces
- Sealed Road Pavements
- Kerbs
- Unsealed Road Pavements
- Footpaths

The sealed surface is the thin spray sealed or asphalt surfacing that seals off the underlying pavement from the intrusion of water. This component has a shorter life than the underlying pavement and typically would need to be renewed on a 12 to 20 years cycle.

The sealed road pavement is made up of a granular material (crushed rock, gravel or the like) that is used to dissipate the imposed vehicle load to the underlying soil so that there is little or no deformation or movement. Pavements do break down and move with time and typically their service life would be in the 50 to 150 year range.

Kerbs in urban areas are used to drain water away from the pavement and tend to have a life similar to the sealed pavement.

The unsealed road pavement performs the same role as the sealed pavement. Except that it does not have the additional protection of a sealed surface. Its renewal life is shorter than the sealed pavement and typically would have a cycle of 15 to 30 years.

Footpath assets are not really related to the road pavement and can be seen as pavements for foot traffic. Their life will vary greatly and can be quite extensive if localised failures are repaired as they occur.

As can be seen from the above very brief descriptions, the adopted road sub asset components all have different lives and performance requirements, this is why they are examined and modelled separately.

This survey has covered all of the above road sub asset groups.

The condition survey involves the measurement and quantifying of all of the above sub asset groups and the breaking down of the assets into a series of like performing segments that are then individually condition rated.

Once this data is placed within the MAMS System the software will deliver works programs in priority order, based upon both the condition of the assets and the hierarchy or relative importance of the road. If data for all of the designated condition and inventory fields is collected, then the software will deliver a costed priority works program for the following activities.

- Reseal – Resurfacing program on sealed roads.
- Sealed Road Pavement Rehabilitation program
- Sealed Road Pavement Major Patching or dig out repair program
- Unsealed Road Re-Sheeting program.
- Unsealed road spot patching program.
- Kerb Renewal program and a separate Isolated failure repair program.
- Footpath Renewal program and a separate Isolated failure repair program.
- A host of other major maintenance reports such as crack sealing report, edge break report etc.

The prime purpose of the condition assessment survey is to deliver the above works programs. But the information collected also serves further very important functions. Firstly it enables full and accurate asset valuations to be undertaken and secondly via the MAMS financial modelling software the data can be used to predict the future pattern of asset renewal demand.

The data is also used to benchmark an individual council's performance between two condition surveys as well as providing industry wide benchmarking against all other councils assessed by MAMS (*Currently around 52 councils*).

In summary the one condition and inventory data set that has just been completed, delivers the following 4 very important outcomes.

- **Council's capital renewal works and major maintenance programs.**
- **Road asset valuation figures.**
- **Predictive modelling of future renewal demand cost.**
- **Internal and External benchmarking of asset condition and performance.**

2.2 The Aim of this report

While the condition assessment survey delivers detailed condition ratings right down to individual segment level, this report is aimed at a higher level and tracks the performance of the roads on a network basis.

This report will focus on the last 3 of the above 4 dot points. For access to the detailed works programs you are referred back to the reports within the MAMS software itself.

In more specific terms the aim of this report is to deliver the following.

- Benchmark asset condition both internally (compared to a previous condition survey) and externally (compared to all other councils assessed by MAMS).
- Deliver asset valuation figures including annual depreciation for the whole network.
- Produce asset degradation curves based upon the statistical analysis of condition change between two condition surveys.
- Deliver a 20-year predicted pattern of asset renewal demand and recommended funding levels using the MAMS financial modelling software in conjunction with the survey results.

2.3 The Moloney Financial Model

Predictive modelling is undertaken within the Moloney financial modelling software in the following way

- It is a whole of asset set model that predicts overall performance of the asset set
- The model commences with the present condition of the assets and then degrades them to simulate the passage of time based on a unique degradation curve developed for each council
- From this point there are two distinct modelling paths
- A retreatment intervention condition is nominated (level of service) within the first path and all assets that rise above the intervention level through the degradation process are returned as a capital renewal requirement. The primary output being a 20-year capital renewal profile.
- In the second path proposed 20-year capital renewal expenditure profile is input and the model predicts the resulting asset condition over the same period.

For a detailed explanation of the model and how it works please refer to our web site at www.moloneys.com.au and from the "Get Information" tab download the PDF document titled "The Moloney Financial Modelling Methodology".

Modelling outcome is very much dependent upon the accuracy of the input data and how assets are grouped. The basic five input criteria required for the modelling process are detailed below with their source identified. Council has supplied the rehabilitation unit rates and present expenditure levels. The survey of the assets has delivered the other variables.

The degradation curves used in the Modelling process within this report have been specifically developed for Southern Mallee District Council via a statistical analysis of asset condition change within 5 condition surveys over the last 14 years.

Rehabilitation Cost	—	Supplied by Council
Present Expenditure Levels	—	Supplied by Council

Asset Quantity	—	Directly from this survey
Asset Condition	—	Directly from this survey
Degradation Curves	—	Unique Degradation curves developed by MAMS

Modelling outcome is dependent upon all 5 of the above variables. If any one is of poor or questionable quality then the whole process can be flawed.

2.3.1 Asset Unit Renewal rates

The asset unit renewal rates used within the modelling sections of this report are all based upon the projected cost to renew or rehabilitate an existing asset. Section 3 of the report dealing with asset valuations, uses unit construction rates based upon (green fields construction) or construction for the first time where no asset previously existed. This is an accounting requirement for valuations, but if those same unit rates were to be used in the future financial modelling of the assets the projected renewal demand could be quite misleading.

2.4 Capital Rehabilitation - Renewal and Capital Expansion Works

The term **Capital Expenditure** has a broad meaning that can denote different things under certain circumstances. For the purpose of this report all **Capital Expenditure** relates to Renewal or **Capital Rehabilitation Expenditure**. That is, expenditure put towards the replacement or rehabilitation of existing assets.

This report is limited in its financial analysis to the costs associated with the ongoing cyclical rehabilitation of the existing road asset base. Costs associated with new or upgraded assets would need to be added to the total expenditure levels delivered within the report. The financial analyses undertaken within the report can best be seen as an estimate of the ongoing financial demand to maintain the present asset base in perpetuity.

Section 3: Valuations and Current Expenditure Levels

This section will examine the overall asset valuations and the current level of capital-renewal and maintenance expenditure.

3.1 Estimated Asset Valuations

Following the completion of the survey the data was placed into the Moloney asset management system and the table below represents a summary of the overall asset quantities and valuations. The Annual Depreciation figure of \$1,417,416 is really an accounting figure and may vary from the actual annual renewal demand or what we term the Annual Renewal Liability. Annual Depreciation represents the first attempt to define the annual loss in capital value within the asset set. At its most basic level it represents the rate of annual capital consumption of the asset base.

ASSET DESCRIPTION	Total Quantity	Units	Weighted Av. Asset Cond.	Replace. Value \$	Asset Life in Years	Written Down Value \$	Accumul. Deprec. \$	Annual Deprec. \$
Footpath	13,266	Lin. Met	3.130	1,051,730	28.8	722,514	329,216	31,765
Kerb	30,310	Lin. Met	4.624	3,334,100	59.5	1,792,472	1,541,628	59,088
Sealed Pavements	118,501	Lin. Met	3.731	16,532,583	90.9	10,363,670	6,168,913	215,398
Unsealed Pavement	883,251	Lin. Met	2.013	30,118,542	44.1	24,055,818	6,062,723	860,530
Sealed Surface	118,501	Lin. Met	5.508	5,109,188	19.6	2,294,856	2,814,332	250,635
TOTAL VALUATIONS				56,146,142		39,229,330	16,916,812	1,417,416

Figure 3.1 Table of asset valuations

Important Note:

The asset valuations detailed above are based upon the best available information at the time of preparing this report. Before they are adopted for accounting purposes council MUST check the inputs and assumptions to ensure that the results are consistent with their approach to the valuation of road assets.

3.2 Current Levels of Renewal Expenditure vs. Av Long-term Demand

Sub Asset Description	Average Planned renewal expenditure next 5 Years	Annual Depreciation or Average Long term Annual Demand	% of Annual Depreciation Being Met
Sealed Pavements	\$0	\$215,398	0%
Sealed Surface	\$201,000	\$250,635	80%
Unsealed Pavement	\$845,000	\$860,530	98%
Kerbs	\$0	\$59,088	0%
Footpaths	\$20,000	\$31,765	63%
Totals	\$1,066,000	\$1,417,416	75%

Figure 3.2 Details of Current Expenditure Levels and demand

Figure 3.2 provides some very important overall figures. It indicates that the average long-term annual renewal demand (depreciation) is \$1,417,416 pa and that the present capital renewal expenditure is \$1,066,000 pa

Council is funding around 75% of the average long-term demand (Depreciation) or consumption rate. Modelling in later sections of the report will determine if the current level of expenditure is meeting present renewal demand.

Section 4: Asset Degradation – Performance Curves

Asset degradation or performance curves, unique to the district, can be developed once two or more consistent condition surveys have been undertaken. This is done in the Moloney system by examining all assets within a given condition rating following the first survey and determining which have degraded by the time of the second survey.

The condition change between surveys is used to predict the annual statistical probability of an asset degrading from one asset condition to the next. In turn this equates to an expected average life within each condition rating. The degradation curves serve two very important functions. Firstly they are used within the financial Modelling section of the Moloney system to predict future asset condition movement and financial demand. Secondly they should form the basis of the justification for the selection of depreciation life cycles within the accounting system.

Within the asset degradation tables below the results are expressed as an expected life in years within each of the condition ratings 0 to 9. Little or no asset life is allocated above condition 8 as this is generally considered the upper condition limit for an asset to remain in service. The other important information within the table is the **% of total asset base within the start condition**. That is, the % of the total asset base that was within the commencing condition range at the time of the first survey, the higher the figure here, the more reliable the prediction.

Figures sometimes need to be manually adjusted to remove inconsistencies resulting from small sample size at the extreme ends of the condition range. In all cases the total expected life will be reduced because of the small sample size. In no situations will the total life be increased other than the rare case where there is no asset within a given condition or no asset within a condition range has degraded between the two surveys.

4.1 Degradation Curves as developed by MAMS

Degradation curves were produced for Southern Mallee District Council by analysing the change in asset condition within the 5 condition surveys over the last 14 years.

Asset Condition Range	Urban Sealed Rd Pavements 2007 - 2015	Rural Sealed Rd Pavements 2001 - 2015	Urban Sealed Rd Pavements 2001 - 2015	Rural Sealed Rd Pavements 2007 - 2015	Rural Sealed Rd Pavements 2004 - 2015
9 - 10	2.0	2.0	2.0	2.0	1.0
8 - 9	10.0	5.0	8.0	4.0	5.0
7 - 8	15.0	15.0	10.0	7.0	8.0
6 - 7	35.2	20.0	25.0	7.9	20.0
5 - 6	27.0	18.0	35.0	13.3	18.7
4 - 5	31.6	15.2	22.2	16.5	12.7
3 - 4	12.3	8.6	17.4	20.0	12.1
2 - 3	11.9	7.0	11.8	20.0	6.8
1 - 2	3.8	5.8	5.7	2.0	8.5
0 - 1	2.0	3.0	4.8	2.0	4.0
	150.8	99.5	141.9	94.7	96.8

Figure 4.1 Road Pavement Degradation Rates – Expected life within each condition rating in Years

The sealed road pavement assets were found to have a total life to condition 10 of around 150 years in the township areas and 95 years in the rural areas.

The total life illustrated in all of the tables within this section is the life to condition 10. In practice you will often intervene and rehabilitate before reaching condition 10. The total life is input into the financial model and the life to the selected intervention level will be less than that figure depending upon where you choose to intervene.

If you choose a low intervention level (High level of service) then your life to intervention can be very much lower than the total life to Condition 10. Think of the car tyre analogy down to the indicator lugs at, 40,000 km. fully worn through, 70,000 km.

Asset Condition Range	All Sealed Surfaces 2010 - 2015	All Sealed Surfaces 2007 - 2015	All Sealed Surfaces 2007 - 2010
9 - 10	0.0	0.0	0.0
8 - 9	1.0	2.0	2.0
7 - 8	3.0	3.0	3.0
6 - 7	4.5	4.0	6.1
5 - 6	3.2	4.4	3.6
4 - 5	2.7	3.1	3.3
3 - 4	2.8	3.4	3.2
2 - 3	2.7	2.9	2.4
1 - 2	2.1	2.3	1.8
0 - 1	1.6	1.7	1.4
	23.5	26.7	26.8

Figure 4.2 Sealed Surface Degradation Rates – Expected life within each condition rating in Years

The spray seal results here are very much in line with what we have observed in other districts. The ideal retreatment intervention level for a spray seal is around 6.2 so service life will be much less than the full life to condition 10.

Asset Condition Range	All Unsealed Roads 2007 - 2010	All Unsealed Roads 2004 - 2015	All Unsealed Roads 2001 - 2015	All Unsealed Roads 2004 - 2010	All Unsealed Roads 2001 - 2010
9 - 10	1.0	0.0	0.0	0.0	0.0
8 - 9	3.0	2.0	1.0	3.0	2.0
7 - 8	5.0	4.0	1.0	3.0	3.0
6 - 7	5.9	6.0	3.0	4.0	6.3
5 - 6	5.9	7.0	7.0	7.3	7.0
4 - 5	6.5	8.0	8.0	7.5	7.0
3 - 4	7.0	9.0	8.0	9.5	6.8
2 - 3	7.8	8.0	10.6	8.2	7.0
1 - 2	9.4	8.0	12.4	9.6	8.7
0 - 1	7.2	6.0	8.0	6.9	7.0
	58.8	58.0	59.0	59.0	54.9

Figure 4.3 Un sealed Pavement Degradation Rates – Expected life within each condition rating in Years

The unsealed pavement degradation curves are at the upper end of the range we have developed for other councils with a total life to condition 10 of around 58-years. But intervention levels can be quite low on these assets and the service life would be expected to be within the 25 - 40 year range.

Asset Condition Range	All Kerbs 2001 - 2015	All Kerbs 2007 - 2010	All Kerbs 2007 - 2015	All Kerbs 2004 - 2010	All Kerbs 2001 - 2010
9 - 10	5.0	2.0	2.0	0.0	0.0
8 - 9	10.0	4.0	8.0	5.0	5.0
7 - 8	20.0	10.0	12.0	15.0	20.0
6 - 7	15.0	15.0	14.2	21.0	22.4
5 - 6	15.0	20.0	18.0	20.0	25.0
4 - 5	15.0	20.0	22.4	20.0	25.0
3 - 4	10.0	15.0	22.0	14.3	23.6
2 - 3	9.8	15.0	20.0	32.7	21.2
1 - 2	8.0	10.4	17.7	6.1	9.2
0 - 1	6.0	4.8	6.8	5.5	7.2
	113.8	116.2	143.1	139.6	158.6

Figure 4.4 Kerb Degradation Curves – Expected life within each condition rating in Years

Asset Condition Range	Concrete Pathways 2007 - 2010	Concrete Footpaths 2010 - 2015
9 - 10	0.0	1.0
8 - 9	2.0	2.0
7 - 8	5.0	5.0
6 - 7	10.0	8.0
5 - 6	9.0	9.0
4 - 5	11.0	10.0
3 - 4	15.0	15.0
2 - 3	16.1	16.0
1 - 2	10.0	10.0
0 - 1	10.0	6.0
	88.1	82.0

Figure 4.5 Pathways Degradation Curves – Expected life within each condition rating in Years

The kerb assets are closely aligned to the results found for the sealed road pavements and the footpath assets are broadly in line with what we have developed for other councils.

This is the fifth survey undertaken by MAMS for all assets and as such the degradation curves are now considered to be quite strong and reliable.

4.2 Benefit of Unique Degradation Curves

The unique degradation curves developed via an analysis of condition change between surveys takes all variables into account to deliver a condition performance profile based upon the actual council locality. It is then used within the Moloney model to predict future condition change with time and greatly enhances the overall financial Modelling outcome.

Section 5: Sealed Road Pavement Asset Analysis

This section will deal with the Sealed Road Pavement assets. The first two figures below relate to asset condition and how condition has changed since the last survey while the third provides a condition comparison with other council districts surveyed by Moloney.

5.1 Condition and Performance Indicators for Sealed Road Pavements

MAMS have developed a series of 6 key condition indicators that can be applied to all road sub asset sets. They are used to measure condition movement between field surveys some years apart. They are also used to benchmark against other council districts assessed on the same basis.

The same key condition indicators are used for all road asset groups. However for some asset classes certain indicators are not applicable and as such are omitted. Detailed below is a brief explanation of the 6 key indicators. The explanation is also applicable to their use with other road sub asset sets other than the sealed road pavements.

5.1.1 Weighted Average Asset Condition

The weighted average asset condition is a single condition indicator that represents the whole condition distribution in one figure. It is derived by weighting the raw asset condition scale 0 - 10 for the extent of asset within each condition and so provides a basic single figure summary of the overall condition of the asset set and is very useful as a condition movement indicator.

5.1.2 Percentage of Urgent Failures

The percentage of urgent failures is a measure of the isolated failures identified in the survey as needing immediate repair. It is expressed as a percentage of the total asset group quantity.

5.1.3 Percentage of Other Failures

The percentage of other failures represents those isolated failures, which while present on the ground do not require urgent attention. The figure is again expressed as a percentage of the total asset quantity.

5.1.4 Average Roughness

Average roughness is only relevant to pavement assets and for sealed road pavements is a key capital condition indicator of longitudinal pavement shape, while for unsealed pavements is a key maintenance indicator. It is based on a 0 – 10 scale with 0 being perfect and 10 un-driveable.

5.1.5 Average Profile

Average pavement profile is similar to the roughness rating and can be seen as the pavement cross sectional shape indicator while roughness is the longitudinal pavement shape indicator. It is based on a 0 – 10 scale with 0 being perfect and 10 un-driveable.

5.1.6 Extent of Poor Condition Assets above a given Condition

The percentage of the asset base at and above a given condition rating is a very good way of expressing the extent of poor condition assets present. This figure is expressed as a percentage of the total asset base and is reported at several different condition levels from condition 5 to 8 depending upon the asset set in question. For example sealed road pavements at and above condition 7 would represent the extent of the asset base that would be likely to require rehabilitation over the next 3 – 5 years.

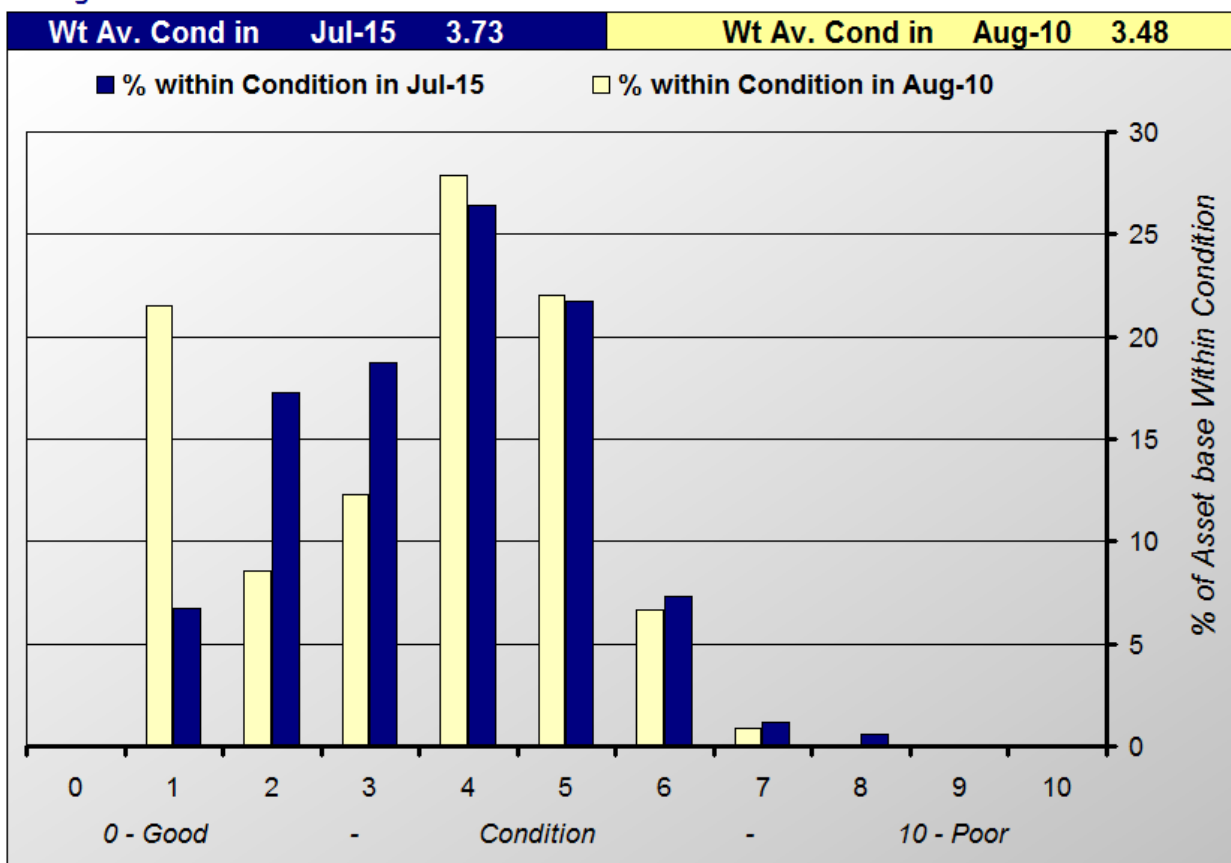
Change in Cond. Distribution for **Sealed Pavement**

Figure P1 Condition Distribution Comparison Graph – Between Surveys

Key Cond. Indic. No.	Sealed Pavement Condition Indicator	Figures from Last Survey in Aug-10	Figures from Current Survey in Jul-15	Change between Surveys New Minus Old	% Change Between Surveys	Better or Worse Since last Survey
1	Weighted Average Asset Condition	3.48	3.73	-0.245	-7.0%	Worse
2	% of Urgent Failures	0.20	0.55	-0.349	-173.1%	Worse
3	% of Other Failures	1.95	2.17	-0.217	-11.1%	Worse
4	Average Pavement Roughness	3.51	3.53	-0.018	-0.5%	Worse
5	Average Pavement Profile	3.22	3.43	-0.207	-6.4%	Worse
6	% of Asset Base above Condition 6	7.59	9.05	-1.468	-19.4%	Worse
7	% of Asset Base above Condition 7	0.91	1.76	-0.848	-92.8%	Worse
8	% of Asset Base above Condition 8	0.00	0.57	-0.569	100.0%	Worse
Renewal Demand Being Met For:		% of Long Term Demand Being Met				
Sealed Rd Pavement Asset Group		0.0%				

Figure P2 Table of Key Condition Indicator Change since the last Survey

The above 2 figures provide details of how the sealed road pavement asset condition has changed since the last survey. Figure P1 details the condition distribution for each survey along with the first of the key indicators the “weighted average asset condition”.

Figure P2 contains the eight key condition indicators and also shows how they have changed since the previous survey. At the bottom of the table are two very important figures. These indicate the percentage of the present renewal demand (from Modelling) and annual depreciation being met.

The % of the long-term average demand being met is simply the ratio of present renewal expenditure to your depreciation figure for the asset class. The % of the present renewal demand being met is the ratio of your present renewal expenditure to the present renewal demand predicted within the model later in this same section. If these percentages are low then a decline in overall asset condition would be expected.

The key performance indicators in Figure P2 indicate that all indicators have declined quite measurably since the last survey in 2010. Given that the rate of renewal expenditure has been at zero over this period, the condition decline this should come as no surprise.

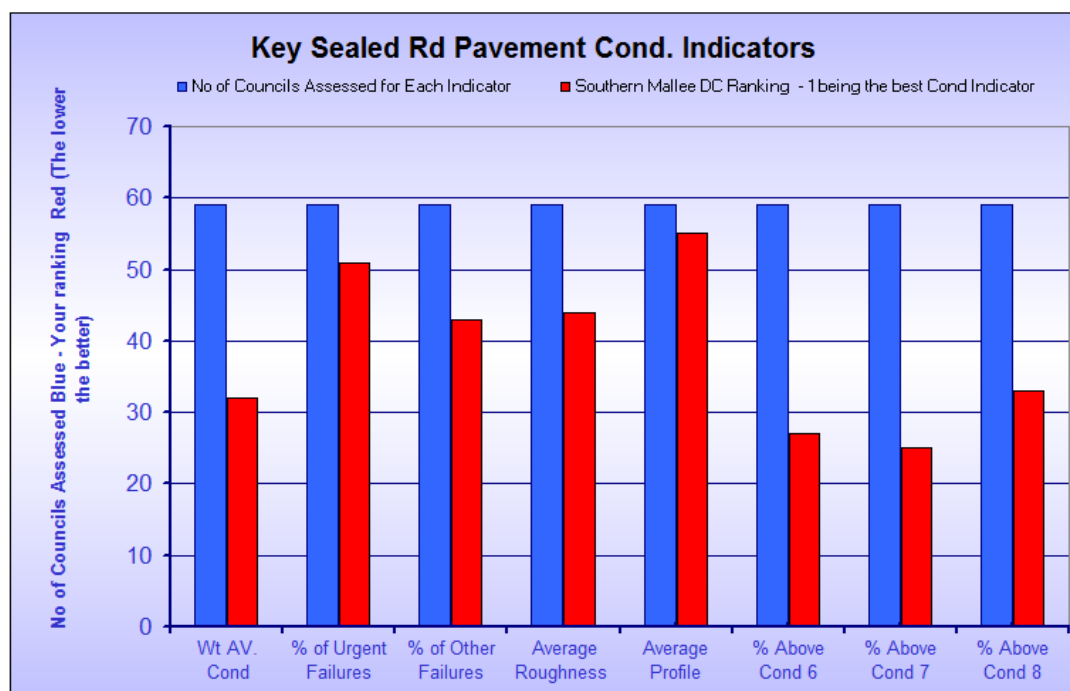


Figure P3 Key Condition Indicators as Compared with other Councils surveyed

The same key condition indicators can be used to benchmark Council against all other council districts assessed by MAMS. The graph ranks the key condition indicators against those of all other councils assessed by MAMS. The lower the red bar the better the condition indicator. The blue bars represent the total number of councils assessed. The red bar at 1 equates to the best condition indicator encountered. The red bar level with the blue, represents the worst condition indicator.

The comparison with other councils in Figure P3 indicates that council's sealed road pavements are in good overall condition but there is an elevated extent of localised pavement failures which have also increased strongly since 2010 as indicated by condition indicator 2 in Figure P2 above.





5.2 Sealed Road Pavement Financial Modelling Analysis

The Sealed road pavement assets will normally be modelled in three groups with the results aggregated here in one presentation. The table below contains a list of the basic Modelling parameters used. Note that the useable life is the life to intervention, an asset should not remain in service after that point.

5.2.1 Sealed Road Pavement – Selection of Re-treatment Intervention Level

The point at which you choose to intervene to renew or replace an asset will have a big impact in the predicted future renewal demand. The intervention level can be seen as the level of service associated with the asset set. High intervention level equates to low level of service while low intervention level relates to a high level of service.

Detailed below are a series of photographs illustrating various sealed road pavement condition ratings. They do not cover the complete condition range but hopefully will provide some guidance to the selection of an acceptable re-treatment intervention level.

	
Condition 0 – 1 No Failures no Shape loss	Condition 6 Moderate failures and shape loss
	
Condition 7 Ext Shape loss and Failures	Condition 8 – 9 Bad Shape loss and Ext Failures

It is very difficult to cover pavement condition in such a limited range of photographs but hopefully they will provide some idea of asset condition in the 7 – 9 condition range where most interventions will take place. Pavements can be within this condition range for a number of different reasons and the photos will cover only a limited range of these situations. They should be considered as a typical situation and not the only situation for that condition rating.

5.2.2 Sealed Road Pavement Financial Modeling

Modelling Parameter	Urban Sealed Rd Pavements	Rural Sealed Rd Pavements
Asset Quantity in sqm	220,414	687,263
Unit Renewal Rate	\$22.00	\$17.00
Total Asset Group Renewal Cost	\$4,849,108	\$11,683,471
Annual Renewal Exp.	\$0	\$0
Annual Maintenance Exp.	\$0	\$0
Retreat. Intervention Condition	8.0	8.0
Life to Condition 10 in Years	125.0	85.0
Life in years to Intervention	115.1	79.0

Figure P4 A – Summary of Modelling Input Parameters for sealed pavement assets

Sealed road pavement modelling has been undertaken within 2 categories as detailed in P4 A above.

Retreatment intervention levels have been set to reflect the current level of service and life cycles have been set at what are considered to be reasonable, but not optimistic lives and are based on the results from the degradation curves within section 4.

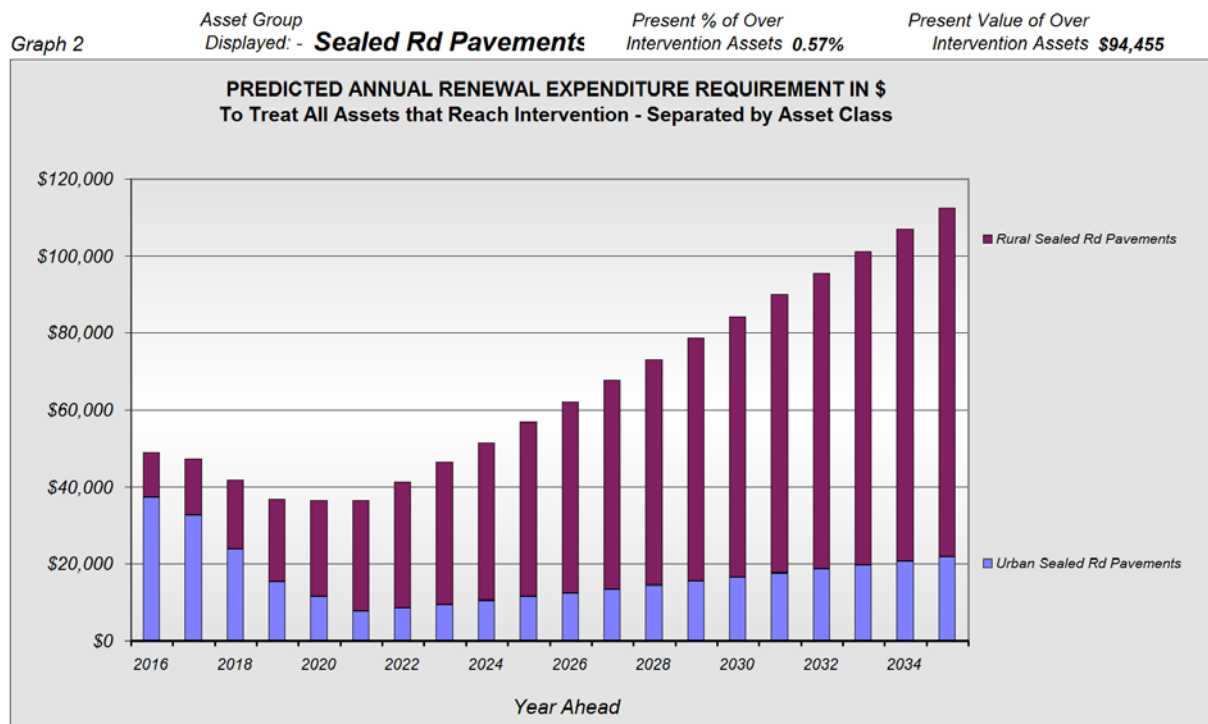


Figure P4 Predicted Renewal Demand to treat all assets that reach the Intervention level in future years

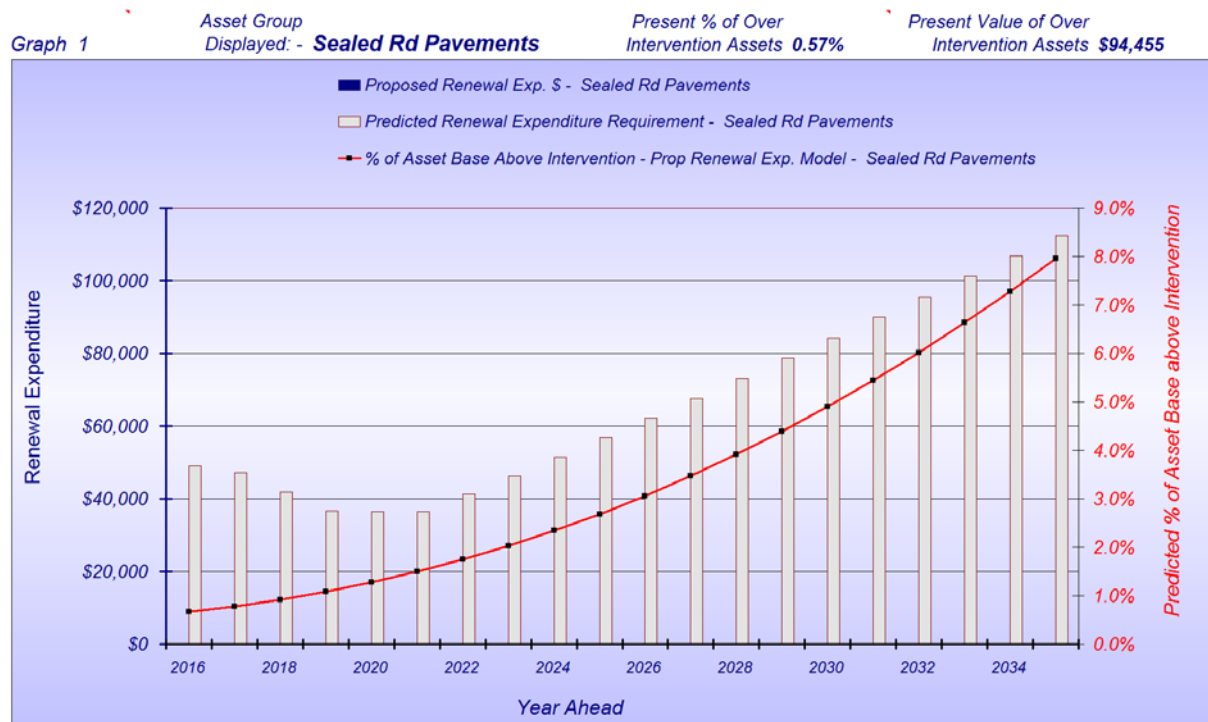


Figure P5 Future Predicted Condition Based on planned expenditure profile

Figures P4 provides a profile of the predicted renewal demand to treat all assets that reach the adopted retreatment intervention level through the degradation process. Figure P5 plots the extent of the asset base that is predicted to rise above the intervention level based upon the continuation of the present level of renewal expenditure (in blue bars). It also plots the predicted renewal demand within the grey bars.

Renewal demand is presently sitting at around \$50,000 pa with the peak demand over the next 20-years estimated at \$112,000 pa in the year 2035.

Figure P5 indicates that the continuation of a zero level of renewal expenditure will result in a progressive and continual increase in the extent of overall asset condition. With a relatively small total asset quantity within the sealed road pavement area there will be times when renewal expenditure is at zero. Thus no criticism is intended here because of the present level of renewal expenditure. The present level of over

intervention assets at 0.57% is a good figure by industry standards so the zero level of renewal expenditure has been quite appropriate in recent years.

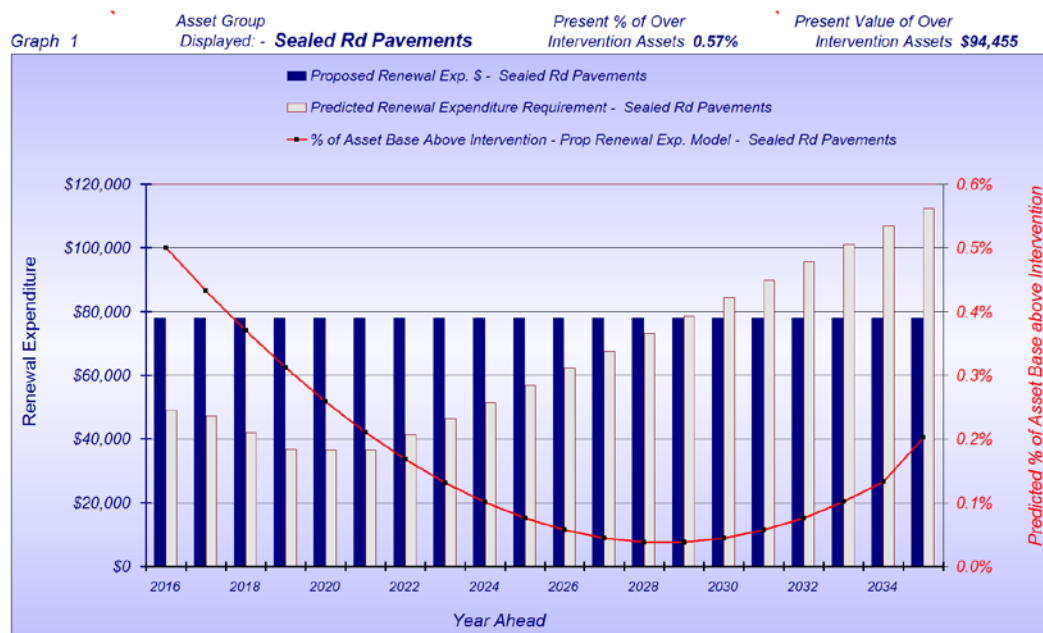


Figure P6 Recommended Renewal funding profile to achieve outcome as detailed below

The Moloney financial modelling software has the capacity to develop a recommended renewal funding profile that will deliver a nominated extent of the asset base to be over the selected intervention level within a selected time frame. A global outcome can be set for the whole roads group. In this way the model is used to allocate funding based on need rather than the historic expenditure level. There are 3 variables that are input and in most cases the same 3 variables are used for all of the road sub assets, however this can be varies between sub asset sets if required.

This is the first road sub asset set to be considered and the aim in using this model is to deliver a recommended funding profile across the whole of the roads group that will deliver an acceptable condition outcome for all sub asset sets. We normally attempt to commence the year one expenditure with council's present expenditure level (this is at a whole of roads group level). In this way we can deliver an achievable outcome. If additional funding is required then it will come as an annual percentage increase. If total funding is sufficient then there may be some reallocation between asset classes based on need.

The three Variables used for the sealed pavement asset modelling are as detailed below:

- Desired extent of over intervention assets - 30% of present level of - 0.57%
- Time to achieve this - 20 - Years
- Annual percentage increase in renewal expenditure - 0%

The present total level of over intervention assets at 0.57% is considered to be a good figure by industry standards and reflects the relatively young age profile of the assets as well as sound recent management and long pavement lives as shown within section 4.

The recommended renewal expenditure over the next 20-years is a flat average annual expenditure of \$75,000. This should be seen as an average annual renewal demand and may in practice be reflected in a single project of say \$400,000 in one year followed by 4-years of zero expenditure.

5.3 Sealed Road Pavement Summary

The sealed road pavement assets were found to be in good overall condition, but had experienced a quite measurable condition decline since 2010. The rapid expansion in urgent isolated pavement failures of - 173.1% is of some concern and does need to be addressed.

It is recommended that the renewal funding level be set at an average annual level of \$75,000 for the next 10-years in today's dollars. Renewal expenditure could be lowered to around \$40,000 pa for the next 10-years but it would then need to rise \$75,000 in the second decade. Thus the recommended figure of \$75,000 pa is considered to represent a reasonable approach.

Section 6: Sealed Surface Asset Analysis

This section will deal with the Sealed Surface assets. The first two figures relate to asset condition and how condition has changed since the last survey while the third provides a condition comparison with other council districts surveyed by MAMS.

6.1 Condition and Performance Indicators for Sealed Surfaces

Change in Cond. Distribution for Sealed Surface

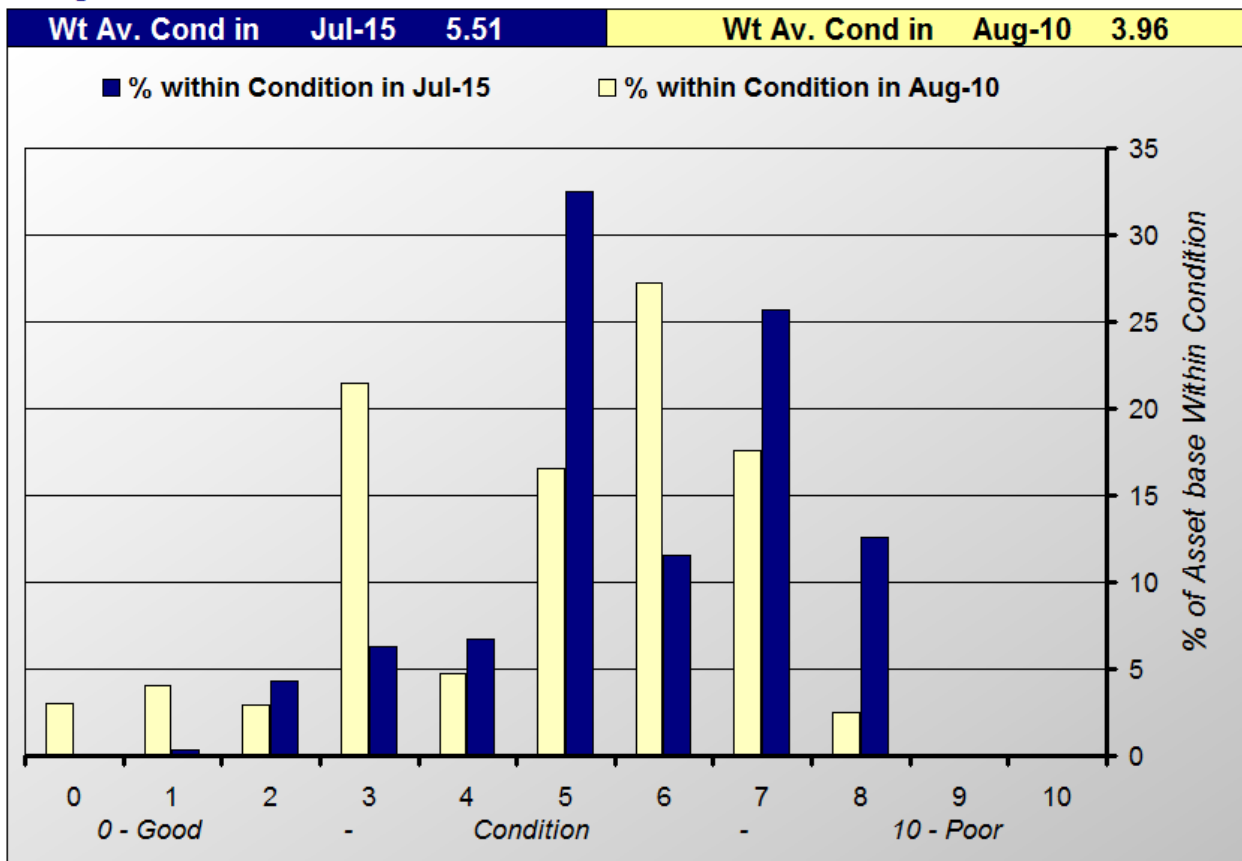


Figure S1 Condition Distribution Comparison Graph – Between Surveys all Sealed Surfaces

Key Cond. Indic. No.	Sealed Surface Condition Indicator	Figures from Last Survey in Aug-10	Figures from Current Survey in Jul-15	Change between Surveys New Minus Old	% Change Between Surveys	Better or Worse Since last Survey
1	Weighted Average Asset Condition	3.963	5.508	-1.55	-39.0%	Worse
2	% of Asset Base above Condition 5	63.783	82.371	-18.59	-29.1%	Worse
3	% of Asset Base above Condition 6	47.264	49.835	-2.57	-5.4%	Worse
4	% of Asset Base above Condition 7	20.059	38.287	-18.23	-90.9%	Worse
5	% of Asset Base above Condition 8	2.511	12.602	-10.09	-401.8%	Worse
Renewal Demand Being Met For:		% of Long Term Demand Being Met				
Sealed Surface Asset Group		80%				

Figure S2 Condition Change since last survey & Renewal demand being met

The above 2 figures provide details of how the sealed surface asset condition has changed since the last survey. Figure S1 details the condition distribution for each survey along with the first of the key indicators the “weighted average asset condition”.

Figure S2 contains 5 of the eight key asset condition indicators that are relevant to this asset set. For a detailed explanation of the key condition indicators refer to section 5.1 above.

Figure S2 indicates that all 5 performance indicators have declined in condition quite dramatically since the time of the last survey in 2010. This represents a very heavy condition decline and it is suspected that the renewal expenditure (all be it low) has been at even lower levels over the last 5-years.

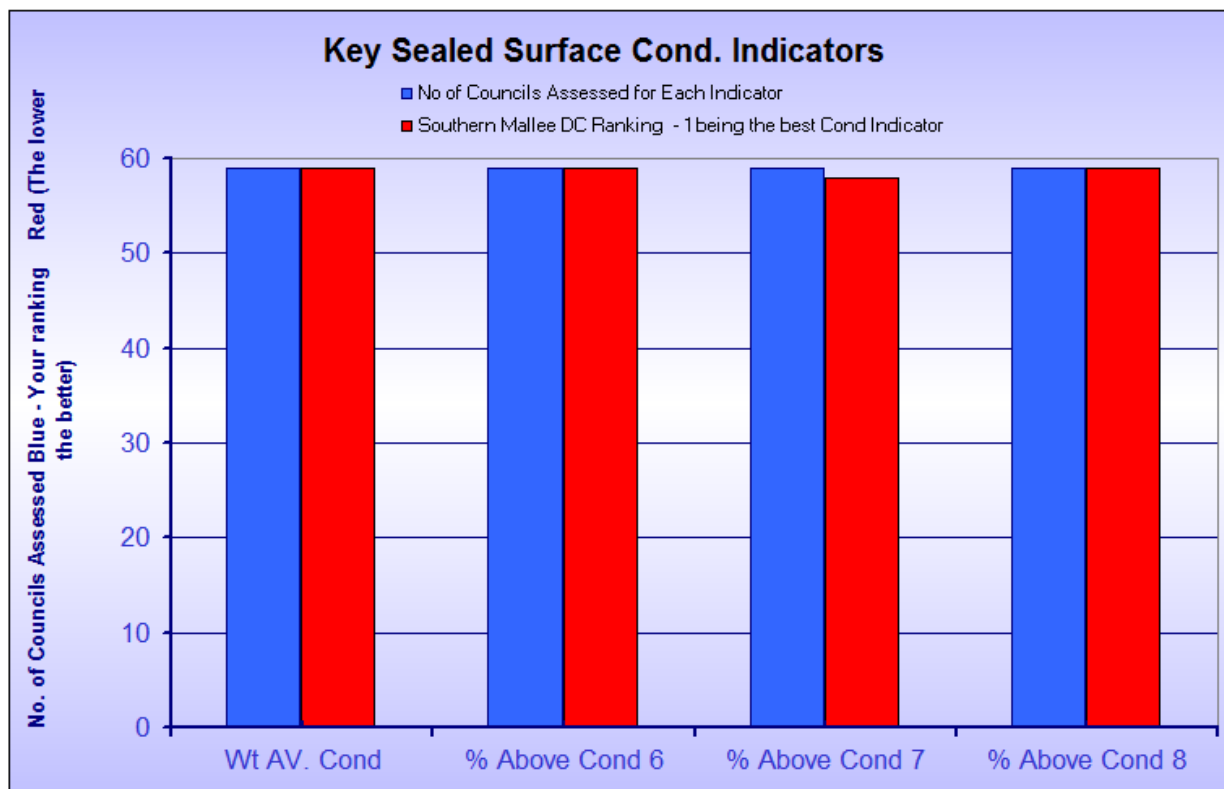


Figure S3 Key Condition Indicators as Compared with other Councils surveyed

The five key condition indicators as detailed in figure S3 provide council with a comparison of where they sit in relation to other councils assessed by MAMS. The graph ranks the key condition indicators against those of all other councils assessed by MAMS. The lower the red bar the better the condition indicator. The blue bars represent the total number of councils assessed. The red bar at 1 equates to the best condition indicator encountered. The red bar level with the blue, represents the worst condition indicator.

The sealed surfaces within Southern Mallee District Council are in very poor overall condition and rank mostly as the worst council assessed for 4 of the 5 very important sealed surface condition indicators within Figure S3.





6.2 Sealed Surface Financial Modelling Analysis

The Sealed Surface assets will be modelled in two groups with the results aggregated here in one presentation. The table below contains a list of the key Modelling parameters used. Note that the useable life is the life to intervention, an asset should not remain in service after that point.

6.2.1 Sealed Surfaces – Selection of Re-treatment Intervention Level

The point at which you choose to intervene to renew or replace an asset will have a big impact in the predicted future renewal demand. The intervention level can be seen as the level of service associated with the asset set. High intervention level equates to low level of service while low intervention level relates to a high level of service.

Detailed below are a series of photographs illustrating various sealed surface condition ratings. They do not cover the complete condition range but hopefully will provide some guidance to the selection of re-treatment intervention level.

	
Condition 0 – 1 Seal in Excellent near new condition	Condition 5 Cracking but seal not too oxidized
	
Condition 6.5 - 7 Oxidized and Stripping	Condition 8 Fully Oxidized and falling apart

It is very difficult to cover sealed surface condition in such a limited range of photographs but hopefully they will provide some idea of asset condition in the 7 – 9 condition range where most interventions will take place. Sealed Surfaces can be within this condition range for a number of different reasons and the photos will cover only a limited range of situations. They should be considered as a typical situation and not the only situation for that condition rating.

6.2.2 Sealed Surfaces – Financial Modeling Results

Modelling Parameter	Urban Spray Seals	Rural Spray Seals
Asset Quantity in sqm	212,050	605,530
Unit Renewal Rate	\$5.31	\$5.25
Total Asset Group Renewal Cost	\$1,126,155	\$3,179,033
Annual Renewal Exp.	\$15,000	\$85,000
Annual Maintenance Exp.	\$0	\$0
Retreat. Intervention Condition	8.0	8.0
Life to Condition 10 in Years	22.0	22.0
Life in years to Intervention	21.1	21.1

Figure S4 A – Summary of Modelling Input Parameters for Sealed Surface Assets

The sealed surfaces will be modelled within 2 groups as detailed within Figure S4 A above. Intervention levels have been set at what are considered to be very high levels. Life cycles have also been set at relatively high levels. Thus the modelling results will tend to be at the optimistic end of the range. But given the relatively dry climatic conditions the figures are considered to be appropriate.

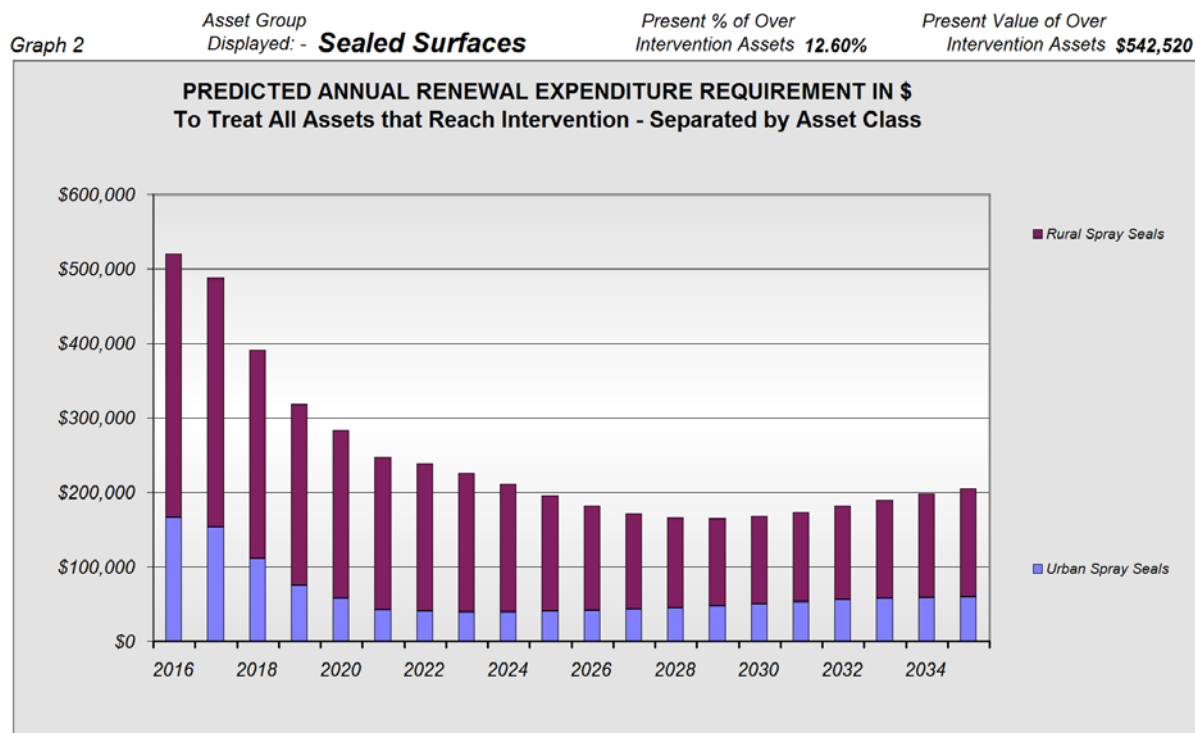


Figure S4 Predicted Renewal Demand to treat all assets that reach the Intervention level in future years

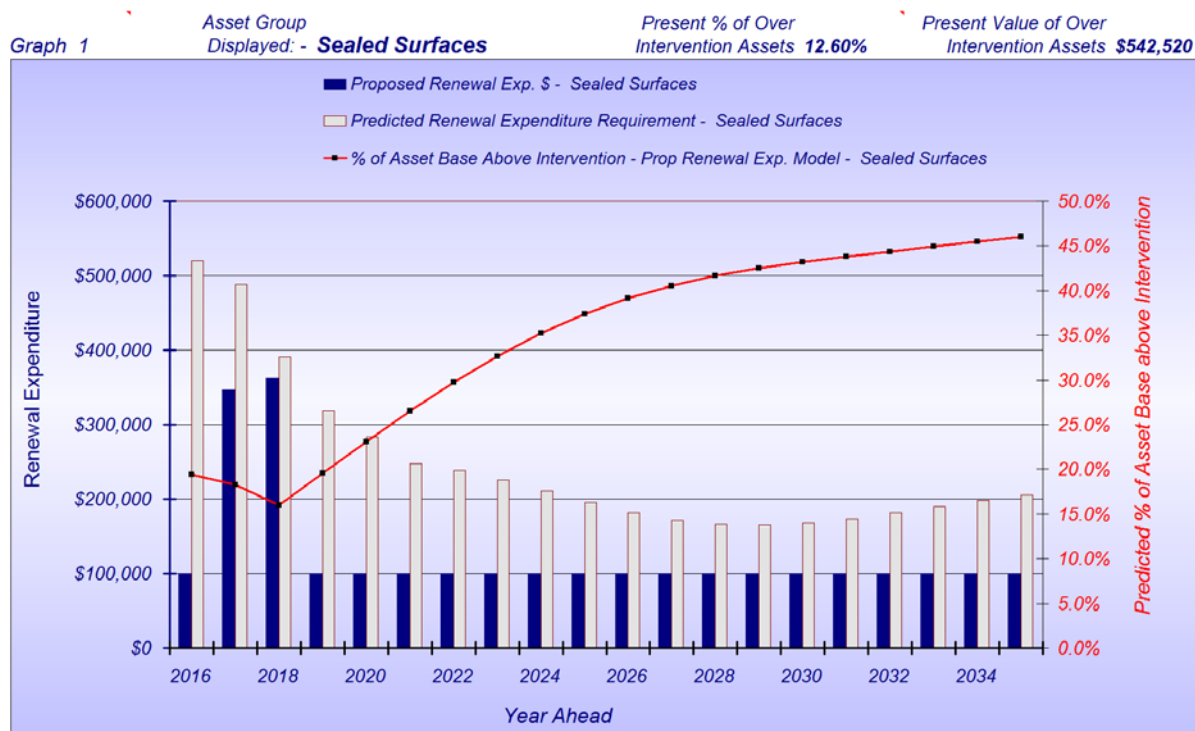


Figure S5 Future Predicted Condition Based on planned expenditure profile

Figures S4 provides a profile of the predicted renewal demand to treat all assets that reach the intervention level through the degradation process. Figure S5 plots the extent of the asset base that is predicted to rise above the intervention level based upon the continuation of the present level of renewal expenditure (in blue bars). It also plots the predicted renewal demand within the grey bars.

Capital renewal demand to treat all assets at and above the selected intervention level is presently sitting at around \$520,000 pa, which is also predicted as the peak value over the next 20-years. The planned renewal expenditure profile is far lower than the predicted demand and if maintained is predicted to result in a level of 46% of over intervention assets within 20-years.

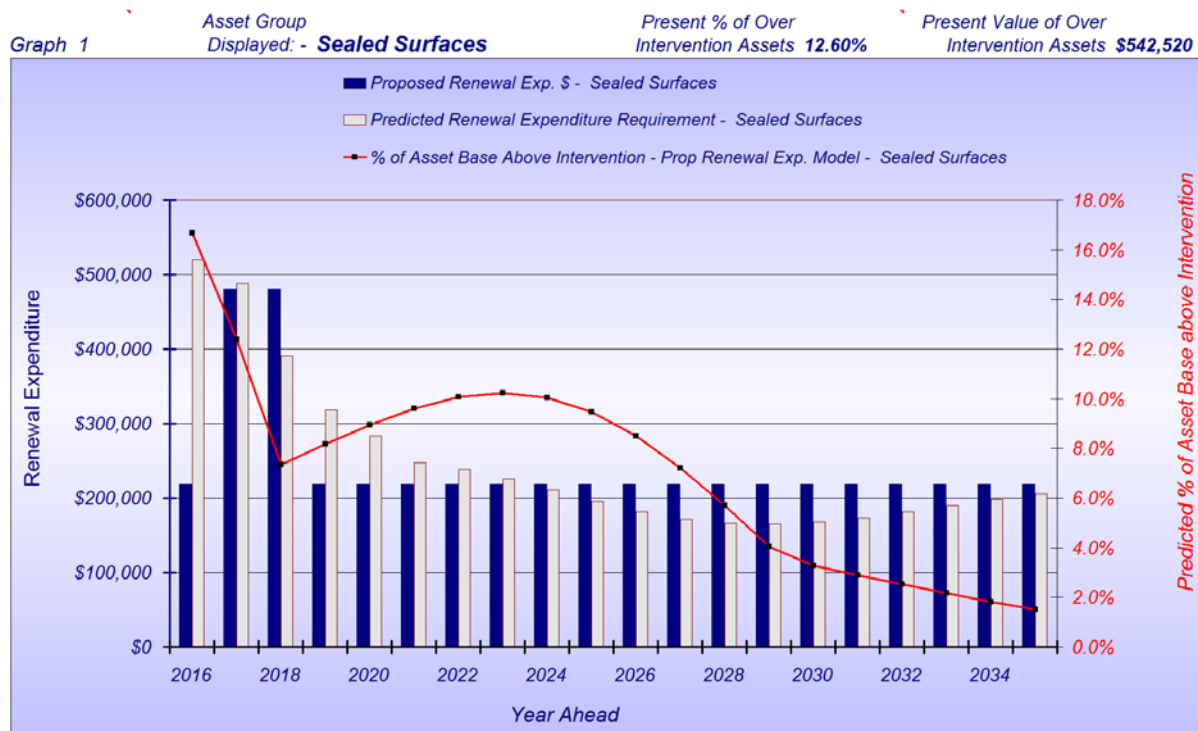


Figure S6 Recommended Renewal funding profile to achieve outcome as detailed below

The Moloney financial modelling software has the capacity to develop a recommended renewal funding profile that will deliver a nominated extent of the asset base to be over the selected intervention level within a selected time frame. A global outcome can be set for the whole roads group. In this way the model is used to allocate funding based on need rather than the historic spend. See the notes below Figure P6 above for more detail. There are 3 variables that are input and in most cases the same 3 variables are used for all of the road sub assets, however this can be varies if required.

The three Variables used for the sealed surface asset modelling are as detailed below:

- Desired extent of over intervention assets - 30% of present level of - 12.60%
- Time to achieve this - 20 - Years
- Annual percentage increase in renewal expenditure - 0%

Figure S6 represents the minimum annual renewal expenditure to achieve a desired condition outcome within a nominated time frame. This modelling approach is designed to deliver an achievable outcome that accepts a small percentage of over intervention assets as remaining and hence often delivers lower expenditure profiles than the S4 graph where all over intervention assets have to be treated.

The model indicates that a flat annual expenditure of \$215,000 pa over the next 20 -years will deliver a 70% reduction in the present level of over intervention assets of 12.60%. For short life assets such as sealed surfaces the present level of over intervention assets is considered to be a high and it would be desirable to get this down earlier if possible

6.3 Sealed Surface Summary

The sealed surface assets were found to be in very poor overall condition and had declined quite dramatically since the last survey in 2010. These are really important assets and should always be fully funded as the top roads group funding priority, as failure to do so will result in a diminished pavement life and hence higher ongoing costs.

It is recommended that the present renewal expenditure of \$201,000 pa be lifted to an absolute minimum of \$215,000 pa for the next 3-years and reviewed again following the next condition survey. It is further recommended that consideration be given to a few years of higher renewal expenditure in order to improve the overall condition more rapidly.

Section 7: Unsealed Pavement Assets

This section will deal with the Unsealed Road Pavement assets. The first two figures relate to asset condition and how condition has changed since the last survey while the third provides a condition comparison with other council districts surveyed by MAMS.

7.1 Condition and Performance Indicators for Unsealed Road Pavements

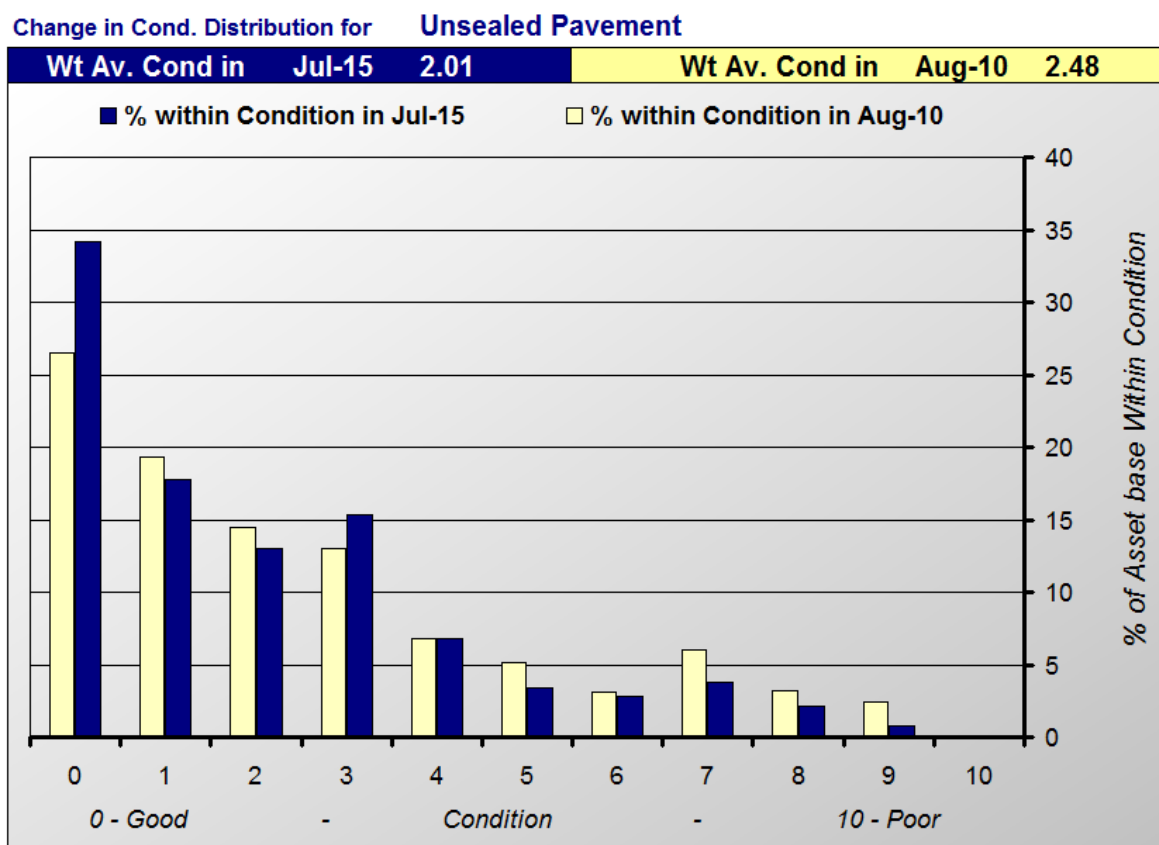


Figure U1 Condition Distribution Comparison Graph – Between Surveys

Key Cond. Indic. No.	Unsealed Pavement Condition Indicator	Figures from Last Survey in Aug-10	Figures from Current Survey in Jul-15	Change between Surveys New Minus Old	% Change Between Surveys	Better or Worse Since last Survey
1	Weighted Average Asset Condition	2.48	2.01	0.47	18.8%	Better
2	% of Pavement Failures	4.66	3.75	0.90	19.4%	Better
3	Average Pavement Roughness	3.21	3.22	-0.01	-0.2%	Worse
4	Average Pavement Profile	2.83	2.95	-0.12	-4.2%	Worse
5	Average Pavement Depth in mm	119	128	9.00	7.6%	Better
6	% of Asset Base above Condition 6	14.72	9.50	5.22	35.5%	Better
7	% of Asset Base above Condition 7	11.61	6.65	4.95	42.7%	Better
8	% of Asset Base above Condition 8	5.58	2.88	2.71	48.5%	Better
Renewal Demand Being Met For:		% of Long Term Demand Being Met				
UnSealed Rd Pavement Asset Group		98%				

Figure U2 Condition Change since last survey & Renewal demand being met

The above 2 figures provide details of how unsealed pavement asset condition has changed since the last survey. Figure U1 details the condition distribution for each survey along with the first of the key indicators the “weighted average asset condition”.

Figure U2 contains the eight key asset condition indicators that are relevant to this asset set. For a detailed explanation of the key condition indicators refer to section 5.1 above. There is one additional indicator for the unsealed road pavements that is unique to this asset set and as such was not included back in section 5.1. This is the average pavement depth, which is simply the average depth of imported pavement material found on the pavements when they were dug during the survey.

Figures U1 and U2 above indicate that asset condition has improved quite measurably since the last survey in 2010. Renewal expenditure is reported at 98% of the level of annual depreciation, but annual depreciation is based on an asset life of 25 years and the degradation curves in section 4 combined with the measured improvement in condition suggest that asset life will be quite a bit longer than 25-years.

The two indicators in figure U2 that have declined (roughness and profile) are shape characteristics that both relate to the maintenance condition of the assets only. Also the change was quite modest in both areas and not of any real statistical significance.

Average pavement depth has increased by 7.6%. This indicates that council is placing pavement material onto the unsealed roads at a faster rate than it is being lost and further suggests that the depreciation life could be extended a little. Note also that average pavement depth has continued to increase over each of five the successive since 2001, further indicating that pavement material is being placed at a faster rate than it is being lost.

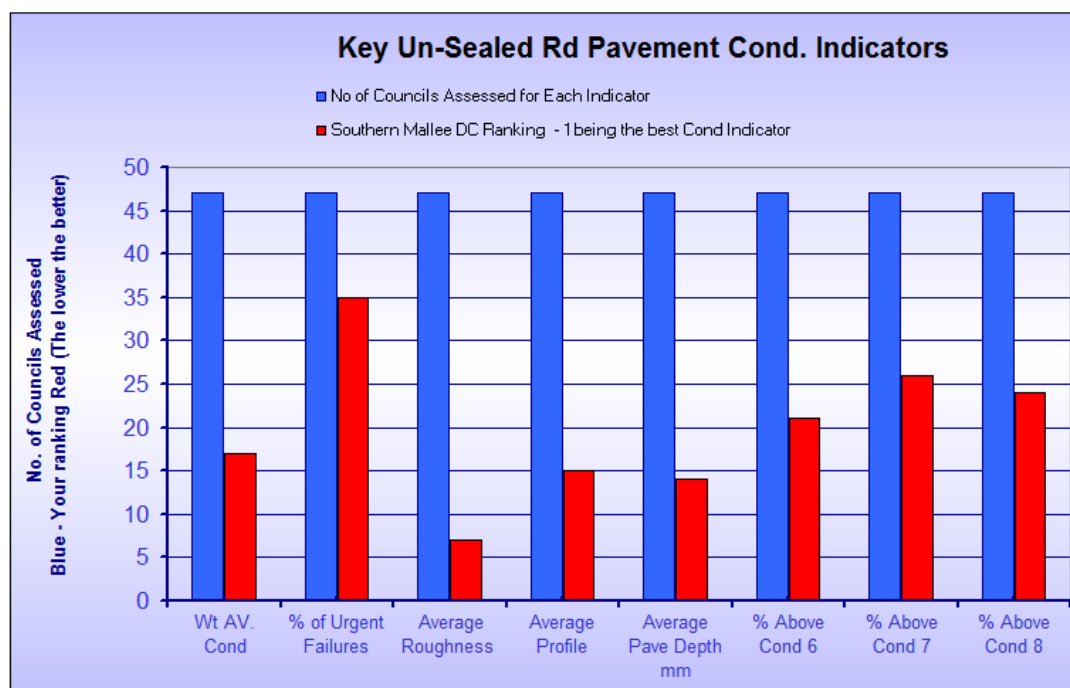


Figure U3 Key Condition Indicators as Compared with other Councils surveyed

The eight key condition indicators as detailed in figure U3 provide council with a comparison of where they sit in relation to other councils assessed by MAMS. The graph ranks the key condition indicators against those of all other councils assessed by MAMS. The lower the red bar the better the condition indicator. The blue bars represent the total number of councils assessed. The red bar at 1 equates to the best condition indicator encountered. The red bar level with the blue, represents the worst condition indicator.

The unsealed road pavement assets were found to be in very good overall condition and have improved quite measurably since 2010. Figure U3 also indicates that the assets compare quite well with other councils assessed by MAMS and are sitting mostly within the best 35% of the 47 councils assessed.

7.2 Unsealed Road Pavement Financial Modelling Analysis





The Unsealed road pavement assets will normally be modelled in three groups with the results aggregated here in one presentation. The table below contains a list of the basic Modelling parameters

used. Note that the useable life is the life to intervention, an asset should not remain in service after that point.

7.2.1 Unsealed Road Pavement – Selection of Re-treatment Intervention Level

The point at which you choose to intervene to renew or replace an asset will have a big impact in the predicted future renewal demand. The intervention level can be seen as the level of service associated with the asset set. High intervention level equates to low level of service while low intervention level relates to a high level of service.

Detailed below are a series of photographs illustrating various unsealed road pavement condition ratings. They do not cover the complete condition range but hopefully will provide some guidance to the selection of re-treatment intervention level.

	
Condition 0 – 1 Average Depth 150 mm	Condition 7 – Average depth 20 – 30 mm only
	
Condition 8 Av Depth 20 mm & Ext Bare Patches	Condition 9 Scattered patched of Pave Material only

It is very difficult to cover Unsealed Pavement condition in such a limited range of photographs but hopefully they will provide some idea of asset condition in the 7 – 9 condition range where most interventions will take place. Unsealed Pavements can be within this condition range for a number of different reasons and the photos will cover only a limited range of situations. They should be considered as a typical situation and not the only situation for that condition rating.

Modelling Parameter	Rubble Pavements Urban	Rubble Pavements Rural
Asset Quantity in sqm	43,670	5,861,927
Unit Renewal Rate	\$5.10	\$5.10
Total Asset Group Renewal Cost	\$222,714	\$29,895,827
Annual Renewal Exp.	\$6,000	\$760,000
Annual Maintenance Exp.	\$0	\$0
Retreat. Intervention Condition	7.0	7.0
Life to Condition 10 in Years	35.0	40.0
Life in years to Intervention	31.4	35.9

Figure U4A – Summary of Modelling Input Parameters for Unsealed Rd Pavement Assets

For Southern Mallee District Council we have modelled these assets within 2 groups based on the rural urban split.

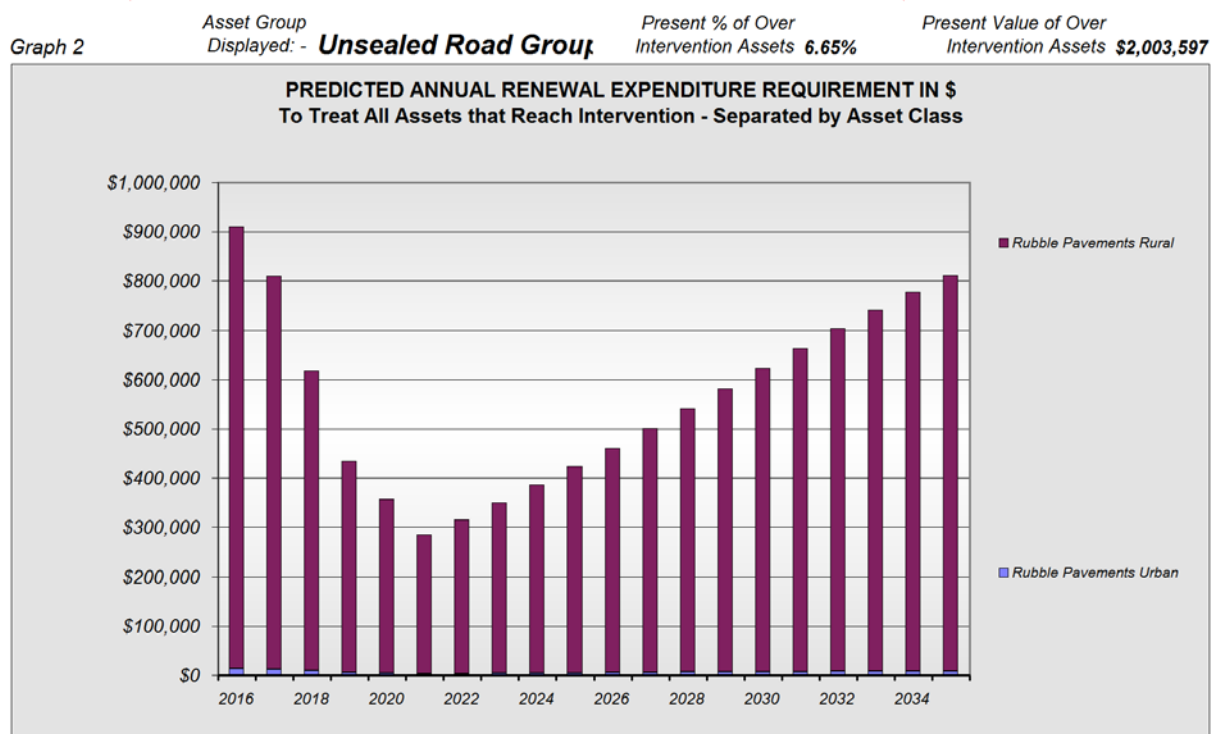


Figure U4 Predicted Renewal Demand to treat all assets that reach the Intervention level in future years

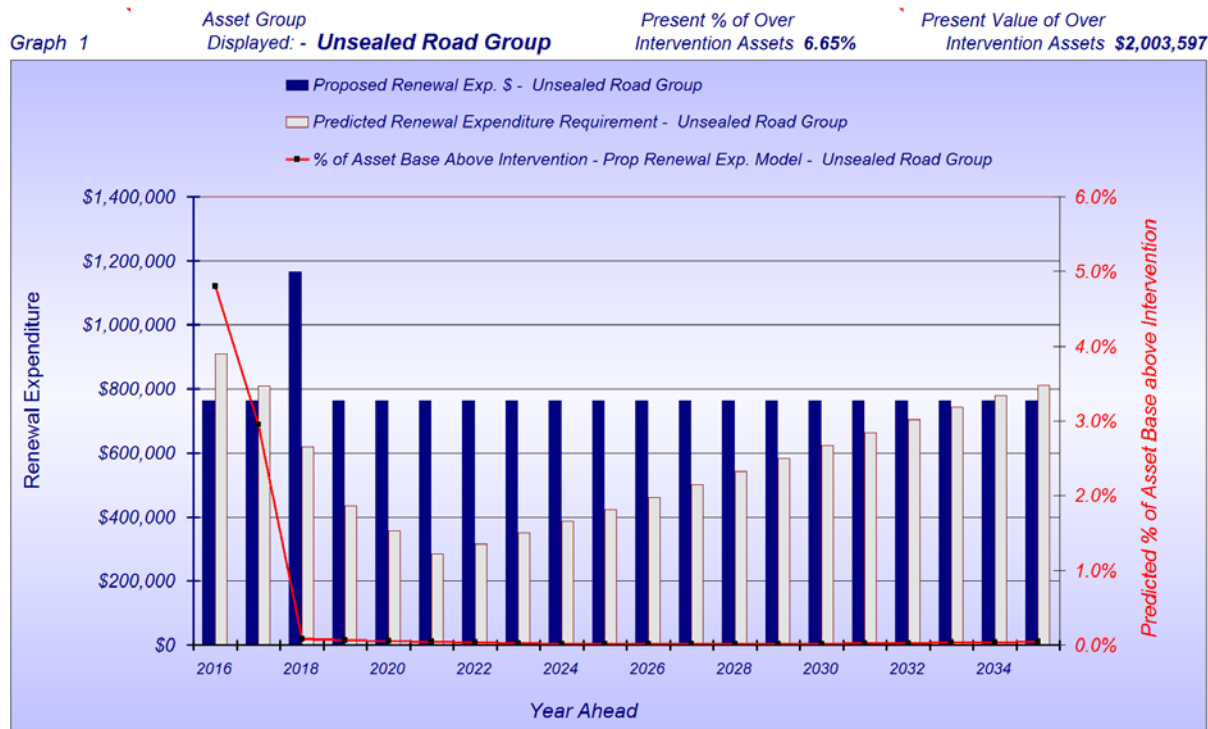


Figure U5 Future Predicted Condition Based on planned expenditure profile

Figures U4 provides a profile of the predicted renewal demand to treat all assets that reach the intervention level through the degradation process. Figure U5 plots the extent of the asset base that is predicted to rise above the intervention level based upon the continuation of the present level of renewal expenditure (in blue bars). It also plots the predicted renewal demand within the grey bars.

Capital renewal demand is presently sitting at \$910,000 pa which also represents the predicted peak demand over the next 20-years. Present renewal expenditure is very close to this figure at \$845,000 pa.

Modelling does suggest that the present funding level of \$845,000 pa is a little higher than what is required over the next 10-15 years.

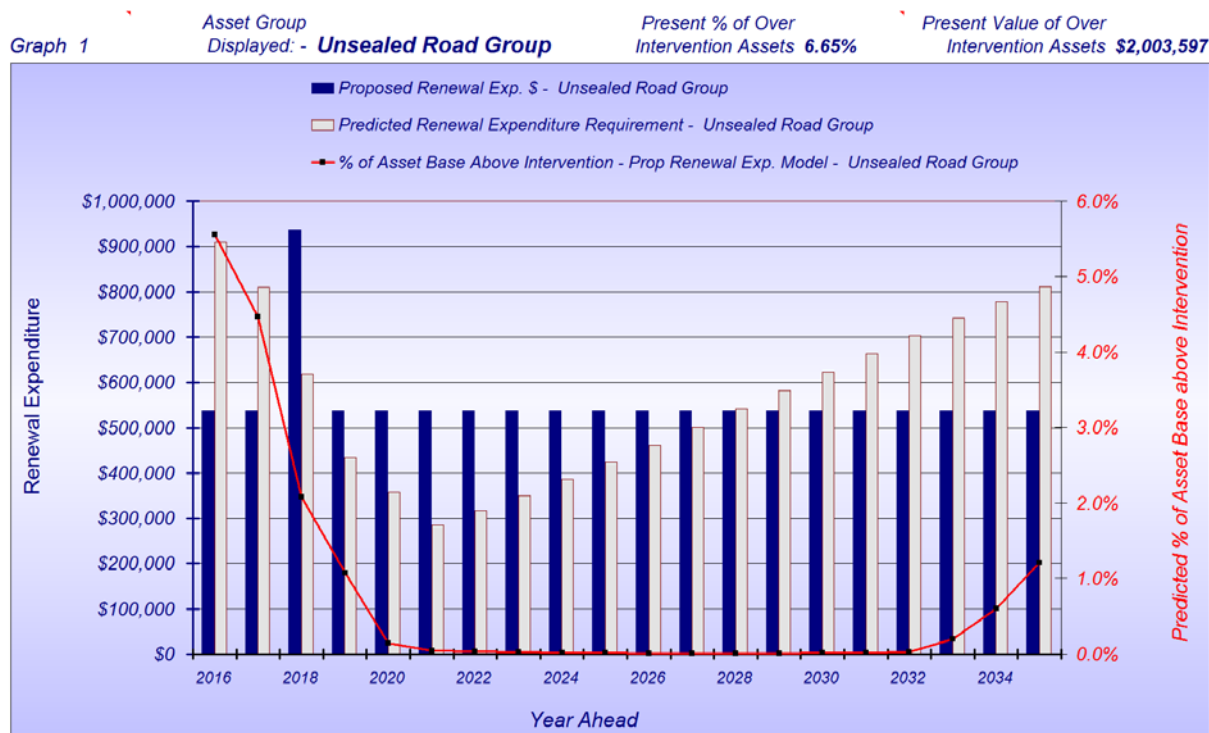


Figure U6 Required Funding profile to deliver same extent of over intervention assets after 10-years

The Moloney financial modelling software has the capacity to develop a recommended renewal funding profile that will deliver a nominated extent of the asset base to be over the selected intervention level within a selected time frame. A global outcome can be set for the whole roads group. In this way the model is used to allocate funding based on need rather than the historic spend. See the notes below Figure P6 above for more detail. There are 3 variables that are input and in most cases the same 3 variables are used for all of the road sub assets, however this can be varies if required.

The three Variables used for the Un-sealed pavement asset modelling are as detailed below:

- *Desired extent of over intervention assets* - 30% of present level of - 6.65%
- *Time to achieve this* - 20 - Years
- *Annual percentage increase in renewal expenditure* - 0%

Figure U6 represents the minimum annual renewal expenditure to achieve a desired condition outcome within a nominated time frame. This modelling approach is designed to deliver an achievable outcome that accepts a small percentage of over intervention assets as remaining and hence often delivers far lower expenditure profiles than the U4 graph where all over intervention assets have to be treated.

The unsealed pavement assets are in very good overall condition with around 52% of the assets in condition zero or 1 (having very close to the required full depth of imported pavement material).

Figure U6 indicates that a flat expenditure of \$537,000 pa for the next 20-years will deliver a 70% reduction in the present level of over intervention assets.

Council may not be prepared to drop renewal expenditure down to the recommended level of \$537,000 pa. But given the clear and strong continued improvement in this asset class over the last 14-years, renewal funding could be lowered and then reviewed again following the next condition survey. The savings could be re-directed to the reseal program which is in real need of a funding boost.

7.3 Unsealed Road Pavement Summary

The Unsealed road pavement assets were found to be in very good condition and had improved in condition quite measurably since the last survey in 2010.

It is recommended that renewal funding be set at \$537,000 pa for the next 3-years and then reviewed again following the next condition survey.

Section 8: Kerb Asset Analysis

This section will deal with the kerb assets. The first two figures relate to asset condition and how condition has changed since the last survey while the third provides a condition comparison with other council districts.

8.1 Condition and Performance Indicators for Kerb Assets

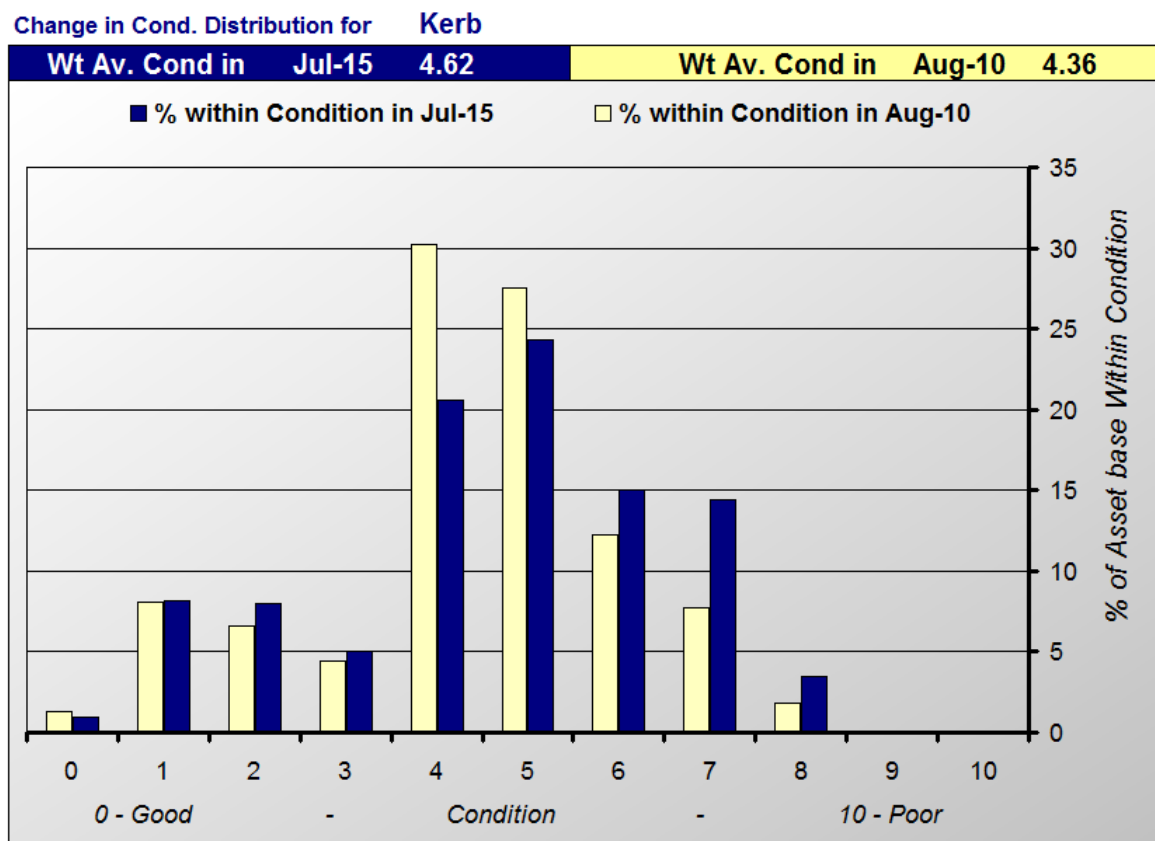


Figure K1 Condition Distribution Comparison Graph – Between Surveys

Key Cond. Indic. No.	Kerb Condition Indicator	Figures from Last Survey in Aug-10	Figures from Current Survey in Jul-15	Change between Surveys New Minus Old	% Change Between Surveys	Better or Worse Since last Survey
1	Weighted Average Asset Condition	4.357	4.624	-0.27	-6.1%	Worse
2	% of Urgent Failures	25.818	31.620	-5.80	-22.5%	Worse
3	% of Other Failures	43.071	29.885	13.19	30.6%	Better
4	% of Asset Base above Condition 5	49.368	57.278	-7.91	-16.0%	Worse
5	% of Asset Base above Condition 6	21.823	32.933	-11.11	-50.9%	Worse
6	% of Asset Base above Condition 7	9.583	17.875	-8.29	-86.5%	Worse
7	% of Asset Base above Condition 8	1.843	3.487	-1.64	-89.2%	Worse
Renewal Demand Being Met For:		% of Long Term Demand Being Met				
Kerb Asset Group		0%				

Figure K2 Condition Change since last survey & Renewal demand being met

The above 2 figures provide details of how the Kerb asset condition has changed since the last survey. Figure K1 details the condition distribution for each survey along with the first of the key indicators the “weighted average asset condition”.

Figure K2 contains 7 of the eight key asset condition indicators that are relevant to this asset set. For a detailed explanation of the key condition indicators refer to section 5.1 above.

The kerbs were found to be in very poor overall condition. The change in condition since 2010 also indicates an across the board heavy condition decline. The one reported improvement (Indicator 3 the percentage of non urgent localised failures) does not really relate to an actual improvement but rather a slightly different reporting methodology. If the overall condition of the kerb was at condition 7 or above then no non urgent failures were reported this time, as clearly the whole segment of the kerb needs to be replaced. Last survey those failures were reported and hence the perceived improvement.

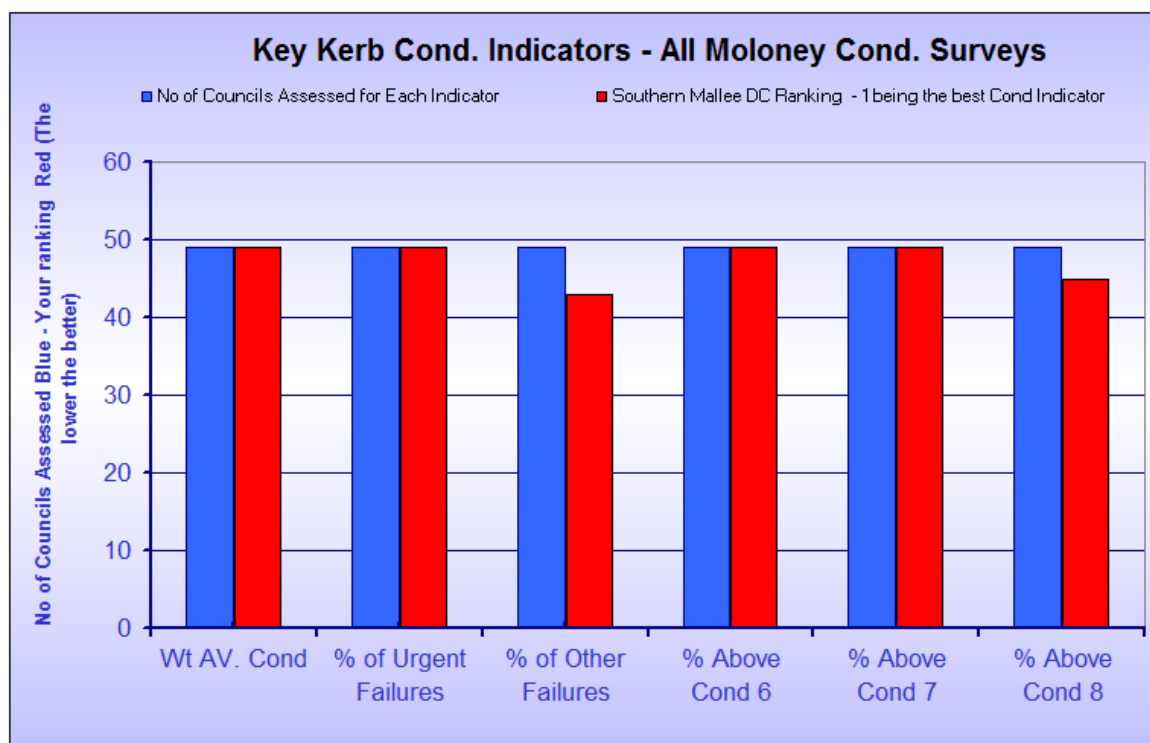


Figure K3 Key Condition Indicators as Compared with other Councils surveyed

The seven key condition indicators as detailed in figure K3 provide council with a comparison of where they sit in relation to other councils assessed by MAMS. The graph ranks the key condition indicators against those of all other councils assessed by MAMS. The lower the red bar the better the condition indicator. The blue bars represent the total number of councils assessed. The red bar at 1 equates to the best condition indicator encountered. The red bar level with the blue, represents the worst condition indicator.

The comparison with other council districts indicates that Southern Mallee has very poor condition kerbs with several of the indicators being the worst we have encountered.

8.2 Kerb Financial Modelling Analysis

The Kerb assets will be modelled as a single asset group. The table below contains a list of the basic Modelling parameters used. Note that the useable life is the life to intervention, an asset should not remain in service after that point.

8.2.1 Kerb Assets – Selection of Re-treatment Intervention Level

The point at which you choose to intervene to renew or replace an asset will have a big impact in the predicted future renewal demand. The intervention level can be seen as the level of service associated with the asset set. High intervention level equates to low level of service while low intervention level relates to a high level of service.

Detailed below are a series of photographs illustrating various kerb condition ratings. They do not cover the complete condition range but hopefully will provide some guidance to the selection of re-treatment intervention level.



Condition 3 Old But only Minor loss of shape & movement



Condition 6 Movement and Concrete breakdown



Condition 8 Large movement and holding of water



Condition 9 Extreme movement and lack of Function

It is very difficult to cover kerb condition in such a limited range of photographs but hopefully they will provide some idea of asset condition in the 7 – 9 condition range where most interventions will take place. Kerbs can be within this condition range for a number of different reasons and the photos will cover only a limited range of situations. They should be considered as a typical situation and not the only situation for that condition rating.

8.2.2 Kerb Assets – Financial Modeling Results

Modelling Parameter	All Kerbs
Asset Quantity in lineal metres	29,830
Unit Renewal Rate	\$110.00
Total Asset Group Renewal Cost	\$3,281,300
Annual Renewal Exp.	\$0
Annual Maintenance Exp.	\$0
Retreat. Intervention Condition	9.0
Life to Condition 10 in Years	85.0
Life in years to Intervention	81.3

Figure K4 A – Summary of Modelling Input Parameters for Kerb Assets

Kerbs have been modelled as a single asset set as detailed in Figure K4 A above.

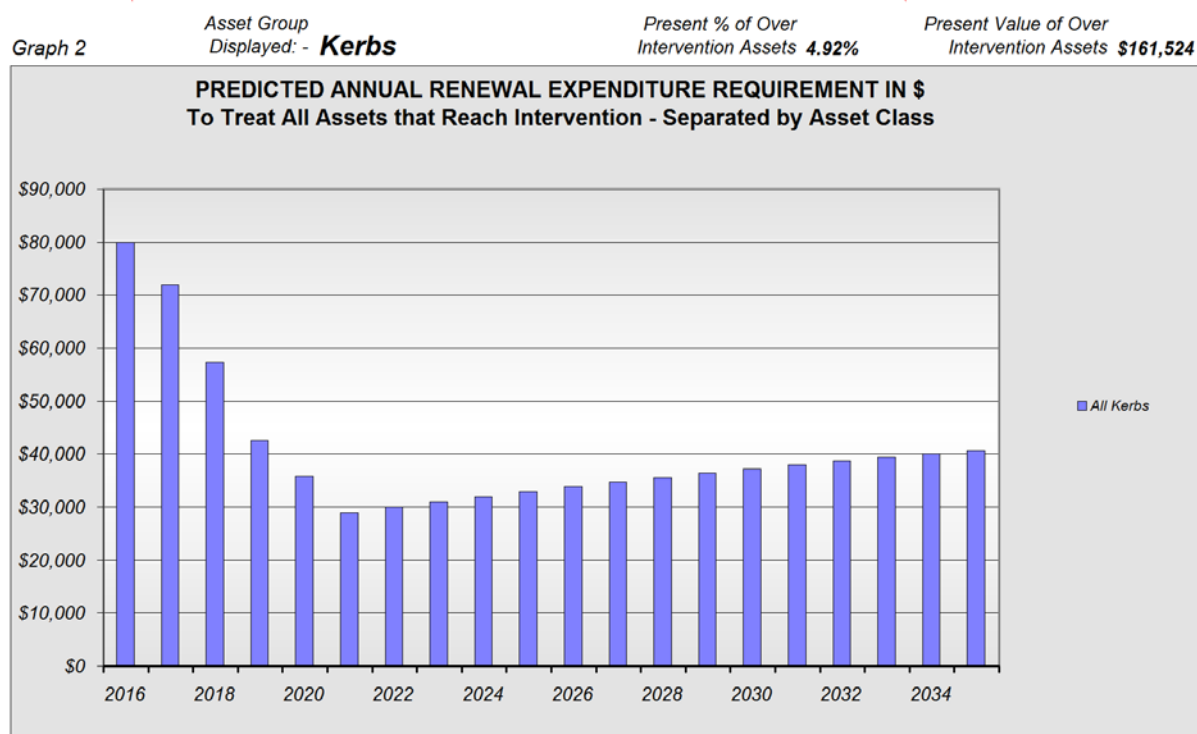


Figure K4 Predicted Renewal Demand to treat all assets that reach the Intervention level in future years

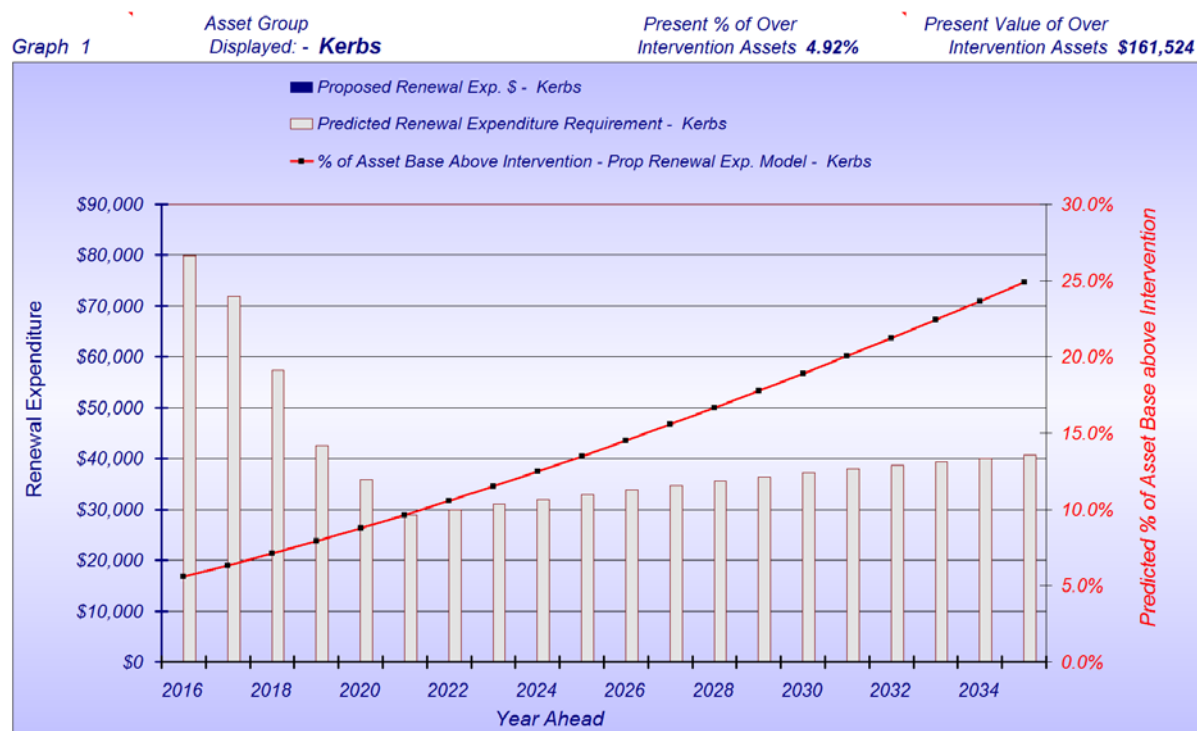


Figure K5 Future Predicted Condition Based on planned expenditure profile

Figures K4 provides a profile of the predicted renewal demand to treat all assets that reach the intervention level through the degradation process. Figure K5 plots the extent of the asset base that is predicted to rise above the intervention level based upon the continuation of the present level of renewal expenditure (in blue bars). It also plots the predicted renewal demand to treat all over intervention assets within the grey bars.

Capital renewal demand is presently sitting at around \$80,000 pa which also represents the peak demand over the next 20-years. The present renewal expenditure is at zero and clearly cannot be held at that level indefinitely.

Note that all of the sections of isolated kerb failure that were identified during the survey have been converted to small lengths of very poor condition kerb and so included in the model. This has resulted in the high early renewal demand within figure K4 over the first 5-years. But it does mean that the modelling results include the repair of all the identified localised kerb failures.

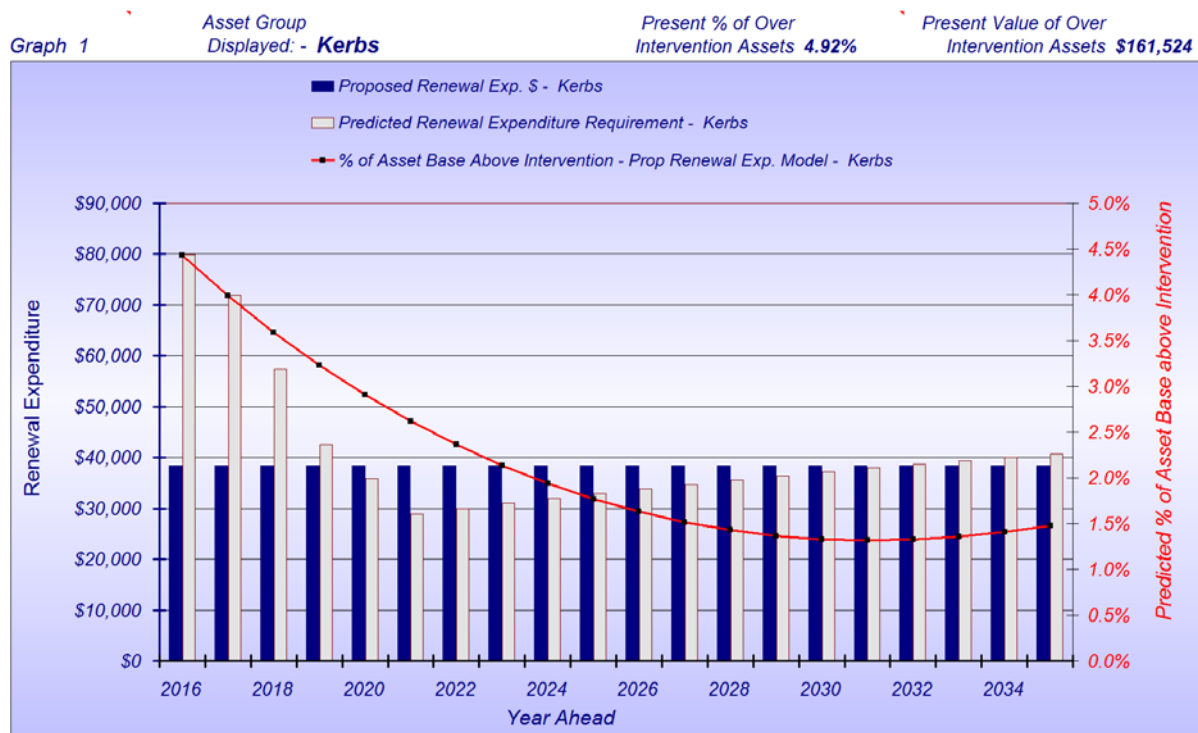


Figure K6 Renewal funding profile to achieve 0 over intervention within 20 years

The Moloney financial modelling software has the capacity to develop a recommended renewal funding profile that will deliver a nominated extent of the asset base to be over the selected intervention level within a selected time frame. A global outcome can be set for the whole roads group. In this way the model is used to allocate funding based on need rather than the historic spend. See the notes below Figure P6 above for more detail. There are 3 variables that are input and in most cases the same 3 variables are used for all of the road sub assets, however this can be varies if required.

The three Variables used for the kerb asset modelling are as detailed below:

- Desired extent of over intervention assets - 30% of present level of - 4.92%
- Time to achieve this - 20 - Years
- Annual percentage increase in renewal expenditure - 0%

Figure K6 represents the minimum annual renewal expenditure to achieve a desired condition outcome within a nominated time frame. This modelling approach is designed to deliver an achievable outcome that accepts a small percentage of over intervention assets as remaining and hence often delivers far lower expenditure profiles than the K4 graph where all over intervention assets have to be treated.

Figure K6 indicates that an expenditure of around \$38,000 pa will result in a 70% reduction in the present level of over intervention assets after 20-years.

8.3 Kerb Summary

The Kerb assets were found to be in very poor overall condition and had declined in condition quite measurably since the last survey in 2010.

It is recommended that the renewal expenditure on the kerb assets be set at \$38,000 pa for the next for the next 3 - Years and then reviewed again following the next condition survey.

Section 9: Footpath Asset Analysis

This section will deal with the footpath assets. The first two figures relate to asset condition and how condition has changed since the last survey while the third provides a condition comparison with other council districts assessed by MAMS.

9.1 Condition and Performance Indicators for Footpath Assets

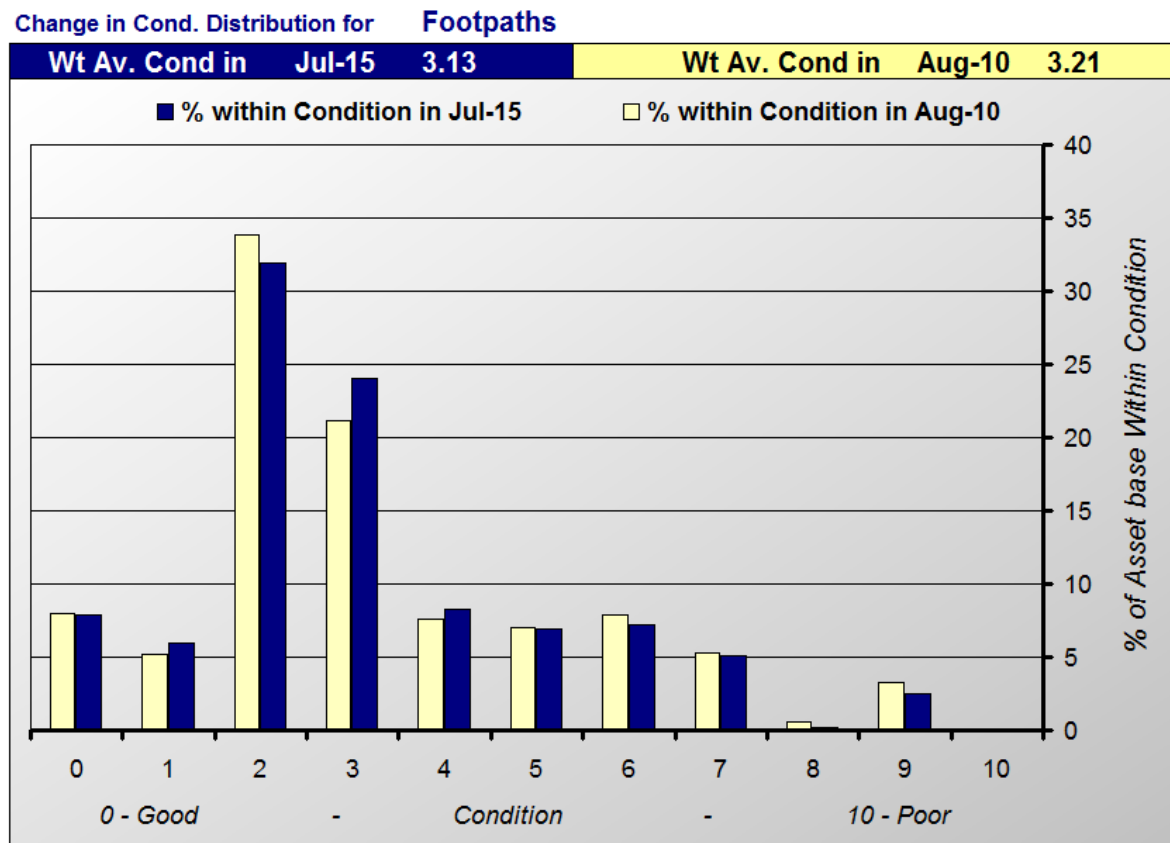


Figure F1 Condition Distribution Comparison Graph – Between Surveys

Key Cond. Indic. No.	Footpath Condition Indicator	Figures from Last Survey in Aug-10	Figures from Current Survey in Jul-15	Actual Change Negative is a Condition Decline	% Change Between Surveys	Better or Worse Since last Survey
1	Weighted Average Asset Condition	3.21	3.13	0.08	2.4%	Better
2	% of Urgent Failures	1.92	3.14	-1.22	-63.7%	Worse
3	% of Other Failures	3.25	1.91	1.34	41.1%	Better
2	% of Asset Base above Condition 5	24.08	21.96	2.11	8.8%	Better
3	% of Asset Base above Condition 6	17.03	15.04	1.99	11.7%	Better
4	% of Asset Base above Condition 7	9.13	7.80	1.33	14.6%	Better
5	% of Asset Base above Condition 8	3.85	2.75	1.11	28.7%	Better
Renewal Demand Being Met For:		% of Long Term Demand Being Met		% of Present Demand (From Model) Being Met		
Footpath Asset Group		63.0%		33.9%		

Figure F2 Condition Change since last survey & Renewal demand being met

The above 2 figures provide details of how Footpath asset condition has changed since the last survey. Figure F1 details the condition distribution for each survey along with the first of the key indicators the “weighted average asset condition”.

Figure F2 contains 7 of the eight key asset condition indicators that are relevant to this asset set. For a detailed explanation of the key condition indicators refer to section 5.1 above.

The footpath assets were found to be in poor overall condition but had experienced a general improved in condition since 2010. The one exception was the extent of urgent footpath failures which had increased by over 60%.

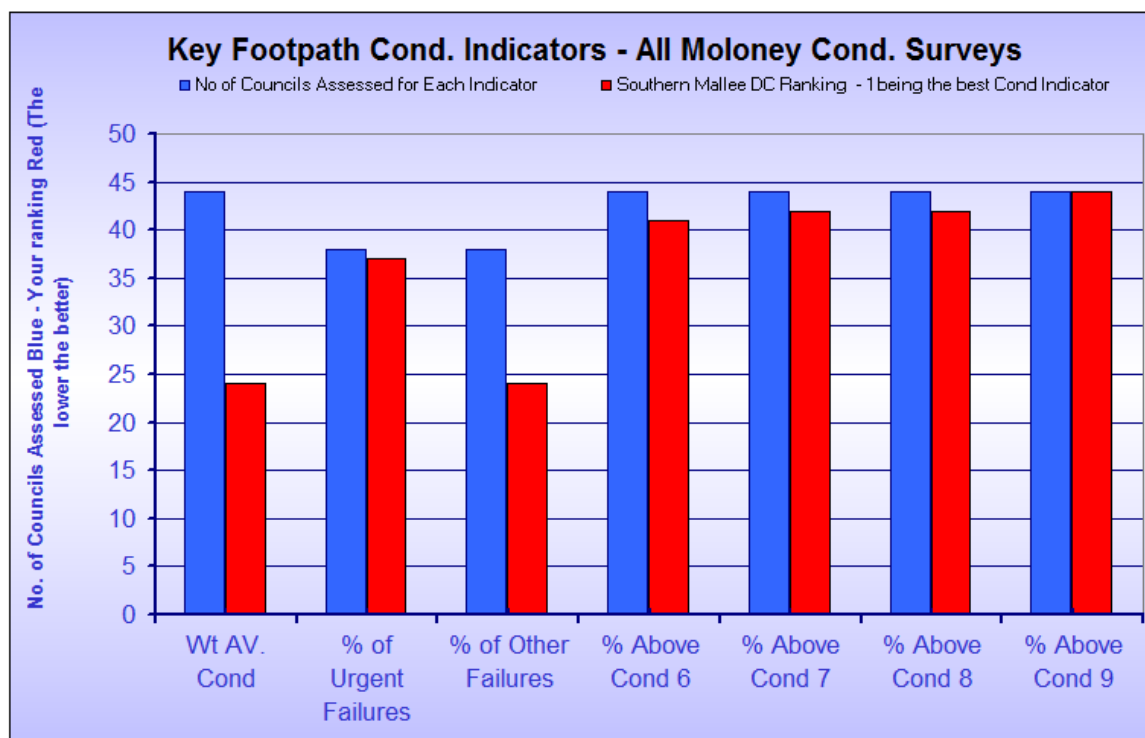


Figure F3 Key Condition Indicators as Compared with other Councils surveyed

The seven key condition indicators as detailed in figure F3 provide council with a comparison of where they sit in relation to other councils assessed by MAMS. The graph ranks the key condition indicators against those of all other councils assessed by MAMS. The lower the red bar the better the condition indicator. The blue bars represent the total number of councils assessed. The red bar at 1 equates to the best condition indicator encountered. The red bar level with the blue, represents the worst condition indicator.

The footpath assets were found to be in poor overall condition and did not compare well with the 44 councils assessed by MAMS. However it was clear that work had been undertaken on the renewal of these assets since the last survey in 2010. The concern is the very high extent of poor condition assets in conditions 7 - 9 which was close to the worst we had ever encountered as well as the very high extent of urgent footpath failures.

9.2 Footpath Financial Modelling Analysis

The Footpath assets will be modelled in two groups with the results aggregated here in one presentation. The table below contains a list of the basic Modelling parameters used. Note that the useable life is the life to intervention, an asset should not remain in service after that point.

9.2.1 Footpath Assets – Selection of Re-treatment Intervention Level

The point at which you choose to intervene to renew or replace an asset will have a big impact in the predicted future renewal demand. The intervention level can be seen as the level of service associated with the asset set. High intervention level equates to low level of service while low intervention level relates to a high level of service.

Detailed below are a series of photographs illustrating various sealed pathway condition ratings. They do not cover the complete condition range but hopefully will provide some guidance to the selection of re-treatment intervention level.



Condition 0 – 1 Excellent condition



Condition 6 Extensive movement



Condition 7 Extensive cracking and movement



Condition 9 Very poor Condition – Cracking and breaking up

It is very difficult to cover footpath condition in such a limited range of photographs but hopefully they will provide some idea of asset condition in the 7 – 9 condition range where most interventions will take place. Footpaths can be within this condition range for a number of different reasons and the photos will cover only a limited set of situations. They should be considered as a typical situation and not the only situation for that condition rating.

9.2.2 Footpath Assets – Financial Modeling Results

Modelling Parameter	Brick Paveing	Concrete Footpaths	Spray Seal Footpaths	Gravel Footpaths
Asset Quantity in sqm	3,403	5,523	8,444	6,933
Unit Renewal Rate	\$110.69	\$82.00	\$19.00	\$8.00
Total Asset Group Renewal Cost	\$376,673	\$452,886	\$160,436	\$55,464
Annual Renewal Exp.	\$0	\$5,000	\$10,000	\$5,000
Annual Maintenance Exp.	\$0	\$0	\$0	\$0
Retreat. Intervention Condition	7.0	7.0	7.8	7.0
Life to Condition 10 in Years	80.0	80.0	25.0	20.0
Life in years to Intervention	75.2	75.2	24.1	18.8

Figure F4 A – Summary of Modelling Input Parameters for Footpath Assets

The footpath sub asset set has been modelled in four categories as detailed in figure F4 A above.

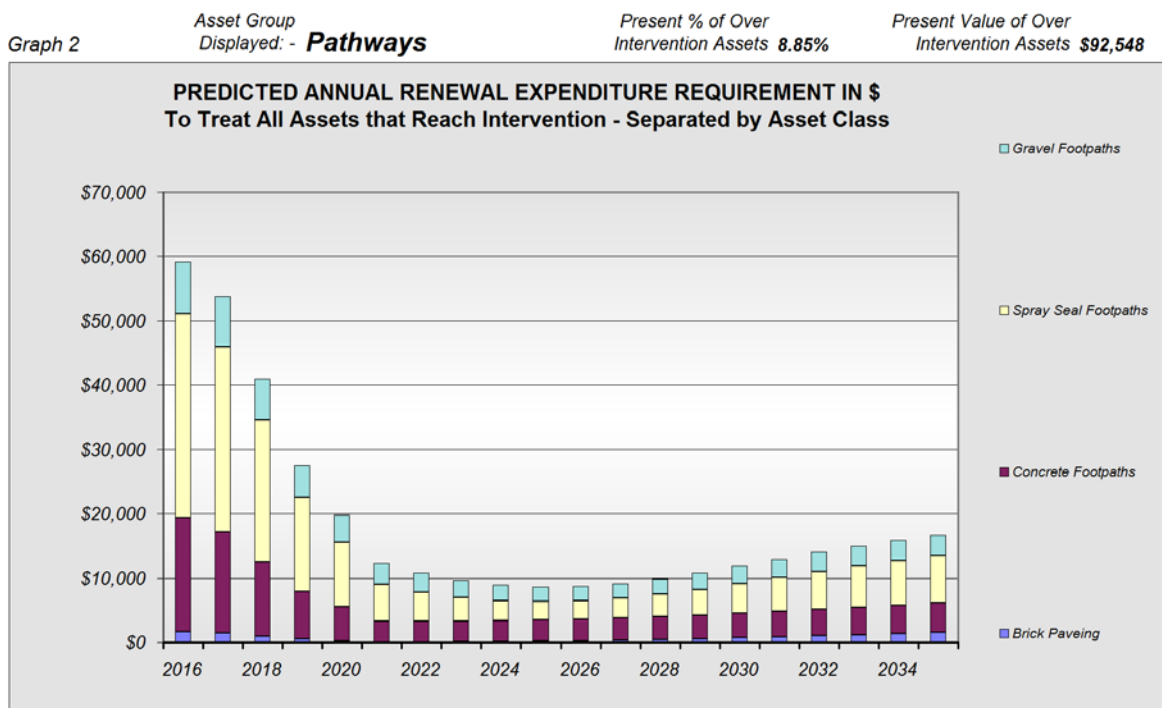


Figure F4 Predicted Renewal Demand to treat all assets that reach the Intervention level in future years

Figures F4 provides a profile of the predicted renewal demand to treat all assets that reach the adopted retreatment intervention level through the degradation process over the next 10-years. It splits the results up into each separately modelled data set if more than one data set has been modelled to produce the overall results. It represents the ideal funding scenario if funding is not limited.

Total predicted renewal demand is sitting at \$59,000 pa which also represents the predicted peak demand over the next 20-years. The high early renewal demand is associated with the very high figure of 8.85% of over intervention assets.

A big proportion of the over intervention footpaths are made up of the older spray seal footpaths, which have a relatively short life compared to more durable materials such as concrete.

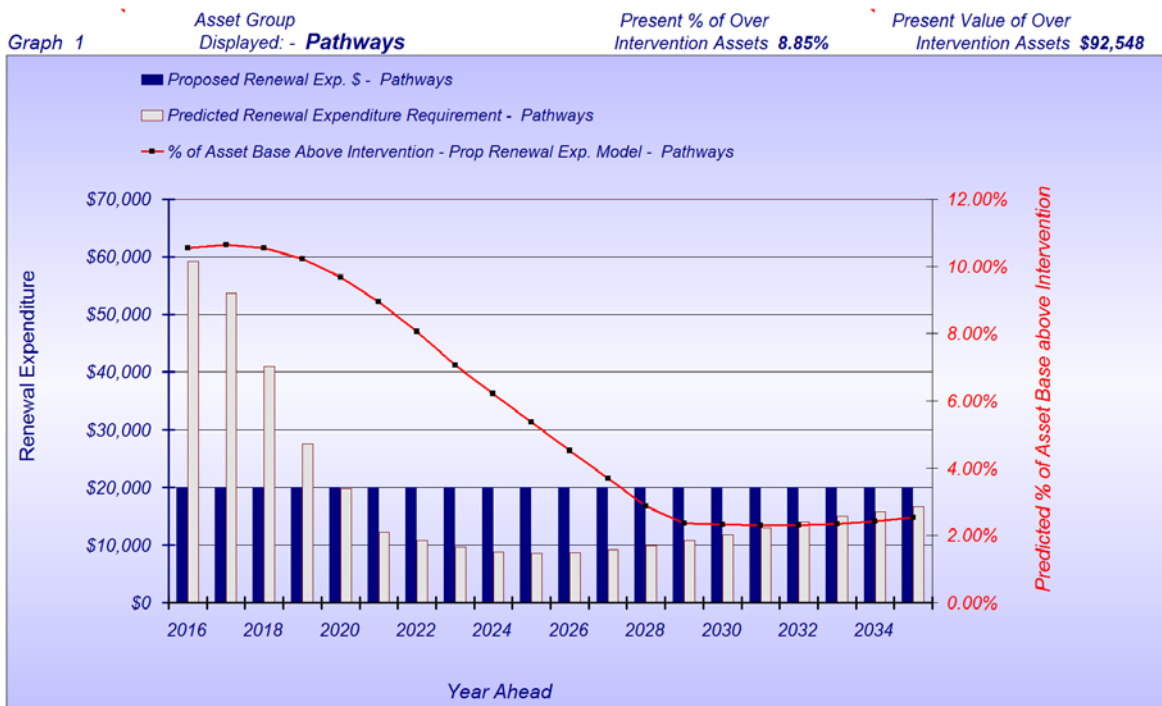


Figure F5 Future Predicted Condition Based on planned expenditure profile

Figure F5 plots the extent of the asset base that is predicted to rise above the intervention level (red line), based upon the continuation of the present level of renewal expenditure (blue bars) or the planned level over the next 10-years. It also plots the total predicted renewal demand (grey bars), which is the same total annual figure as detailed within F4 above.

The planned renewal expenditure level of \$20,000 pa over the next 20-years is predicted to result in a quite measurable decline in the level of over intervention assets over the modelling period as illustrated in figure F5 and could be seen as at an appropriate total expenditure level.

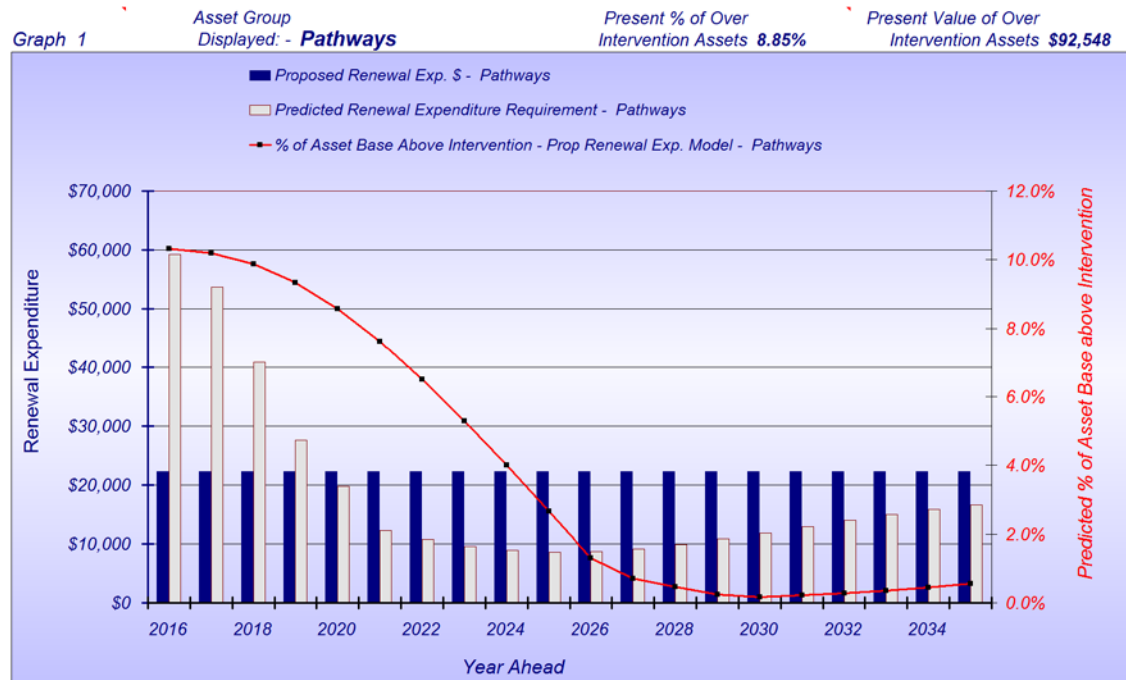


Figure F6 Recommended renewal funding profile for next 10 - 20 years

The Moloney financial modelling software has the capacity to develop a recommended renewal funding profile that will deliver a nominated extent of the asset base to be over the selected intervention level within a selected time frame. A global outcome can be set for the whole roads group. In this way the model is used to allocate funding based on need rather than the historic spend. See the notes below Figure P6 above for more detail. There are 3 variables that are input and in most cases the same 3 variables are used for all of the road sub assets, however this can be varies if required.

The three Variables used for the footpath asset modelling are as detailed below:

- Desired extent of over intervention assets - 30% of present level of - 8.85%
- Time to achieve this - 10 - Years
- Annual percentage increase in renewal expenditure - 0%

Figure F6 represents the minimum annual renewal expenditure to achieve a desired condition outcome within a nominated time frame. This modelling approach is designed to deliver an achievable outcome that accepts a small percentage of over intervention assets as remaining and hence often delivers far lower expenditure profiles than the F4 graph where all over intervention assets have to be treated.

Modelling indicates within figure F6 that an annual expenditure of \$22,000 pa will deliver a 70% reduction in the total extent of over intervention assets after 10-years. The time frame to achieve the 70% reduction in over intervention assets for the footpath assets was set to 10-years rather than 20 as used for other assets because of the relative importance of these assets as well as a consideration of the present level of over intervention assets at 8.85%, which is considered to be high.

9.3 Footpath Summary

The footpath assets were found to be in very poor overall condition but had generally improved in condition since 2010.

It is recommended that the renewal expenditure be set at \$22,000 pa for the next 3-years and then reviewed again following the next condition survey.

Section 10: Aggregated Modelling Results for Road Network

Accurate network modelling within the Moloney system depends upon ten independent Modelling variables. Council now has a good handle on most of these variables and the Modelling results are becoming quite meaningful. Modelling has been based upon the ongoing rehabilitation of the existing asset base only and does not allow for an expanding asset base. Any proposed expenditure on the upgrading of existing assets must be added to the figures delivered within this report.

The Moloney System allows for the Modelling of individual asset sets or sub sets and to then combine these results into a single aggregated report. This section will deal with the aggregated results of the individual sub asset Modelling operations undertaken in the sub asset sections above. It will deliver a single overall Modelling outcome for the whole roads group.

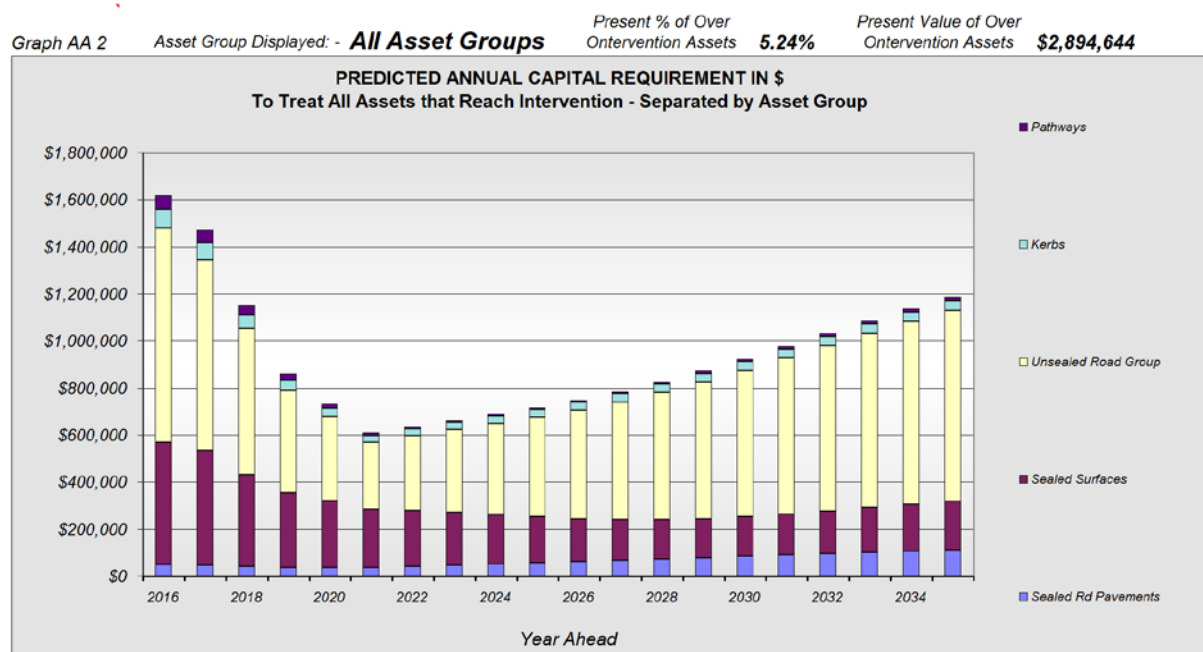


Figure Agg 1 Predicted Renewal Demand to treat all assets that reach the Intervention level in future years

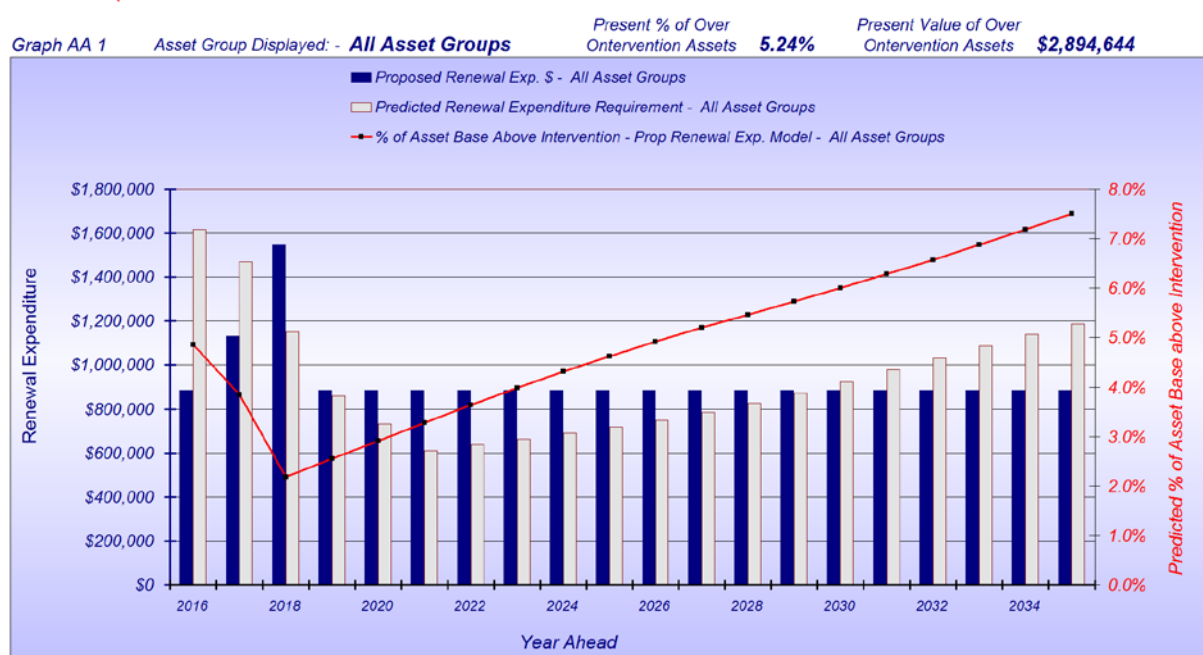


Figure Agg 2 – Future Predicted Condition Based on planned expenditure profile

Modelling predicts the present capital renewal demand at \$1,619,000 pa with the peak over the modelling period of \$1,618,000 pa in the year 2016

Figures Agg 2 plots the extent of the asset base that is predicted to rise above the intervention level based upon the continuation of the present renewal expenditure profile within the blue bars. It also plots the predicted renewal demand within the grey bars for comparison purposes.

The present extent of over intervention assets (backlog) on the whole roads group is estimated at \$2,894,644, which represents 5.24% of the network. This is considered to be a high figure by industry standards and should not be allowed to grow.

The growth in the predicted extent of over intervention assets within figure Agg 2 is strongly linked to the continuation of the present split of total funding between the five road sub assets. The modelling program was used within figure Agg 3 to better distribute the same level of total funding on a needs basis between the 5 asset classes. This resulted in a predicted 70% reduction in the total level of over intervention assets over the next 20-years.

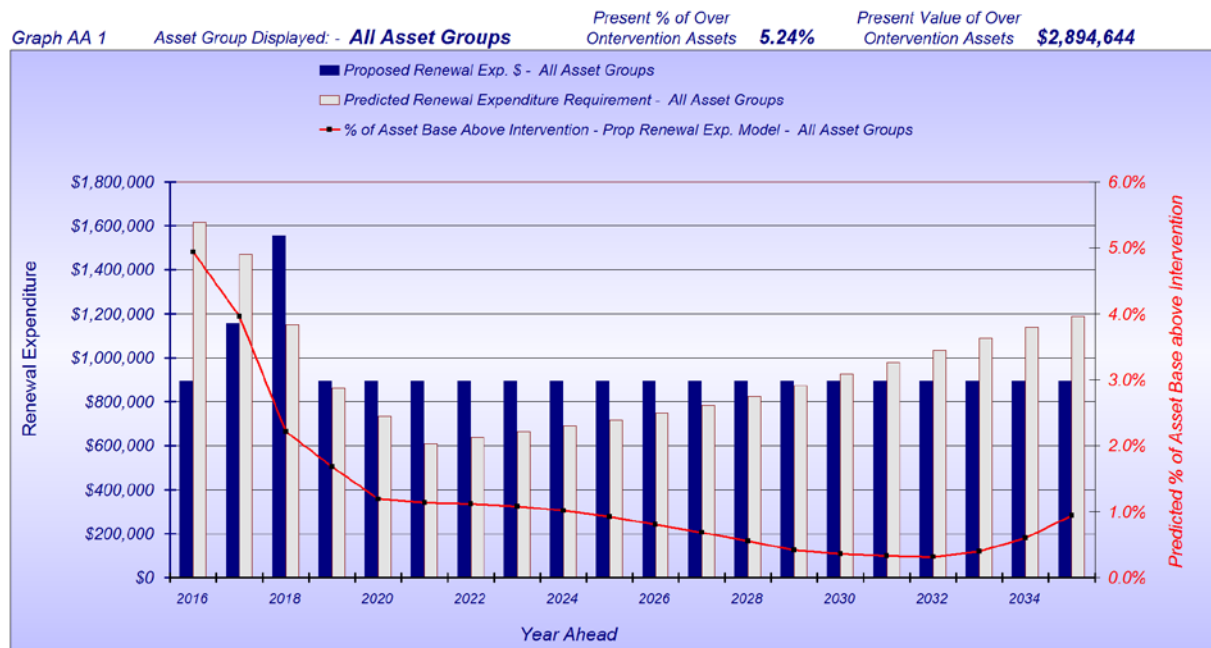


Figure Agg 3 – Recommended future funding profile with future predicted extent of over intervention assets

Figure Agg 3 comes from the same modelling process as Agg 2. Accept that here a recommended total renewal expenditure profile has been developed that will achieve a desired condition outcome within a designated time frame

The Moloney financial modelling software has the capacity to develop a recommended renewal funding profile that will deliver a nominated extent of the asset base to be over the selected intervention level within a selected time frame. A global outcome can be set for the whole roads group. In this way the model is used to allocate funding across all road sub assets based on need rather than historic expenditure. There are 3 variables that are input and in most cases the same 3 variables are used for all of the road sub assets, however this can be varies if required.

We normally attempt to commence the year one expenditure with council's present expenditure level (at a whole of roads group level). In this way we can deliver an achievable outcome. If additional funding is required then it will come as an annual percentage increase. If total funding is sufficient then there may be some reallocation between asset classes based on need.

The three Variables used for the sealed pavement asset modelling are as detailed below:

- *Desired extent of over intervention assets* - 70% of present level of - 5.24%
- *Time to achieve this* - 20 - Years
- *Annual percentage increase in renewal expenditure* - 0%

Figure Agg 3 has been developed through the Moloney model such that the extent of over intervention assets after 20-years will be at 30% of the current level of 5.24%. This current level is considered to be quite high and the planned renewal expenditure pattern is predicted to reduce this to 1.55% after 20-years.

Other scenarios can be run to achieve different outcomes on different time frames. The modelling function employed here is extremely versatile and it is strongly recommended that council spend the time to understand it and use it, as it will be a most valuable tool in the development of the 10-Year financial plan for your organization.

Sub Asset Description	Average Planned renewal expenditure next 5 Years	Annual Depreciation or Average Long term Annual Demand	Present Capital Renewal Demand From Modelling	Peak Capital Renewal Demand From Modelling	Year of Predicted Peak Demand	Recommended Average Funding level for the next 5-years	% of Present Renewal Demand (From Model) Being Met	% of Annual Depreciation Being Met
Sealed Pavements	\$0	\$215,398	\$50,000	\$112,000	2035	\$75,000	0%	0%
Sealed Surfaces	\$201,000	\$250,635	\$520,000	\$520,000	2016	\$215,000	39%	80%
Unsealed Pavements	\$845,000	\$860,530	\$910,000	\$910,000	2016	\$537,000	93%	98%
Kerbs	\$0	\$59,088	\$80,000	\$80,000	2016	\$38,000	0%	0%
Footpaths	\$20,000	\$31,765	\$59,000	\$59,000	2016	\$22,000	34%	63%
Totals	\$1,066,000	\$1,417,416	\$1,619,000	\$1,618,000	2016	\$887,000	66%	75%

Figure Agg 4 – Summary Table of Current & Required Renewal Expenditure Levels

Figure Agg 4 provides an alternative way of comparing the renewal demand with the present renewal expenditure levels. The key figures within the table are located in the two far right columns and represent the percentage of the renewal demand that is being met.

Southern Mallee District Council is currently funding it's renewal program at \$1,066,000 pa which represents 75% of the consumption rate. But this figure does include as additional \$900,000 over the next 2 years coming from the roads to recovery program. Without this additional funding the long term average renewal expenditure is at around \$887,000 pa.

The Moloney financial modelling software does enable you to cost a variety of future condition outcomes and Council is encouraged to examine the many funding options open to them. Within this report we looked at what could be achieved by taking the long term average planned renewal expenditure level of \$887,000 pa and using the Moloney model to distribute it purely on a needs basis. What was found was that with some redistribution of the total funding between the asset classes we could achieve a slow but steady overall improvement in asset condition over the next 20-years.

It should be noted that all modelling was undertaken in today's dollars and that the report assumes that year by year the total planned renewal expenditure will be lifted to cater for inflation. Our model does have the capacity to deliver predicted renewal demand graphs that allows for inflation, But over a 20-year time frame the growth in renewal funding due to inflation alone is quite high and can be misleading if not frightening.

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For a detailed Explanation of the Moloney Model its assumptions and operations please refer to the document "Model All Explanation". This document can be obtained from our web site without the need to log on as a user.

