Asset Management Plan

Transport Infrastructure (Sealed Roads)

Policy Number: POL12/70
Adopted: 25/06/2007
Reaffirmed: 28/07/2009
Amended: 15/04/2014
Minute Number: MIN07.869, MIN09.978, MIN14.266
File: 25442E
Produced By: Assets and Works Group
Review Date: 01/12/2016

For more information contact the Assets and Works Group

*Administrative Centre, Bridge Road, Nowra • **Telephone (02) 4429 3111** • Fax (02) 4422 1816 • PO Box 42 Nowra 2541*
*Southern District Office – Deering Street, Ulladulla • **Telephone (02) 4429 8999** • Fax (02) 4429 8939 • PO Box 737 Ulladulla*

council@shoalhaven.nsw.gov.au • www.shoalhaven.nsw.gov.au

CONTENTS

1. EXECUTIVE SUMMARY

Shoalhaven City Council provides approximately 1,671 Kilometres of roads that play a critical and important part in the Shoalhaven transport network and that supports the delivery of many services provided by the Council.

Approximately 1,366 Kilometres of these roads are sealed roads and the effective management of these assets is essential for the provision of access to rural communities; the movement of primary produce to markets; movement within State Forests and defence training areas; haulage roads for the quarry & timber industries, recreational and tourist pursuits. It is to be noted that the length of sealed road has increased by about 18% since 2007.

Shoalhaven City Council is committed to providing a quality road network for the benefit of residents, industry and visitors. To this end Council considered a report in March, 2012 and adopted a recommendation to increase the funding for road renewal by $1Million or more.

Additional funding has been provided with annual increases over the next ten (10) years. Modelling indicates that the funding to provide a satisfactory and sustainable Level of Service is achievable in the next 10 to 20 years.

However, modelling outcomes are sensitive to the condition data and it is identified that a detailed review of condition data is essential to confirm future funding needs. The *Australian Road Research Board* (ARRB) was engaged to undertake a preliminary review of data capture practices and the road pavement modeling systems. This review highlighted where improvements could be made. Subsequently, a new pavement management system has been implemented through a 'bureau service' hosted by ARRB.

1.1. The Purpose of the Plan

The purpose of this Plan is to specify current and future asset extent and condition, funding needs and long term strategies and capital programs. This Plan was first adopted by Council in June, 2007 and subsequently reviewed in July, 2009.

This Plan is separate to but complements other Transport Asset Management Plans such as, Unsealed Roads, Bridges, Kerb & Gutter, Footpaths & Cycleways, Car Parks, Traffic Facilities and Bus Shelters.

The preparation and implementation of this Plan is the responsibility of the Asset Manager, under guidance from the Director, Assets and Works.

1.2. Asset Description

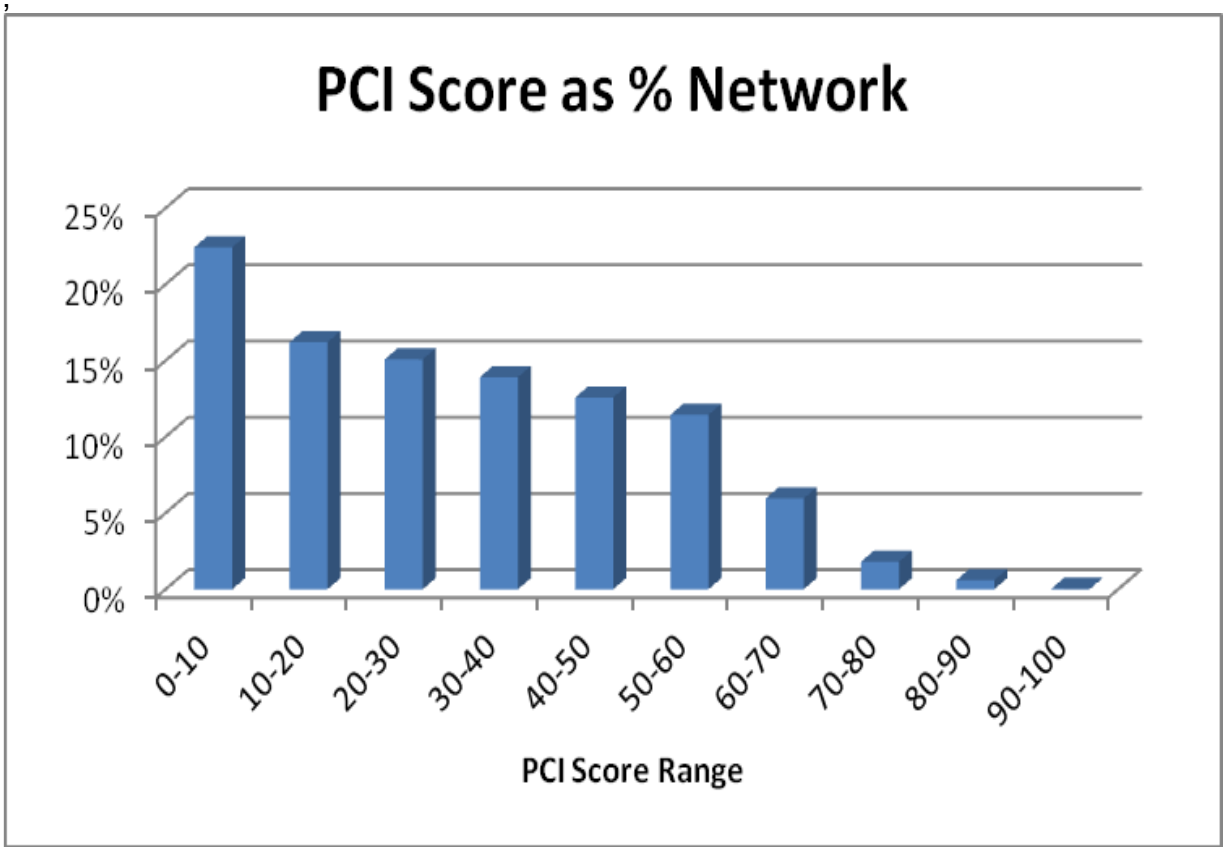
This Plan covers all sealed roads (and road shoulders) within the council area except for State roads (Princes Hwy & Moss Vale Rd). There is 1366Km of sealed road as at 30th June, 2012.

This information is based on data in "Conquest", Council's corporate asset register. Details of the road network are regularly updated from works records and from details from subdivision plans.

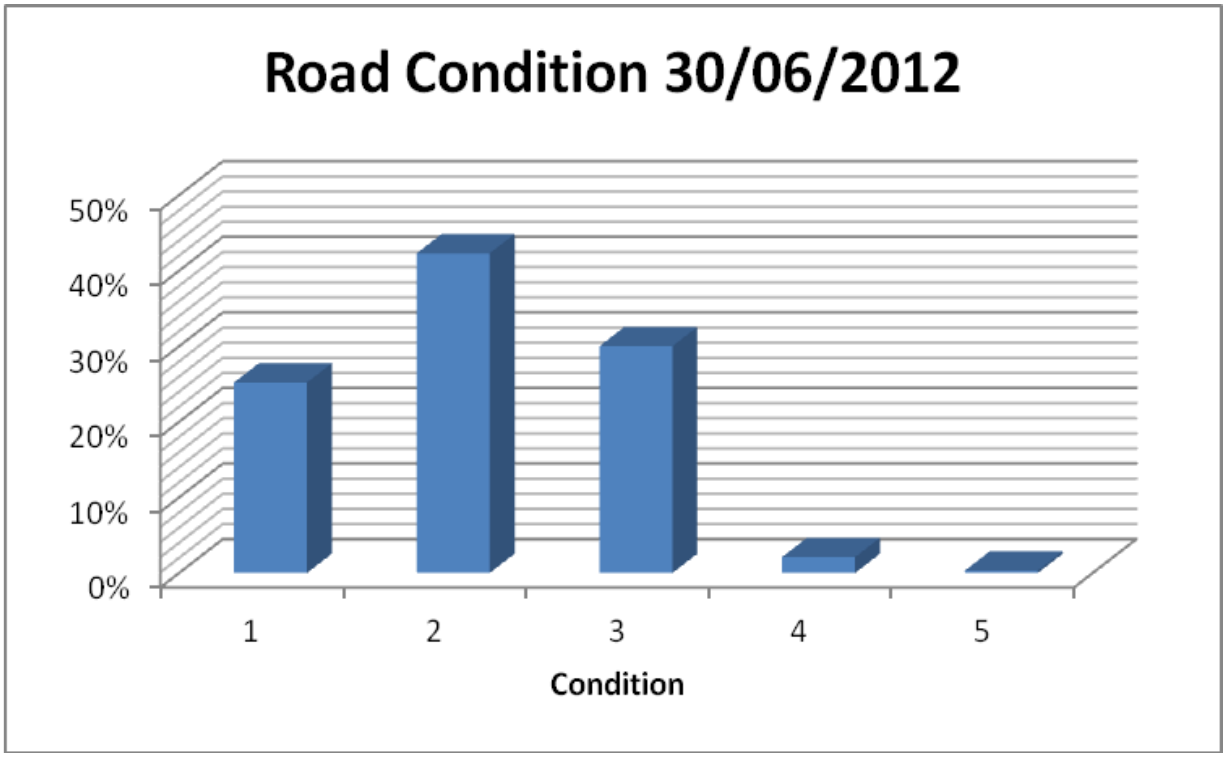
Further details of the road network are shown in the following table –

	Urban Km	Rural Km
Arterial	77.82	163.72
Collector	63.77	234.47
Local	586.36	239.98
Total	727.95	638.17

The condition of the road network is indicated in the following charts –
;



The PCI is the Pavement Condition Index as calculated from ratings of the extent of cracking, deformation and repairs and condition of the surface binder. A PCI of 0 indicates an as-new pavement and over 80 would indicate pavement failure.



The condition ratings have been based on the PCI where 1.=.Very Good; 2 = Good; 3 = Fair; 4 = Poor and 5 = Very Poor

1.3. Levels of Service

The perceptions of the community on the service levels provided by the road network normally relate issues such as: -

- Accessibility/location,
- All weather access,
- Travel times,
- Safety,
- Ride quality,
- Traffic management structures, and
- Visual/environmental attributes.

Measurable factors that directly contribute to the ability of the sealed road to deliver an acceptable level of service typically include:

- Condition of existing surface,
- Quality and condition of existing pavement
- Climatic conditions,
- Surface drainage
- Scouring and erosion potential of edges,
- Condition of shoulders,
- Traffic volume and percentage of heavy vehicle usage,
- Road gradient and alignment,
- Pavement marking and road signage,
- Roadside drainage and

- Most importantly, user satisfaction normally measured by number and type of service requests.

The current overall PCI for the road network is 32 and the extent of the network in Condition 3 (Fair) or better is 94.3%. It is considered that these measures are indicators of the current Level of Service. These measures should be monitored annually to track any changes in the network condition.

It is considered that the sustainable Level of Service is to maintain the network at current condition. Modelling indicates that the current proposed funding levels as shown in the 10 Year Long Term Financial Plan (LTFP) may be sufficient to maintain the network in current condition. However, it will be essential to regularly monitor condition to ensure that the funding strategy is achieving the desired target as the rate of deterioration of roads accelerates with age and if maintenance levels are not appropriate.

Another measure is 'Customer Requests' for maintenance action and this should also be monitored annually. The following table shows past data –

With regard to user satisfaction, maintenance staff advises that they are currently holding the situation in responding to customer service requests and satisfying immediate risk management targets.

The following table shows the number of customer service requests/defects recorded for roads and associated assets/issues.

Description	2001-02	2002-03	2003-04	2010/11	2011/12
Pot hole and edge break repairs	482	466	553	619	838
Shoulder grading and repairs	710	359	302	352	428
Removal of spilled or loose materials	12	39	19	61	27
Street sweeping - all areas	67	85	62	112	157
Totals	**1,271**	**949**	**936**	**1052**	**1450**

1.4. Future Demand

Increasing demands have been identified as –

- An average annual increase in asset extent arising from new development and the sealing of gravel roads.
- Increasing traffic volumes and heavy vehicles from population growth requiring consideration of road widening/additional lanes to increase existing road capacity and/or provide new road links
- An increasing customer expectation (undocumented) for improved road condition.

The sealed road network has been increasing at the rate of 1.5% for the past 5 years. It is expected that this rate will continue.
Traffic volumes have increased by about 3% per annum for collector and arterial roads.

Annual maintenance/operating budgets will need to be increased by 1.5% plus inflation to be maintained at existing levels.

Major new/enhancement projects are indicated in the Contributions Plan (Section 94) and details included expected timeframes can be viewed at – http://shoalhaven.nsw.gov.au/MyCouncil/Policiesplansstrategies/Planningregister.aspx

1.5. Lifecycle Management Plan

Maintenance activities are primarily determined under the *Sealed Road Risk Management Procedure.*

Other essential programmes are –

- Reseal Program
  - Determined annually from condition data for the road surface.
- Repair Program
  - Determined annually from a prioritised list based primarily on condition data, traffic volume and traffic speed.

1.6. Financial Summary

The predicted funding levels for a sustainable Level of Service for the next 20 years are shown in the following table.

	Mntce	Renewal	New	Total	Current Funding in LTFP	Funding Gap
2013/14	$3,477,500	$6,160,000	$2,953,158	$12,590,658	$9,646,500	$2,944,158
2014/15	$3,522,913	$7,090,000	$6,334,158	$16,947,070	$15,451,213	$1,495,858
2015/16	$3,569,006	$7,790,000	$6,386,158	$17,745,164	$20,359,006	-$2,613,842
2016/17	$3,615,791	$8,130,000	$6,382,158	$18,127,949	$11,745,791	$6,382,158
2017/18	$3,663,278	$8,620,000	$2,671,158	$14,954,436	$12,283,278	$2,671,158
2018/19	$3,695,411	$9,370,000	$2,544,158	$15,609,569	$13,103,411	$2,506,158
2019/20	$3,727,865	$9,100,000	$1,100,824	$13,928,689	$14,345,865	-$417,176
2020/21	$3,760,644	$9,440,000	$1,653,000	$14,853,644	$13,200,644	$1,653,000
2021/22	$3,793,750	$10,300,000	$2,313,000	$16,406,750	$15,093,750	$1,313,000
2022/23	$3,827,188	$9,600,000	$2,193,000	$15,620,188	$14,427,188	$1,193,000
2023/24	$3,860,960	$9,600,000	$1,530,000	$14,990,960	$14,660,960	$330,000
2024/25	$3,895,069	$9,600,000	$3,700,000	$17,195,069	$14,695,069	$2,500,000
2025/26	$3,929,520	$9,600,000	$2,200,000	$15,729,520	$14,729,520	$1,000,000
2026/27	$3,964,315	$9,600,000	$2,200,000	$15,764,315	$14,764,315	$1,000,000
2027/28	$3,999,458	$9,600,000	$2,200,000	$15,799,458	$14,799,458	$1,000,000
2028/29	$4,034,953	$9,600,000	$200,000	$13,834,953	$14,834,953	-$1,000,000
2029/30	$ 4,070,802	$9,600,000	$200,000	$13,870,802	$14,870,802	-$1,000,000
2030/31	$4,107,010	$9,600,000	$200,000	$13,907,010	$14,907,010	-$1,000,000
2031/32	$4,143,580	$9,600,000	$200,000	$13,943,580	$14,943,580	-$1,000,000
2032/33	$4,180,516	$9,600,000	$200,000	$13,980,516	$14,980,516	-$1,000,000
Totals:	$76,839,529	$181,600,000	$47,360,770	$305,800,299	$287,842,829	$17,957,470

The majority of the funding shortfall is funding shortfall for New/Enhancement capital projects.

1.7. Asset Management Practices

Council currently has collected extent and condition data for all road segments. The data is stored in Council's corporate asset register, *Conquest.* Council also has purchased the *Conquest* module *Road Surface Manager* to model condition for different funding scenarios and to predict forward reseal programs. In addition, Council has the *Moloney Financial Modeller* for use with all asset classes to predict renewal funding needs. Condition data and other road attributes have not yet been uploaded to the new pavement management system hosted by ARRB.

Condition data is regularly updated following improvement works and also regular condition audits are undertaken although to no set schedule. The adopted *Defect and Risk Management Procedure* specifies that defect/condition audits be undertaken at an average interval of every 4 years. This equates to a rate of audit of 7Kms/week. This is a very low rate and this aspect needs to be reviewed. However, the use of video data capture will be employed more extensively in the future.

1.8. Monitoring and Improvement Programme

Council have committed to providing funding of about $80 Million over the next 10 years for pavement and surface renewal. It is essential to undertake adequate monitoring to track asset condition to gauge the impact of this additional funding.

The following performance measures are proposed –

- The annual number of Customer Requests for maintenance activities.
- Compliance with the response times indicated in the Risk Management Procedure
- Annual monitoring of overall road condition (PCI).
    - Target – 32 or less
- Annual monitoring of the extent of the road network in Condition 3 (Fair) or better.
    - Target – 94% or better

2. INTRODUCTION

2.1. Background

This Plan covers all sealed roads (and road shoulders) within the council area except for State roads (Princes Hwy and Moss Vale Rd). There is 1366Km of sealed road as at 30th June, 2012.

The purpose of this Plan is to specify current and future asset extent and condition, funding needs and long term strategies and capital programs. This Plan was first adopted by Council in June, 2007 and subsequently reviewed in July, 2009.

This Plan is separate to but complements other Transport Asset Management Plans such as, Unsealed Roads, Bridges, Kerb and Gutter, Footpaths and Cycleways, Car Parks, Traffic Facilities and Bus Shelters.

The preparation and implementation of this Plan is the responsibility of the Asset Manager, under guidance from the Director, Assets and Works.

2.2. Goals and Objectives of Asset Ownership

Shoalhaven City Council provides approximately 1,366Km of road that is critical for the Shoalhaven transport network and that supports the delivery of many services provided by the Council and others.

The effective management of these assets is essential for the provision of access to communities; the movement of goods and services, haulage roads for industries, recreational and tourist pursuits.

Shoalhaven City Council is committed to providing a quality road network for the benefit of residents, industry and visitors.

The ***Community Strategic Plan*** includes the following 'Vision 2020' –

"We will work together in the Shoalhaven to foster a safe and attractive community for people to live, work, stay and play; where sustainable growth, development and environmental protection are managed to provide a unique and relaxed lifestyle."

Although not specifically mentioned, roads are essential for access and transport to cater for the above.

The relevant ***Strategies*** identified in the ***Community Strategic Plan*** are –

2.4.1 Develop and acquire infrastructure and assets to meet the needs of the City's growing population while maintaining current asset service levels.

2.4.7 Develop priority transport networks and associated infrastructure to meet the changing needs of the City

5.1.6 Increase funding of asset and infrastructure maintenance and renewal programs as the primary capital expenditure priority, directed by Council's Asset Management Policy, Strategy and Plans.

5.1.7 Prioritise expenditure on asset maintenance and renewal to address the need for more investment in roads, pedestrian and cycle paths, and the backlog of renewal works.

5.1.8 Review Asset Management Plans with particular regard to the levels of service required from infrastructure and assets, guided by the Community Strategic Plan and community engagement responses.

2.3. Plan Framework

The key guiding documents for this AMP are:

Council's *Asset Management Policy*

The policy is used as a base of principles and requirements to create an AMP that is in accordance with the organisation's strategic plan. (2011, International Infrastructure Management Manual)

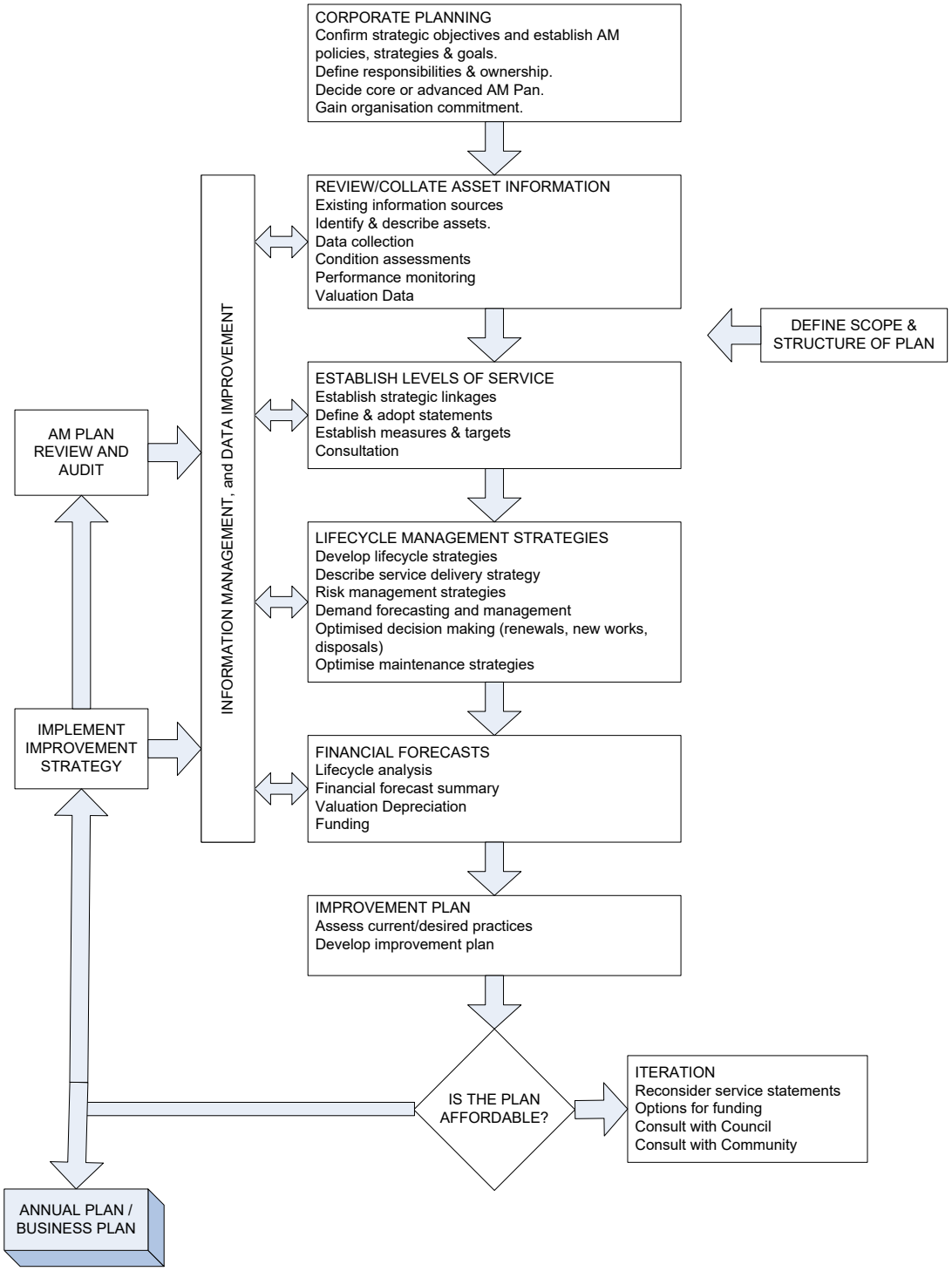
Council's *Asset Management Strategy*

A strategy for asset management covering development and implementation of plans and programs for asset creation, operation, maintenance, rehabilitation/replacement, disposal and performance monitoring to ensure desired level of service and other operational objectives are achieved at optimum cost.

The basic key elements of the AMP consist of:

- Level of service – specifying the services and levels of service to be provided by Council
- Future demand – how this will impact on future service delivery and how this is to be met
- Life cycle management – how Council will manage its existing and future assets to provide the required services
- Financial summary – what funds are required to provide the services
- Plan Improvement and Monitoring – how the plan will be monitored to ensure it is meeting Council's objectives

A road map for preparing an asset management plan is shown below:



Road Map for preparing an Asset Management Plan
Source: IPWEA, 2006, IIMM, Fig 1.5.1, p 1.11.

2.4. Core and Advanced AM

This Asset Management Plan is considered to be at a level between Core and Advanced. It is identified (and verified through modelling) that financial analysis is very sensitive to asset condition. Although best practice has been followed in drafting asset auditing procedures there is still doubt as to the accuracy of council's current asset condition data. The Australian Road Research Board reviewed council's procedures and asset computer systems. It will then be essential to undertake a revised asset condition review for both sealed surfaces and

road pavements and then undertake modelling again to verify long term financial needs and projected asset condition. This modelling and optimisation will be undertaken using Deighton's dTims pavement management system software hosted on ARRB's website. dTims is currently considered 'best practice' software and is used by most State roads authorities and by all Local Government authorities in Western Australia.

3. LEVELS OF SERVICE

3.1. Customer Research and Expectations

It is proposed to place the draft revised Asset Management Plan (Sealed Roads) on public exhibition and comment before formal adoption by Council.

Previous Community Surveys have indicated that residents desire to have an improved road network. However, previous surveys have not been concise enough to distinguish the intent of this customer expectation.
That is - do customers want - 'smoother' road surfaces, better road alignment, better road width, improved shoulders, improved linemarking/signs or fewer potholes?

There is a need to undertake a study to define acceptable and/or sustainable service levels with the community so that appropriate distribution of available funding can be made. This action is not currently resourced but options are under consideration and will be a part of the community engagement program for the review of all asset management plans.

3.2. Strategic and Corporate Goals

Council's goal in managing assets is to meet the required level of service in a sustainable manner for present and future stakeholders. The key elements to strategic goals of asset management are:

- Demonstrating responsible stewardship;
- Taking a life cycle approach to asset ownership;
- Defining the infrastructure assets physically and financially;
- Providing a defined Level of Service and monitoring the performance against service levels and service expectations;
- Understanding and meeting the demands of growth through demand management and infrastructure investment;
- Managing risks associated with asset failure; and
- Support to long term financial planning.

Acting as a leader in the delivery of social, financial, environmental, and operational objectives, Council needs to ensure good governance and administrative support for the Council and organisation.

The Objectives of the Asset Management Policy include -

- *Council recognises that the preference is to allocate resources to maintain and renew existing assets.*

- *Council recognises the need to maintain its asset base and will target a long term asset sustainability index (actual replacement/renewal budget versus required funding as per AMPs) averaging 90-95% for each of the asset types above.*
- *There will be community consultation in the development of appropriate 'levels of service' and asset performance shall be measured against these levels.*
- *Risk management, environment and sustainability will be considered in the development of asset strategies.*
- *Annual operation/maintenance budgets shall include an allowance for additional costs arising from addition of new assets through development, acquisition, dedication or leasing and/or licencing as well as an allowance to cover cost increases in line with indices relevant to each asset class.*
- *Adequate resources shall be provided to undertake regular agreed levels of inspections to identify hazards and asset condition.*

3.3. Legislative Requirements

Changes to the Local Government Act require Councils to consider asset management as part of their Resourcing Strategies. Guidelines issued by the NSW Division of Local Government (DLG) are referenced in the legislation and Councils must comply with these.

The DLG has the following requirements with regard to asset management –

- Each Council must account for and plan for all of the existing assets under its ownership, and any new asset solutions proposed in its Community Strategic Plan and Delivery Program.
- Each Council must prepare an *Asset Management Strategy* and Asset Management Plan/s to support the Community Strategic Plan and Delivery Program.
- The *Asset Management Strategy* and Plan/s must be for a minimum timeframe of 10 years.
- The *Asset Management Strategy* must include a council endorsed Asset Management Policy.
- The *Asset Management Strategy* must identify assets that are critical to the council's operations and outline risk management strategies for these assets.
- The *Asset Management Strategy* must include specific actions required to improve council's asset management capability and projected resource requirements and timeframes.
- The Asset Management Plan/s must encompass all the assets under a council's control.
- The Asset Management Plan/s must identify asset service standards.
- The Asset Management Plan/s must contain long term projections of asset maintenance, rehabilitation and replacement costs.

However, there are no specific legislative requirements with regard to the provision, maintenance and renewal of sealed roads, except the Roads Act which has certain 'operational' requirements for roads.

3.4. Current Level of Service

The perceptions of the community on the service levels provided by the road network normally relate issues such as: -

- Accessibility/location,
- All weather access,
- Travel times,
- Safety,
- Ride quality,
- Traffic management structures, and
- Visual/environmental attributes.

Measurable factors that directly contribute to the ability of the sealed road to deliver an acceptable level of service typically include:

- Condition of existing surface,
- Quality and condition of existing pavement
- Climatic conditions,
- Surface drainage
- Scouring and erosion potential of edges,
- Condition of shoulders,
- Traffic volume and percentage of heavy vehicle usage,
- Road gradient and alignment,
- Pavement marking and road signage,
- Roadside drainage and
- most importantly, user satisfaction normally measured by number and type of service requests.

The average network pavement condition index (average PCI) was 32 at 30th June, 2012 and it is considered that this can be deemed as the current condition based Level of Service. It is also noted that currently 94.3% of the network is in Condition 3 (Fair) or better. Both of these indicators define the current Level of Service.

3.5. Desired Level of Service

The desired Level of Service is, as minimum, to retain assets in current condition and sufficient funding may have been provided in the LTFP to retain current asset condition. However, after community engagement it may be decided that the desired level of service should be to improve network condition to 97% in Fair or better, for instance.

4. FUTURE DEMANDS

4.1. Demand Drivers

Increasing demands have been identified as –

- An average annual increase in asset extent arising from new development and the sealing of gravel roads.
- Increasing traffic volumes and heavy vehicles from population growth and increasing visitations requiring consideration of road widening/additional lanes to increase existing road capacity and/or provide new road links
- An increasing customer expectation (undocumented) for improved road condition.

4.2. Demand Forecasts

The sealed road network has been increasing at the rate of 1.5% for the past 5 years. It is expected that this rate will continue.
Traffic Volumes have increased by about 3% per annum for collector and arterial roads.

4.3. Demand Impacts on Assets

The demand impacts on roads have not yet been assessed.

4.4. Demand Management Plan

There is currently no Demand Management Plan apart from the Development Contributions Plan (Section 94).

4.5. Asset Programmes to Meet Demand

The only Programme is the Contributions Plan as indicated in Section 5.5.

5. LIFECYCLE MANAGEMENT PLAN

5.1. Background Data

5.1.1. Physical Parameters

The length of the sealed road network is 1,366.12Km (9,878,810 sqm) compared to 1,156.49Km in June, 2007. This increase would be due to sealing of gravel roads approximately 60Km and new roads arising from subdivisions, approximately 150Km.

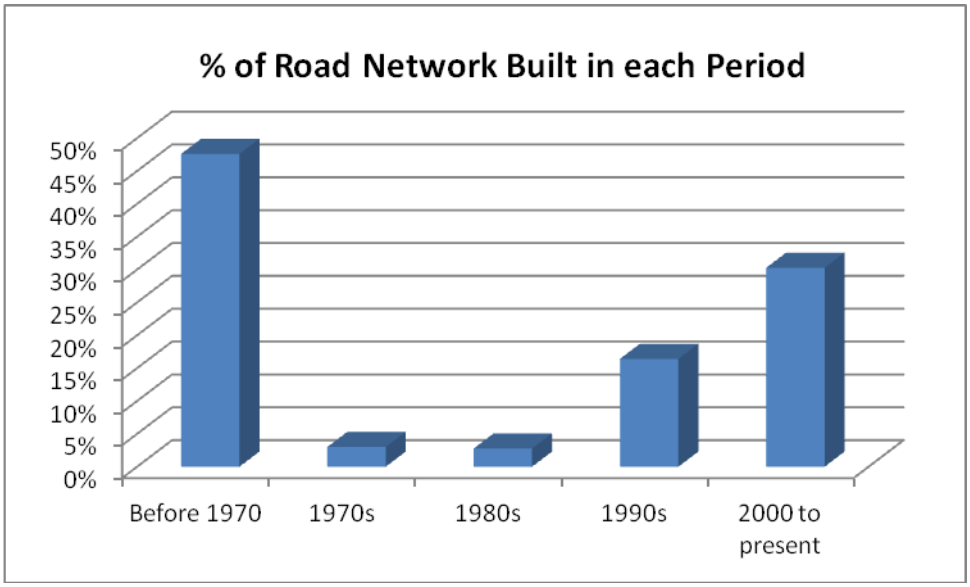
This equates to an annual average increase of approximately 1.5%. However, with the downturn in developments and the easing of the road sealing programs, this % increase is not expected to continue at the same rate.

The network (as at 30/06/2012) consisted of –

	Urban Km	Rural Km
Arterial	77.82	163.72
Collector	63.77	234.47
Local	586.36	239.98
Total	727.95	638.17

These roads do not include the State Roads of Moss Vale Rd and the Princes Hwy as these are not Council's responsibility for the road pavement.

The approximate age distribution of the roads is shown on the following chart. It is to be noted that nearly half the network was constructed before 1970.



5.1.2. Asset Capacity / Performance

Information/data is not available to consider whether individual roads comply with current design standards with regard to lane width or whether the traffic volume on the roads exceed design capacity. Some studies have been undertaken for Illaroo Rd, North Nowra, Kalandar St, Nowra, the Nowra CBD and Yalwal Rd and future projects have been identified for these roads.

However, a future planning project (when resources/funding are available) is to review all roads and prepare a detailed enhancement program based on design capacity Levels of Service.

5.1.3. Asset Condition

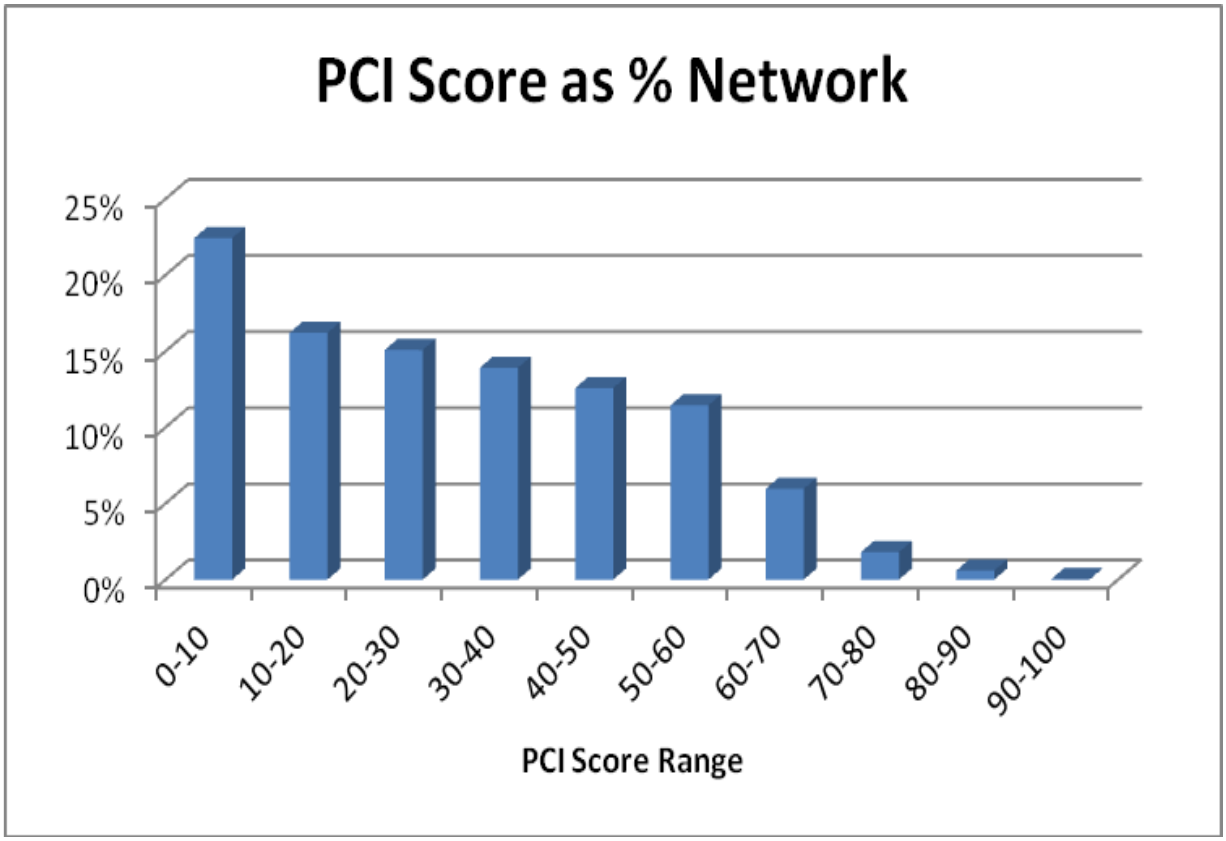
All roads are inspected on a regular basis in accordance with the Risk Management Procedure and also for condition. Council previously used the *Conquest* module 'Road Surface Manager' to determine road condition and predict reseal and renewal programs and funding needs. Each road has recorded a score of 1 to 5 for the following condition ratings –

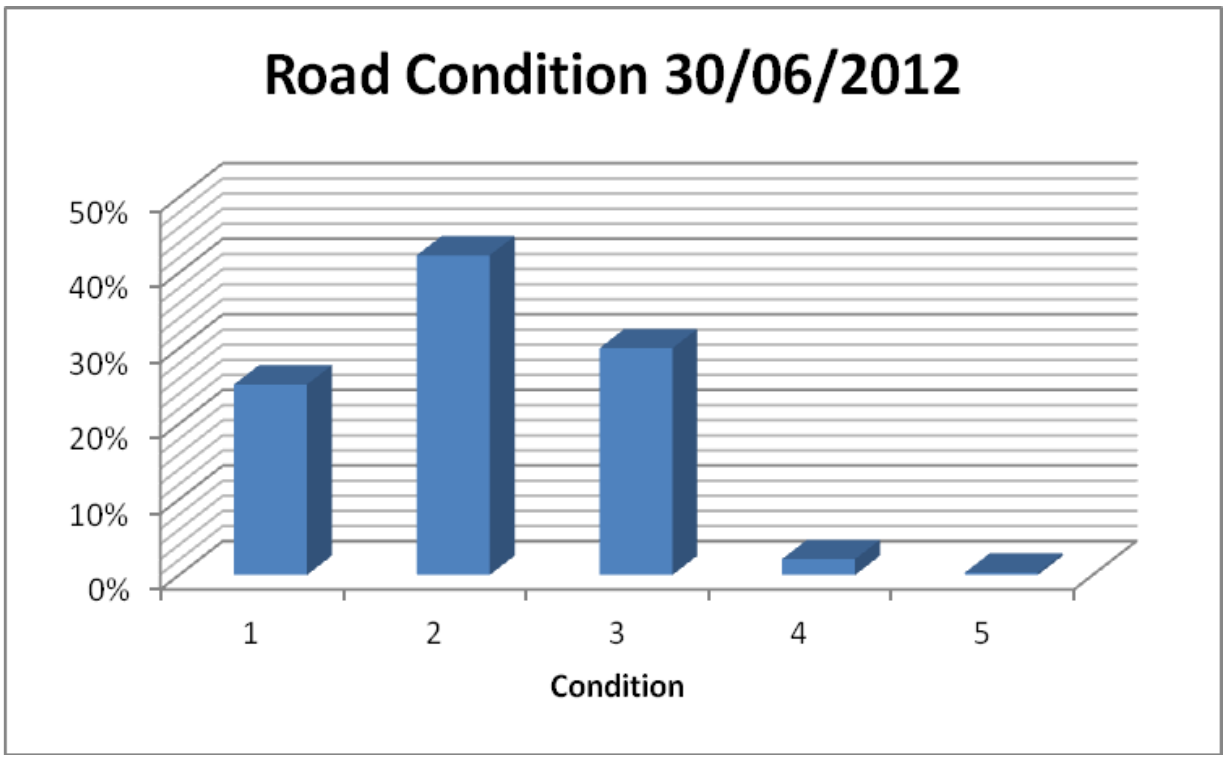
- Cracking
- Patching
- Binder and
- Deformation.

These scores then are used to assign an overall condition score (PCI) of 0 to 100 for each road segment. The following charts indicate the overall network condition. The first chart shows the PCI distribution and the second the % of the network in Conditions 1 to 5 based on –

- Condition 5 (Very Poor) – Asset Unserviceable (PCI>=85)
  - Critical, beyond repair
- Condition 4 (Poor) – Requires Major Reconstruction (PCI>=70, <85)
  - Ranges from poor to critical
- Condition 3 (Fair) – Deterioration Evident (PCI>=40, <70)
  - Ranges from fair to marginal
- Condition 2 (Good) – Superficial Deterioration (PCI>=15, <40)
  - Ranges from generally good to fair

- Condition 1 (Very Good) – Near Perfect (PCI<15)
    - Ranges from new to good



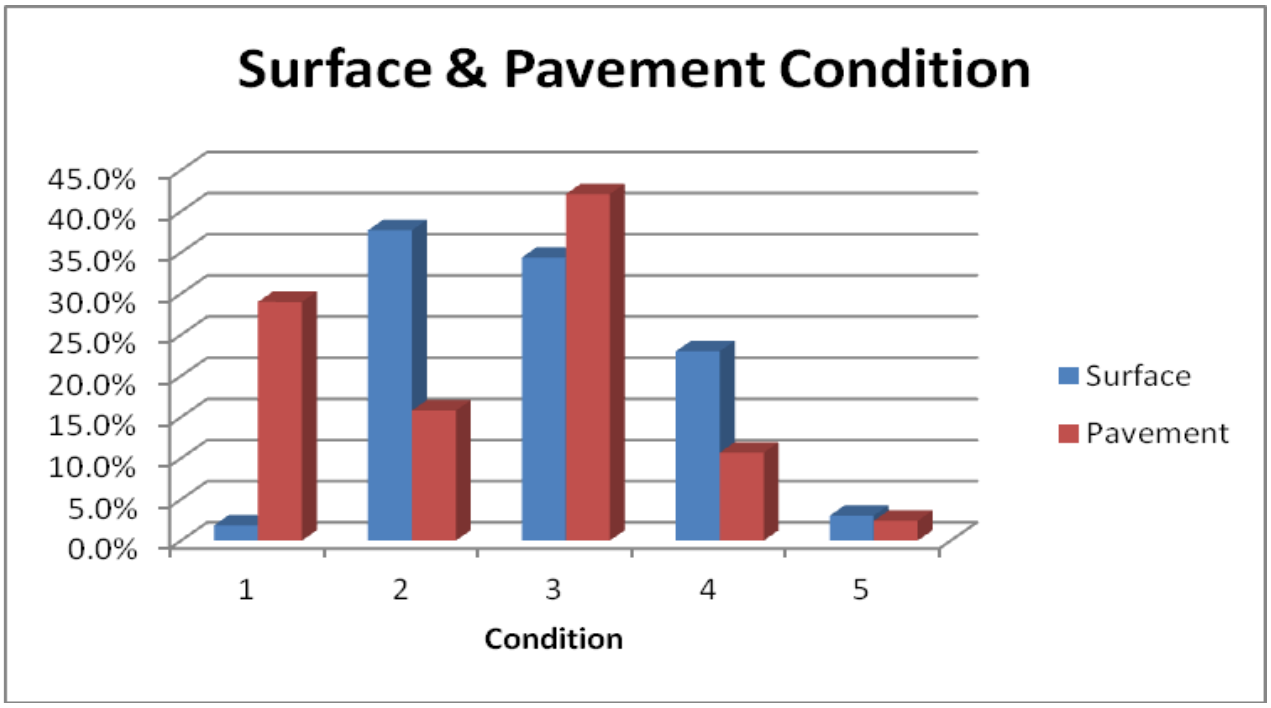


These charts show overall condition of the road segments. However, a sealed road consists of the bitumen surface as well as the gravel pavement. Sealed roads also include concrete and paver pavements/surfaces but these are a small % of the network.

The following chart shows the condition (1very good to 5 very poor) of the surface and the pavement. These scores are calculated by –

- Surface Binder Score
- Pavement The rating scores were used as follows for each road segment to determine an overall pavement rating.
    - Cracking*0.5+Patching*1+Deformation*2
    - The maximum score is 17.5 and the condition will be assigned as shown in the following table –

Score	Condition
0-3.5	1
3.6-5	2
5.5-10	3
10.5-13	4
>13	5



5.1.4. Asset Valuations

The last valuations at 30/06/2009 provided the following figures –

	Current Replacement Cost	Residual Value	Depreciable Amount	Accumulated Depreciation	Depreciated Replacement Cost	Annual Depreciation
Sealed Road Pavement	$468,583,557	$117,145,889	$351,437,668 ,	$86,129,900	$265,307,768	$5,409,995
Concrete Pavement	$3,272,330	$0	$3,272,330	$598,441	$2,673,889	$54,539

Paver Pavement	$623,508	$0	$623,508	$251,737	$371,770	$15,588
Bitumen Surface	$113,554,194	$0	$113,554,194	$40,668,864	$72,885,330	$4,779,730
Earthworks	$63,139,472	$63,139,472	$0	$0	63139472	$0

The following Unit Rates and Useful Lives were used for the valuations.

Asset Type	Unit Rate	Useful Life	Comments
Road Surface			
Surface Asphalt (Urban) – Arterial	$40/m^2	25	Based on current SCC contract rates and includes allowance for milling.
Surface Asphalt (Urban) – Collector	$40/m^2	30	Based on current SCC contract rates and includes allowance for milling.
Surface Asphalt (Urban) - Local	$40/m^2	40	Based on current SCC contract rates and includes allowance for milling.
Surface Asphalt (Rural)	$28/m^2	40	Based on current SCC contract rates and no allowance for milling but $5/m2 prep cost.
Surface Flush Seal - Arterial	$8.60/m^2	14	Based on current SCC contract rates = $3/m2 prep cost
Surface Flush Seal - Collector	$8.60/m^2	18	Based on current SCC contract rates = $3/m2 prep cost
Surface Flush Seal - Local	$8.60/m^2	24	Based on current SCC contract rates = $3/m2 prep cost
Surface – Cold Overlay	$12/m^2	12	Based on current SCC contract rates. Currently, no segments with this surfacing
Road Pavement			
Flexible pavement - Arterial	$63.17/m^2	50	Based on current SCC internal rates. 500mm thick. Excavate and replace. Life based on median of SA Council current practices. (Tonkin - March,2009)
Flexible pavement – Collector	$54.54/m^2	60	Based on current SCC internal rates. 400mm thick. Excavate and replace. Life based on median of SA Council current practices. (Tonkin - March,2009)
Flexible pavement - Local	$42.56/m^2	80	Based on current SCC internal rates. 300mm thick. Excavate and replace. Life based on median of SA Council current practices. (Tonkin - March,2009)
Concrete pavement	$185/m^2	60	Based on current SCC internal rates. 150mm on 200mm gravel base
Brick/Paver pavement	$205/m^2	40	Based on current SCC internal rates. 75mm paver on 300mm gravel

5.1.5. Historical Data

There is limited historical data. Expenditure history is shown in Section 6.1.
The original Sealed Road AMP (June, 2007) indicated that there were annual funding shortfalls of $1.5Million for Reseals (needed $3Million/yr) and $1Million for Maintenance. The original AMP did not give clear guidance as to Renewal needs. Historical condition data is not available.

5.2. Infrastructure Risk Management Plan

Council formally adopted the “Sealed Road Risk Management Procedure” (*POL09/80)* in July 2003. The Risk Procedure was reviewed in August, 2009. The procedure provides as follows:-

This Road Pavement Risk Management Procedure forms a part of the corporate Risk Management Policy. The development of a risk management procedure for the road

pavement asset type is a specific requirement of the corporate Policy. For the purpose of this Procedure, "road pavement" is defined as the total constructed width of a carriageway or formation including sealed and unsealed shoulders but not including any kerb and guttering or other longitudinal drainage.

The purpose of this procedure is to reduce Council's exposure to liabilities associated with the maintenance and repair of road pavements and it has the following objectives:

- *To apply the risk management principles of identification, evaluation and treatment of risks to road pavement maintenance*
- *To implement a formal system of road pavement inspections which record identified risks including defined hazards*
- *To develop and maintain a risk register for road pavements through inspections and incorporate reports of road pavement hazards received from the public and/or employees*
- *To implement a method of prioritising the risks identified by the various sources*
- *To establish reasonably practicable response times, in which to effect repairs or provide temporary warnings, for the risks identified*
- *To establish a system of documenting all important steps of the Procedure to allow ongoing review and to provide evidence to defend road pavement-related claims against Council*

The procedure set out the following Inspection intervals:

There should be provision for "special inspections" to identify and record any defects which may require a quicker response to suit special events or anticipated higher deterioration levels caused by unexpected incidents

Road Type	**Hazard/Risk Identification Inspection Interval**	**Distribution of Inspections**
Sealed Arterial Roads	Monthly	12 in any 12 month period
Sealed Collector Roads	6 Monthly	2 in any 12 month period
Sealed Local Roads	12 Monthly	1 in any 12 month period

Definitions for minimum recording levels of hazards are as follows

Hazard Code	**Hazard Description**	**Recording Level**
1200	Pot holes and Edge Breaks	150mm in diameter or 150mm from design edge of seal both at least 50mm deep
1240	Surface Irregularity	40mm above Design level of road
1250	Edge drop-off	50mm below Design level of road
1280	Spilled or Loose Material	Any granular material deeper than 10mm and a minimum of 1 sq metre in area

Priorities are defined in the procedure and are generally on road hierarchy as other ranking systems are considered to be too complex to be consistently and meaningfully applied by all employees.

The maximum response times listed in Table 3 below will be met for the various types of risks. The response will be either:

- a recorded inspection to verify the extent and location of the risk, or,
- the erection of appropriate warning devices, or,
- the temporary or permanent repair to reduce the risk.

	Risk/Hazard Type			
Road Type	Pot Holes	Edge Drop Off	Surface Irregularity (Shoving)	Spilled Materials
Sealed Arterial Roads	10 calendar days	30 calendar days	60 calendar days	10 calendar days
Sealed Collector Roads	30 calendar days	60 calendar days	180 calendar days	10 calendar days
Sealed Local Roads	60 calendar days	180 calendar days	360 calendar days	10 calendar days

In some cases, the severity of the risk would need to be verified by inspection and a quicker response may be warranted e.g. oil or chemical spill. This would also apply to sealed roads that are known to deteriorate quicker under the prevailing traffic or weather conditions than is normally expected.

This Procedure will be reviewed at least annually by relevant employees. It will be necessary to regularly review the Procedure to verify that its requirements are reasonably practicable and that it is effective in reducing Council's exposure to liability claims.

It is to be noted with regard to claims that the recent claim history is as follows:-

- 2008/09 - 6 claims – all denied
- 2009/10 - 18 claims – all denied
- 2010/11 - 23 claims – all denied
- 2011/12 - 34 claims – 3 paid ($1,025), 31 denied
- 2012/13 - 3 claims for 1st quarter

Almost all claims were for damaged tyres/rims or tar on paintwork. Claims were denied as Council was complying except in 3 instances with the Risk Management Procedure.

5.3. Routine Operations and Maintenance Plan

5.3.1. Operations and Maintenance Plan

The following maintenance activities are undertaken –

- Pothole and Edge Repair
- Heavy Patching
- Sweeping/Removal of Loose Materials
- Emergency Removal of Oil/Chemical Spills
- Shoulder Grading
- Shoulder Gravel Resheeting

- Shoulder Grassing
- Other Unplanned activities

Determination as to the need to undertake maintenance works is primarily governed by the Risk Management Procedure. However, urgent works could be undertaken to high risk hazards following information received or by staff identification.

The following table shows past levels of customer requests for maintenance action.

Description	2001-02	2002-03	2003-04	2010/11	2011/12
Pot hole and edge break repairs	482	466	553	619	838
Shoulder grading and repairs	710	359	302	352	428
Removal of spilled or loose materials	12	39	19	61	27
Street sweeping - all areas	67	85	62	112	157
Totals	**1,271**	**949**	**936**	**1052**	**1450**

It is unfortunate that continuous data is not readily available. However, it appears that there is an increase in the number of customer requests with regard to the condition of road surfaces. These data need to be monitored over the next 10 years as an indicator of positive outcomes from the additional funding to road renewal and resurfacing.

Compliance with the target 'Response Times' (calendar days) of the Risk Management Procedure are indicated in the following table.

Defect Type	Target Response Time	Number of Hazards Detected	Number within time	Number on time	Number over time	% Compliance with target	Average Response Time
Arterial Roads							
Potholes/Edges	10	2332	1653	54	625	73%	9.1
Edge Drop	30	59	32	0	27	54%	32.5
Surface Irregularity	60	937	620	54	263	72%	51.5
Spilled Material	10	46	19	0	27	41%	20.8
Collector Roads							
Potholes/Edges	30	1085	952	18	117	89%	14.5
Edge Drop	60	23	15	0	8	65%	50.8
Surface Irregularity	180	262	220	2	40	85%	89.4
Spilled Material	10	19	12	1	6	68%	21
Local Roads							
Potholes/Edges	60	4523	4202	8	313	93%	17.1
Edge Drop	180	87	83	0	4	95%	49.6
Surface Irregularity	360	389	374	0	15	96%	83.4
Spilled Material	10	173	76	2	95	45%	21.5

It is noted that the % compliance requires improvement. However, it is also noted that the average response times are satisfactory except for 'spilled materials'.

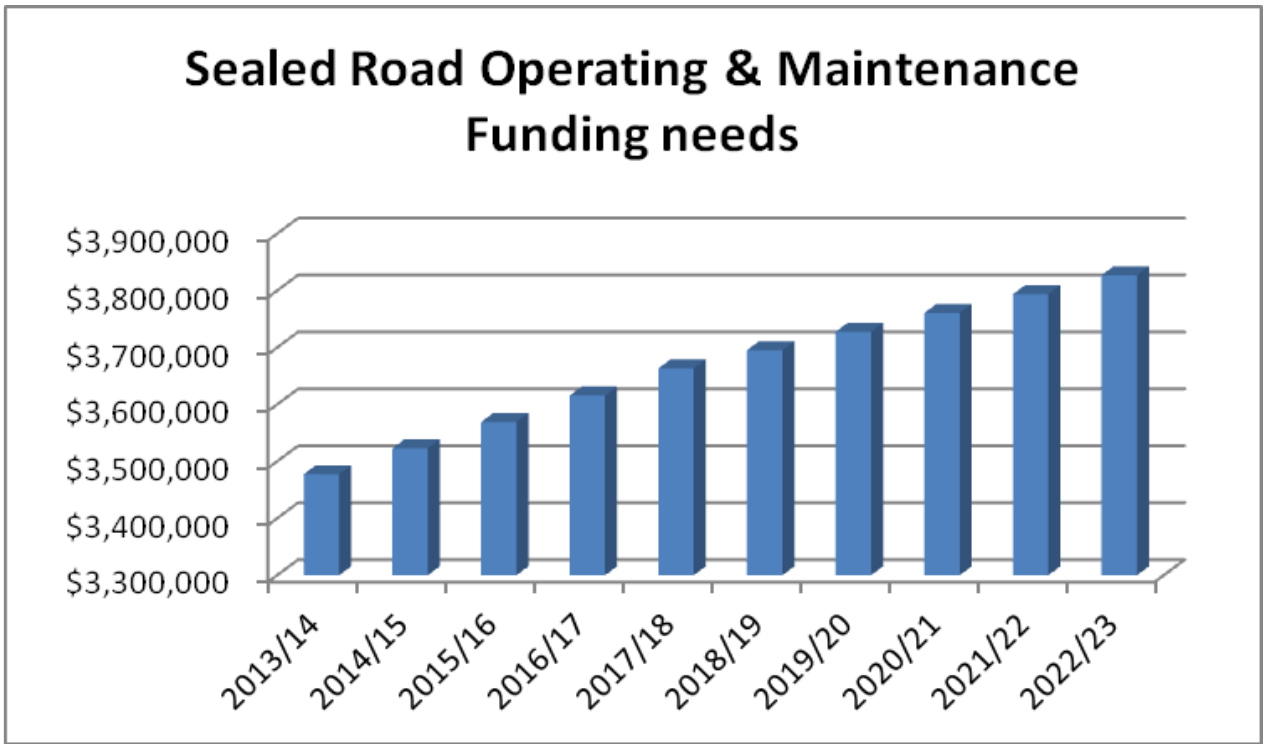
5.3.2. Operations and Maintenance Strategies

There are currently no defined maintenance strategies and there are no defined Levels of Service. All maintenance/operations are based on minimising risk and are primarily governed by the *Sealed Road Risk Management Procedure.*
With regard to road shoulders, there is no condition or asset extent data. It is assumed that the total length of road shoulders is the length of sealed road times 2, less the length of K and G. This gives an approximate shoulder length of 1,800Km.

It is assumed that a sustainable Level of Service for shoulder maintenance is to grade/resheet/reshape at an average frequency of every 6 years. This equates to an annual average expenditure of approximately $450,000 compared to the current expenditure of $447,000.

5.3.3. Summary of Future Costs

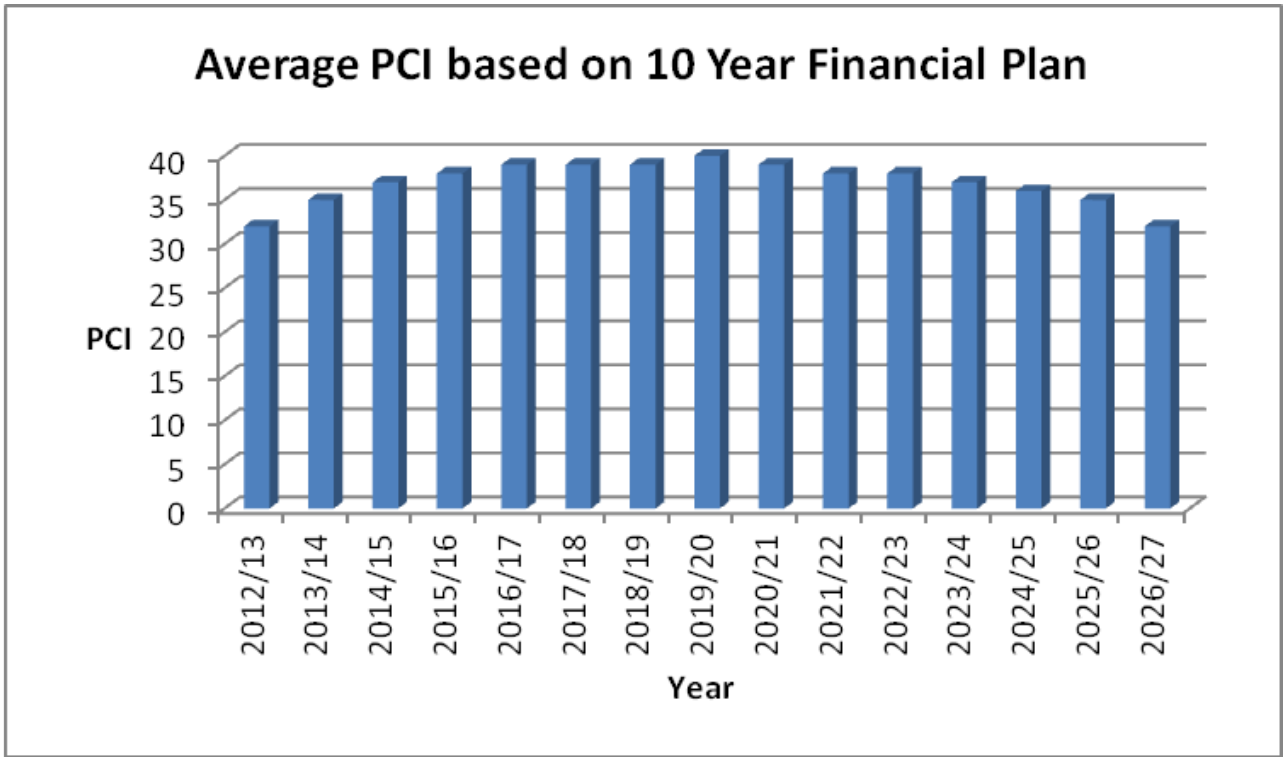
It is considered that current funding levels are sufficient to meet a Sustainable Level of Service for maintenance/operational activities although there is a significant amount of 'deferred' maintenance which would be desirable to undertake. The length of the sealed road network is increasing by 1.5% per annum and the annual budget allocation should increase accordingly. An annual allowance of 4% should also be made for inflation. The following chart shows required funding expressed in *today's dollars.*



5.4. Renewal / Replacement Plan

The currently proposed expenditure as indicated in the LTFP have been used to model the average network condition (average PCI - Pavement Condition Index) over a fifteen year period using the Road Surface Manager module of the corporate Asset Register (Conquest).

The PCI is a measure of the condition of the road segment; that is of both the surface and the pavement. The results are shown on the following chart.



The results indicate that there will be a slight decline in network condition for about 7 years and then an improvement with the result that the network condition will be the same in 15 years time. This satisfactory result is due to the additional funding over the next 10 years but this modelling needs to be validated using the dTims system.

5.4.1. Renewal Plan

The condition of road segments are regularly reviewed following their inspection and condition rating as detailed in Section 5.1.3. The ratings are entered into the corporate asset register (Conquest) and draft future reseal programs are analysed by the *Road Surface Manager* Module and through a specifically configured reseal ranking methodology.

For pavement renewal programs (*Local Road Repair Program and Regional Road Repair Program)*, a Strategy (prioritised list of works) has been prepared including all local roads over a PCI of 75 and which have high volumes and/or high speed traffic..
A three year program is prepared for the Regional Roads which is half funded by the State Government and the program requires approval of the Roads and Maritime Authority.

5.4.2. Renewal Strategies

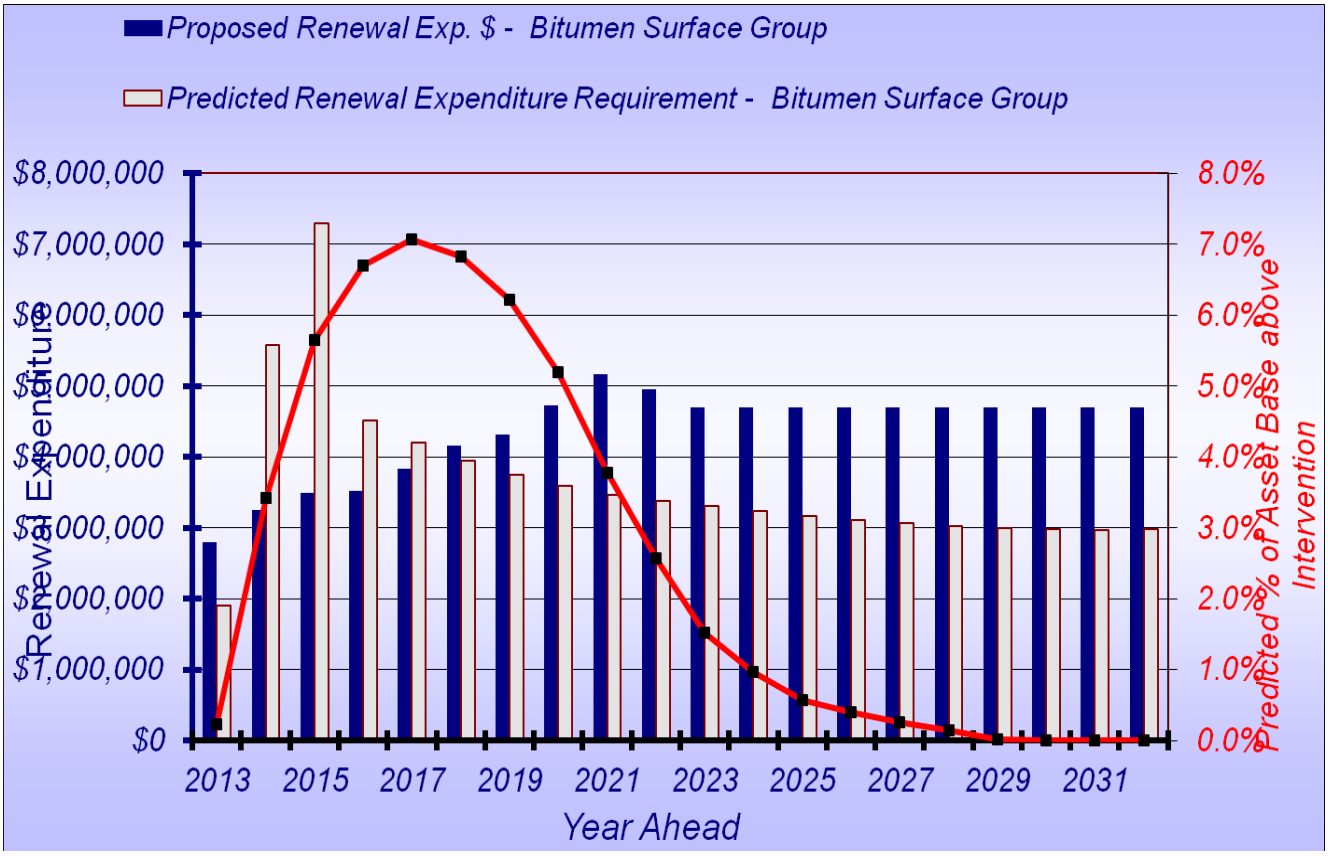
<u>Road Surface</u>
The annual Reseal Program is determined by the following procedure –

- Update Conquest/RMS for any relevant works undertaken in previous year.
- Run the Conquest Query – “local road reseal process”. This will select from Conquest those local roads that have Condition Point greater than 50.

- Export query list into Excel and then refine list (use Filter method) to roads that meet the criteria of
  - Binder>3
  - Cracking>3
  - Deformation<4
- Inspect the list by experienced engineer/rater and reassess the ratings and the need for reseals and/or rehab
  - Update Conquest rating scores where applicable
  - Update the (forward) Local Road Rehabilitation Strategy where applicable.
- Edit the list and prepare draft reseal list based on traffic volume, rating score and budget.

The funding levels as included in the LTFP have been used in the *Moloney Financial Modelling* software and the predicted road surface conditions for the next 30 years are shown on the following chart.

Current condition data shows a backlog for the next 3 to 4 years but that overall condition will then improve due to the additional funding as indicated in the LTFP. There is an indication that funding could be reduced after about 2020 by about $1Million per annum.



Road Pavement (Repair Programs)

Council adopted a Local Road Repair program in 2010 with priorities ranked by a score based on traffic volume, speed zoning, extent of deformation, extent of cracking and repairs and special factors (eg near CBD). However, the Strategy now requires review.

A draft Strategy for about the top 100 priority projects has been prepared and is included at Attachment 1. The list has been prioritised based on the score derived from the following formula and all roads with either PCI greater than 75 or Deformation Rating of 5 have been rated –

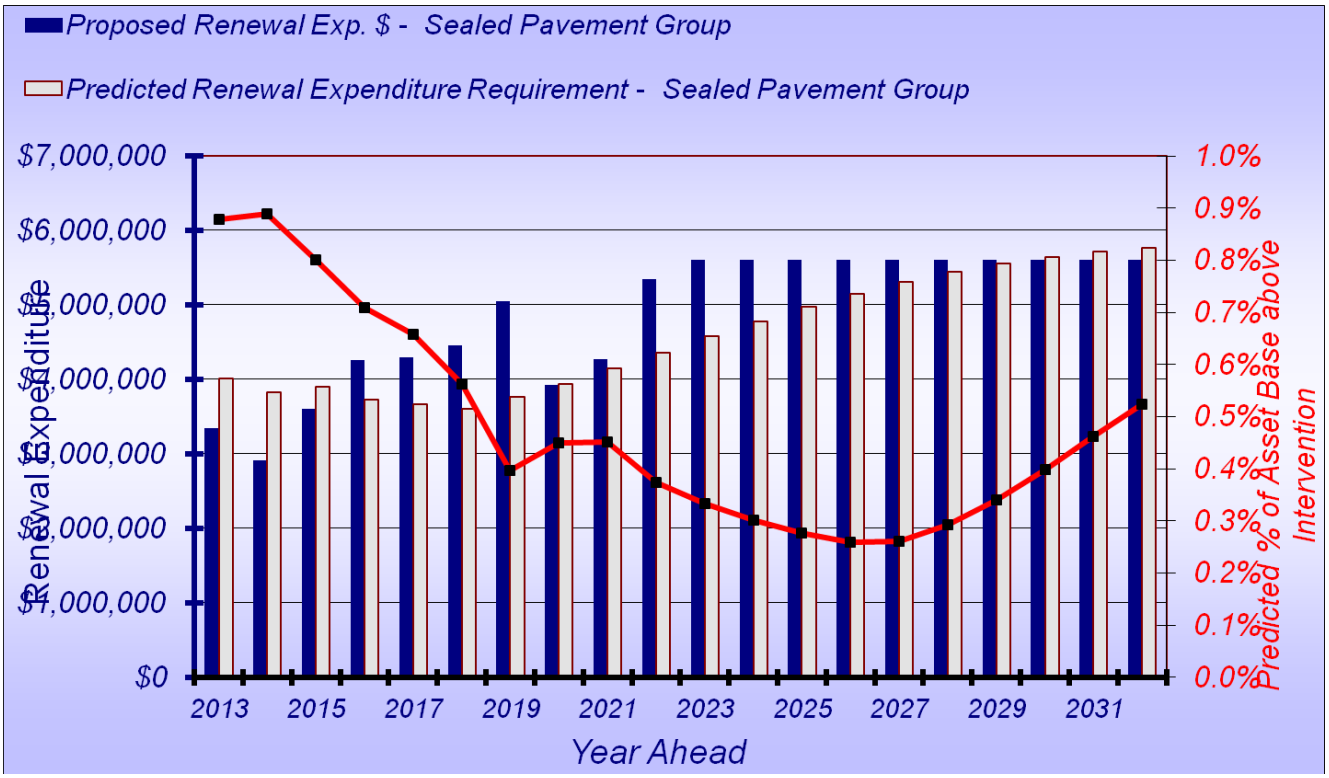
Ranking Score = 4 times Deformation Rating + Patching Rating + 3 times Speed Zone + 4 times Traffic Volume + Other Factors

- Speed Zone – 0 for very slow roads, 1 for 50KPH, 2 for 50 to 80 KPH and 3 for over 80KPH
- Traffic Volume – a rating of 0, 1, 2 or 3
- Other Factors – a rating of 0, 1, 2 or 3 for proximity to 'special' locations such as CBD, precinct shops, school

The total value of the 'top 100' list is about $25 Million and with current funding predictions all currently identified road sections will be completed during 2022. It is expected that additional road sections will be identified each year and when identified they will be added to the Strategy. Accordingly, the Strategy will be reviewed annually immediately prior to compiling the annual Operational Plan.

The *Moloney Financial Modelling* software has been used to model network condition based on the funding as indicated in the LTFP and the results are shown in the following chart.

It is noted that the proposed 10 Year funding shows some improvement in network condition but after 2027 network condition deteriorates.



As mentioned earlier, modelling is dependent on the actual network condition data available so long term trends cannot be accurately predicted without valid historic and current condition data.

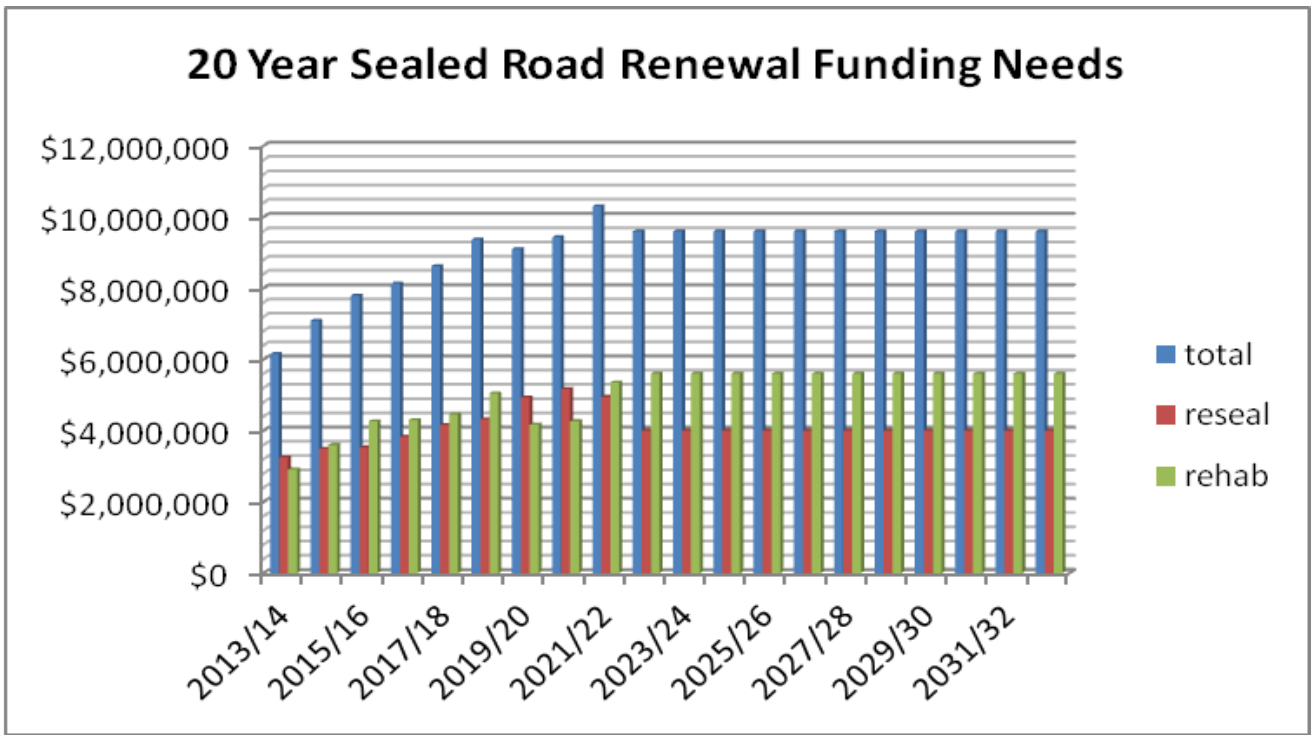
5.4.3. Summary of Future Costs

The following chart shows the 20 year funding needs based on current LTFP funding levels for pavement renewal and a reduction of $1Million for the Reseal Program from 2021/22 when compared to the adopted LTFP.

However, it needs to be noted that modelling is sensitive to the condition ratings and further work is required to verify the 'accuracy' of the current ratings as included in the Asset Register. It is recommended that this be undertaken as a priority and the modelling then be refreshed.

Funding sources for the two renewal programs as shown in the LTFP are –

- General Funds $40,063,748
- Strategic Reserves $6,500,000
- Loan Funds $14,000,000
- Grants (Roads to Recovery) $8,888,252



5.5. Creation / Acquisition / Augmentation Plan

There is insufficient data at present to determine a Level of Service and capital program to enhance existing sealed roads to cater for current and predicted traffic volumes. That is, to determine required lane and formation widths for current and predicted traffic volumes to ensure all roads conform to design standards.

Currently, when undertaking pavement renewal road and formation widths are increased when required. Some formation widths are also increased to cater for on-road cycle lanes. Further investigations are required to develop an appropriate strategy.

Council have identified a number of projects to provide additional roads and/or enhance existing roads and these projects are included in Council's *Contributions Plan (Section 94).* All adopted Contributions Plan projects can be viewed via –

http://shoalhaven.nsw.gov.au/MyCouncil/Policiesplansstrategies/Planningregister.aspx

There are 29 projects in the Contributions Plan relating to sealed road enhancement or acquisition. The total project costs are –

- Total $75,144,000
- Cost $44,794,000
- Council Cost $30,350,000
- Current available funds $2,095,000

The LTFP indicates funding of $15,473,000 for these projects over the next 10 years and the only works that are likely to be funded over the next 10 years are the North Nowra Link Road. Recent works have included St Georges Basin Town Centre and Anson Rd extension.

5.5.1. Selection Criteria

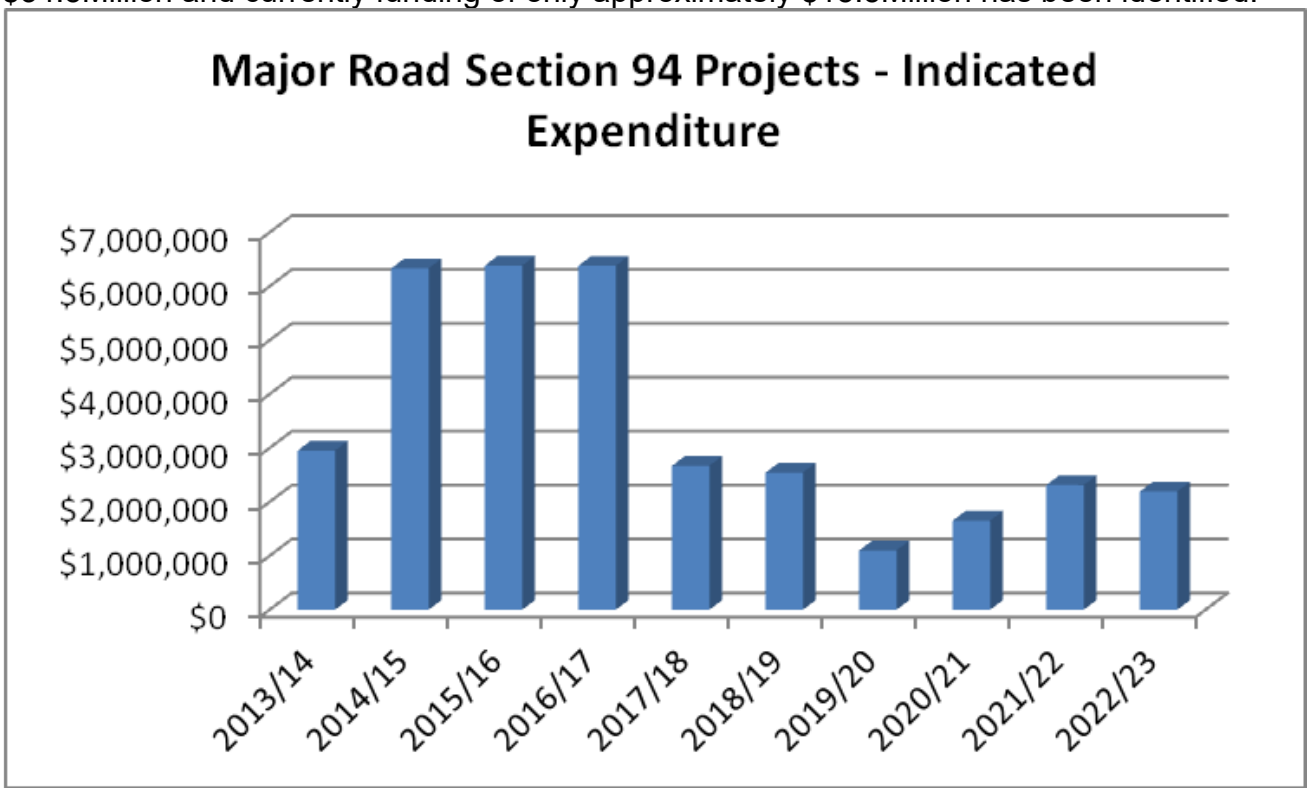
The Contributions Plan gives indicative timeframes that set priorities. However, this is subject to regular review.

5.5.2. Capital Investment Strategies

There are no current Investment Strategies.

5.5.3. Summary of Future Costs

The cash flow (for Council funds only) as indicated in the Contributions Plan is shown in the following chart. It is to be noted that the total indicated Council expenditure is approximately $34.5Million and currently funding of only approximately $15.5Million has been identified.



5.6. Disposal Plan

It is not expected that any sealed roads will be decommissioned.

6. FINANCIAL SUMMARY

6.1. Financial Statements and Projections

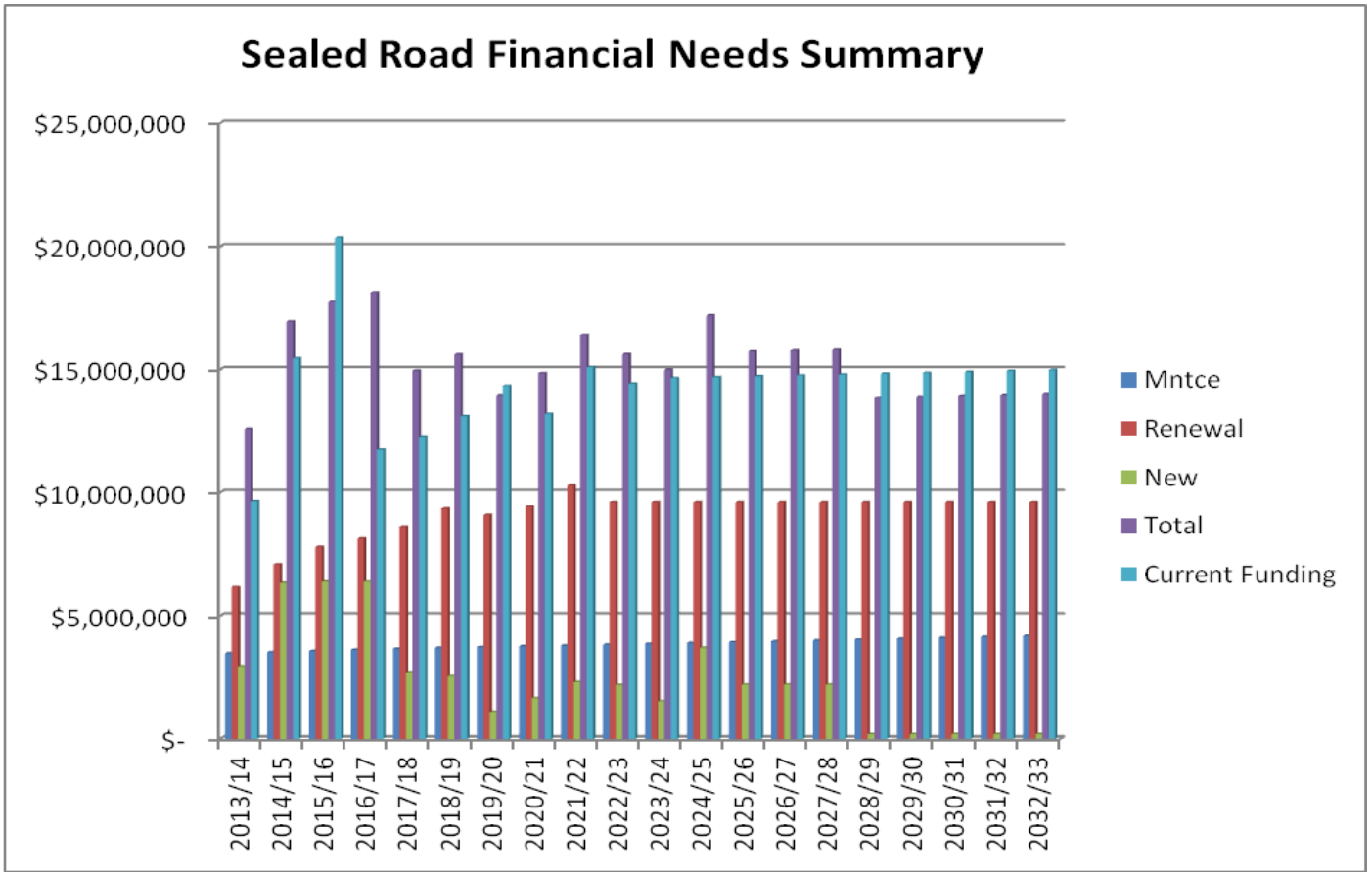
The past expenditure history for sealed roads is detailed in the following table.

Activity	2009/10 (Actual)	2010/11 (Actual)	2011/12 (Actual)	2012/13 (Budget)	% Increase over last 3 Yr Average
Maintenance					
PotholesandEdges	$1,195,917	$1,311,042	$1,651,811	$1,511,000	9.0%
Heavy Patch	$1,117,609	$1,229,197	$1,392,748	$1,301,000	4.4%
Sweep pavement	$34,425	$42,345	$23,287	$36,300	8.8%
Pavement Other	$41,972	$70,532	$59,805	$52,000	(9.5%)
Grade Shoulder	$370,926	$261,784	$286,433	$320,000	4.4%
Regravel Shoulder	$110,489	$208,065	$80,842	$197,000	48.0%
Grass Shoulder	$37,120	$4,321	$11,326	$5,000	(71.6%)
Shoulder Other	$48,736	$77,021	$68,897	$25,200	(61.2%)
Maintenance Totals	**$2,957,194**	**$3,204,307**	**$3,575,149**	**$3,477,500**	**7.1%**
Capital					
Pavement Renewal	$1,791,290	$1,779,684	$2,585,351	$3,632,900	77.0%
Reseals	$2,196,659	$2,017,011	$2,184,000	$3,377,800	58.4%
Enhancement	$0	$46,939	$79,999	$0	--
New	$41,778	$250,833	$1,529,271	$150,100	(75.3%)
Shoulder Sealing	$106,908	$57,658	$13,961	$160,000	168.9%
Capital Totals	**$4,136,635**	**$4,152,125**	**$6,392,582**	**$7,320,800**	**49.6%**
Grand Totals	**$7,093,829**	**$7,356,432**	**$9,967,731**	**$10,798,300**	**32.7%**

Special Schedule No 7 in the 2011-2012 Financial Report of the Council showed that the estimated cost to bring the sealed roads including shoulders in the city to a “good” standard is **$18Million**. This schedule also reports that the estimated annual maintenance required for roads is **$7.7Million** and the actual maintenance expenditure for the year was **$5.6Million**.

Based on modeling undertaken as indicated in previous sections the required expenditure levels for the next 20 years are indicated on the following table and chart.

	Mntce	Renewal	New	Total	Current Funding	Funding Gap
2013/14	$3,477,500	$6,160,000	$2,953,158	$12,590,658	$9,646,500	$2,944,158
2014/15	$3,522,913	$7,090,000	$6,334,158	$16,947,070	$15,451,213	$1,495,858
2015/16	$3,569,006	$7,790,000	$6,386,158	$17,745,164	$20,359,006	-$2,613,842
2016/17	$3,615,791	$8,130,000	$6,382,158	$18,127,949	$11,745,791	$6,382,158
2017/18	$3,663,278	$8,620,000	$2,671,158	$14,954,436	$12,283,278	$2,671,158
2018/19	$3,695,411	$9,370,000	$2,544,158	$15,609,569	$13,103,411	$2,506,158
2019/20	$3,727,865	$9,100,000	$1,100,824	$13,928,689	$14,345,865	-$417,176
2020/21	$3,760,644	$9,440,000	$1,653,000	$14,853,644	$13,200,644	$1,653,000
2021/22	$3,793,750	$10,300,000	$2,313,000	$16,406,750	$15,093,750	$1,313,000
2022/23	$3,827,188	$9,600,000	$2,193,000	$15,620,188	$14,427,188	$1,193,000
2023/24	$3,860,960	$9,600,000	$1,530,000	$14,990,960	$14,660,960	$330,000
2024/25	$3,895,069	$9,600,000	$3,700,000	$17,195,069	$14,695,069	$2,500,000
2025/26	$3,929,520	$9,600,000	$2,200,000	$15,729,520	$14,729,520	$1,000,000
2026/27	$3,964,315	$9,600,000	$2,200,000	$15,764,315	$14,764,315	$1,000,000
2027/28	$3,999,458	$9,600,000	$2,200,000	$15,799,458	$14,799,458	$1,000,000
2028/29	$4,034,953	$9,600,000	$200,000	$13,834,953	$14,834,953	-$1,000,000
2029/30	$ 4,070,802	$9,600,000	$200,000	$13,870,802	$14,870,802	-$1,000,000
2030/31	$4,107,010	$9,600,000	$200,000	$13,907,010	$14,907,010	-$1,000,000
2031/32	$4,143,580	$9,600,000	$200,000	$13,943,580	$14,943,580	-$1,000,000
2032/33	$4,180,516	$9,600,000	$200,000	$13,980,516	$14,980,516	-$1,000,000
Totals:	$76,839,529	$181,600,000	$47,360,770	$305,800,299	$287,842,829	$17,957,470



6.2. Funding Strategy

The current and proposed funding levels (as indicated in the LTFP) may be considered satisfactory except that average network PCI may be too high and sufficient funds are not available for implementation of the projects in the Contributions Plan. This aspect needs to be reviewed prior to the next review of this Plan.

It is to be noted that for the next 10 years commencing 2012/13 that the previous total funding over this period for Reseals and Renewal (allowing 3% CPI) would have been about $62Million. Council have now committed to providing funding over this period of $86Million. This is a significant additional commitment. Detailed monitoring to validate the affect of this additional funding is essential.

6.3. Valuation Forecasts

The 2009/10 Valuations showed an annual depreciation of $10.2Million for pavement and bitumen surface.

6.4. Key Assumptions Made in Financial Forecasts

The key assumptions are –

	Unit Rate	Useful Life
Pavement – arterial	$45	50
Pavement – collector	$40	60
Pavement – local	$30	70
Asphalt – urban – arterial	$28	30
Asphalt – urban – collector	$28	35
Asphalt – urban – local	$28	40
Asphalt – rural	$24	40
Flush Seal - arterial	$7	20
Flush Seal – collector	$7	25
Flush Seal – local	$7	30

The condition data are indicated in previous sections.

6.5. Forecast Reliability and Confidence

It should be noted that the modelling software outcomes are sensitive to the condition data inputs. Current condition data requires review and verification and this was confirmed by the engagement of the *Australian Road Research Board.*

The current condition rating procedure is shown at Attachment 2.

7. PLAN IMPROVEMENT AND MONITORING

7.1. Status of AM Practices

Current AM practices could be improved primarily with regard to the accuracy of the road data and specialist knowledge regarding condition assessment.

7.2. Improvement Programme

The Australian Road Research Board (ARRB) has provided access to the 'best practice' pavement management system – dTims.

7.3. Monitoring and Review Procedures

There are no current procedures. However, it is expected to be some changes following the implementation of the new pavement management system.

7.4 Performance Measures

The following performance measures are proposed –

- The annual number of Customer Requests for maintenance activity.
- Compliance with the response times indicated in the Risk Management Procedure
- Annual monitoring of overall road condition (PCI).
    - Target – 32 or less
- Annual monitoring of the extent of the road network in Condition 3 or better.
    - Target – 94% or better

8. REFERENCES

There are no references.

9. APPENDICES

Attachment 1shows the ***Local Road Repair Strategy***.

Attachment 2 shows the procedure for recording asset condition.

10. REVIEW

All Asset Management Plans are reviewed on a 4 yearly cycle and all reviews are undertaken within 1 year of council elections. The Local and Regional Road Renewal Strategies are reviewed annually in conjunction with the preparation of the draft Operations Plan.

Attachment 1 – Local Road Renewal Strategy

ROAD	Rehab Urgency score (Max=48)	Project Rehab cost	Cumulative Rehab cost
Surface - CURRARONG RD - ch 5.000to ch 6.006	40	$442,640	$443,000
Surface - BTU RD - ch.3.232 to ch.3.796	41	$284,256	$727,000
Surface - CURRARONG RD - ch 6.240 to ch 6.469	40	$111,752	$839,000
Surface - ALBATROSS RD - ch.2.65 to ch.2.77	39	$96,000	$935,000
Surface - JINDY ANDY LN - ch.2.44 to ch.3.419	39	$563,904	$1,499,000
Surface - KANGAROO VALLEY RD - ch. 4.821 to ch 5.821	39	$480,000	$1,979,000
Surface - LAKE CONJOLA ENTRANCE RD - ch.7.020 to ch.7.626 - (INSIDE VAN PARK)	39	$193,920	$2,173,000
Surface - VICTORIA ST - ch 0.000 to ch 0.212	39	$137,376	$2,310,000
Surface - WOODHILL MOUNTAIN RD - ch.2.216 to ch.4.06	39	$885,120	$3,195,000
Surface - BENDALONG RD - ch.0.796 to ch.1.261	38	$305,040	$3,500,000
Surface - BTU RD - ch.4.55 to ch.4.614	38	$32,256	$3,532,000
Surface - COMERONG ISLAND RD - ch.4.865 to ch.5.162	38	$118,800	$3,651,000
Surface - COOLANGATTA RD - ch 4.540 to ch 5.540	38	$432,000	$4,083,000
Surface - COOLANGATTA RD - ch 5.540to ch 6.540	38	$504,000	$4,587,000
Surface - CURRARONG RD - ch 6.006 to ch 6.240	38	$136,656	$4,724,000
Surface - CURRARONG RD - ch 6.469 to ch 6.835	38	$175,680	$4,900,000
Surface - JINDY ANDY LN - ch.0.509 to ch.0.7	38	$94,736	$4,995,000
Surface - JINDY ANDY LN - ch.0.7 to ch.1.45	38	$372,000	$5,367,000
Surface - JINDY ANDY LN - ch.3.419 to ch.3.497	38	$45,551	$5,413,000
Surface - LAKEHAVEN DR - ch 0.493 to ch 0.597	38	$56,576	$5,470,000
Surface - MEROO RD - ch.0 to ch.0.11	38	$61,600	$5,532,000
Surface - PRINCESS ST - ch 0.448 to ch 0.662	38	$94,160	$5,626,000
Surface - ALBANY LN - ch 0.000 to ch 0.135	37	$88,560	$5,715,000
Surface - CALLALA BEACH RD - ch.0 to ch.0.323	37	$160,208	$5,875,000
Surface - COMERONG ISLAND RD - ch.5.162 to ch.6.3	37	$455,200	$6,330,000
Surface - COOLANGATTA RD - ch 6.540 to ch 6.963	37	$213,192	$6,543,000
Surface - CURRARONG RD - ch 3.380 to ch 3.601	37	$88,400	$6,631,000
Surface - GREENBANK GR - ch 0.847 to ch 1.025	37	$102,528	$6,734,000
Surface - JERVIS BAY RD - ch 7.287 to ch 7.533	37	$281,424	$7,015,000
Surface - KANGAROO VALLEY RD - ch 6.303 to ch 7.066	37	$366,240	$7,381,000
Surface - NAVAL COLLEGE RD - ch 7.088 to ch 8.150	37	$560,736	$7,942,000
Surface - ORSOVA PDE - ch 0.213 to ch 0.322	37	$55,808	$7,998,000
Surface - SHOEBRIDGE LN ACCESS RD - ch 0.000 to ch 0.090	37	$28,800	$8,027,000
Surface - UPPER KANGAROO RIVER RD - ch.0 to ch.0.178	37	$99,680	$8,127,000
Surface - UPPER KANGAROO RIVER RD - ch.0.178 to ch.0.235	37	$31,920	$8,159,000
Surface - BENDALONG RD - ch.1.261 to ch.1.564	36	$198,768	$8,358,000
Surface - COONEMIA RD - ch.2.582 to ch.2.874	36	$296,672	$8,655,000
Surface - CULBURRA RD - ch 7.711 to ch 8.413	36	$466,128	$9,121,000
Surface - CURRARONG RD - ch 10.267 to ch 11.827	36	$736,320	$9,857,000
Surface - GREENWELL POINT RD - ch 0.000 to ch 0.213	36	$221,520	$10,079,000
Surface - GREENWELL POINT RD - ch 1.967 to ch 2.274	36	$245,600	$10,325,000
Surface - JACOBS DR - ch 0.592 to ch 0.727	36	$131,760	$10,457,000
Surface - KALANDAR ST (WEST) - ch.0.04 to ch.0.312	36	$237,184	$10,694,000
Surface - KANGAROO VALLEY RD - ch 13.932 to ch 14.762	36	$491,232	$11,185,000
Surface - LAKE CONJOLA ENTRANCE RD - ch.6.362 to ch.7.020	36	$379,008	$11,564,000
Surface - MAIN RD - ch.1.24 to ch.1.388	36	$118,400	$11,682,000
Surface - NAVAL COLLEGE RD - ch 6.088 to ch 7.088	36	$528,000	$12,210,000
Surface - PRINCE EDWARD AVE - ch.3.177 to ch.3.328	36	$66,439	$12,276,000

Surface - RINGLAND LN - ch.0 to ch.0.47	36	$188,000	$12,464,000
Surface - TANNERY RD - ch.0 to ch.0.715	36	$531,960	$12,996,000
Surface - TAPITALLEE RD - ch 0.502 to ch 1.005	36	$241,440	$13,237,000
Surface - THE WOOL RD (PRINCES-TASMAN) - ch 4.172 to ch 4.783	36	$474,136	$13,711,000
Surface - WOODHILL MOUNTAIN RD - ch.1.609 to ch.1.82	36	$101,280	$13,812,000
Surface - WOODSTOCK RD - ch.5.641 to ch.6.668	36	$492,960	$14,305,000
Surface - YALWAL RD - ch.3.32 to ch.3.625	36	$161,040	$14,466,000
Surface - BOLONG RD - ch 0.087 to ch 0.595	35	$386,080	$14,852,000
Surface - COMERONG ISLAND RD - ch.6.3 to ch.6.8	35	$200,000	$15,052,000
Surface - CROOBYAR RD - ch.0.965 to ch.1.397	35	$345,600	$15,398,000
Surface - CURRARONG RD - ch 9.181 to ch 10.267	35	$512,592	$15,911,000
Surface - FLINDERS RD - ch.0.11 to ch.0.333	32	$124,880	$16,036,000
Surface - FORSTER DR - ch.0 to ch.0.974	32	$405,184	$16,441,000
Surface - GEORGE ST (STH) - ch 0.000 to ch 0.112	32	$85,120	$16,526,000
Surface - GRAYDONS POINTER RD - ch 0.520 to ch 0.930	32	$98,400	$16,624,000
Surface - HUNTINGDALE DR - ch 0.000 to ch 0.089	32	$49,840	$16,674,000
Surface - JINDY ANDY LN - ch.3.497 to ch.3.53	32	$19,007	$16,693,000
Surface - LARMER AVE - ch 0.000 to ch 0.519	32	$373,680	$17,067,000
Surface - MURRAMARANG RD - ch.6.442 to ch.6.772	32	$184,800	$17,252,000
Surface - ORIENT POINT RD - ch 0.440 to ch 0.673	32	$95,064	$17,347,000
Surface - PARMA RD - ch.2.3 to ch.2.5	32	$88,000	$17,435,000
Surface - SUNCREST AVE - ch 1.178 to ch 1.272	32	$69,936	$17,505,000
Surface - THE WOOL RD (PRINCES-TASMAN) - ch 2.900 to ch 3.000	32	$77,600	$17,583,000
Surface - TOURIST RD - ch 3.470 to ch 4.400	32	$334,800	$17,918,000
Surface - WANDYPARK RD - ch 0.000 to ch 0.128	32	$72,704	$17,991,000
Surface - YALWAL RD - ch.2.17 to ch.3.32	32	$607,200	$18,598,000
Surface - ALBERT ST - ch 0.000 to ch 0.140	31	$114,240	$18,712,000
Surface - BENDALONG RD - ch.0.027 to ch.0.049	31	$21,120	$18,733,000
Surface - BOAG ST - ch 0.000 to ch 0.237	31	$142,200	$18,875,000
Surface - BTU RD - ch.0 to ch.1.266	31	$638,064	$19,513,000
Surface - CURRARONG RD - ch 11.827 to ch 12.731	31	$426,688	$19,940,000
Surface - CURRARONG RD - ch 7.109 to ch 8.716	31	$964,200	$20,904,000
Surface - GOLF AVE - ch 0.546 to ch 0.764	31	$153,472	$21,057,000
Surface - GREENWELL POINT RD - ch 12.292 to ch 12.443	31	$96,640	$21,154,000
Surface - KANGAROO VALLEY RD - ch 14.762 to ch 15.492	31	$397,120	$21,551,000
Surface - KANGAROO VALLEY RD - ch 2.529 to ch 3.529	31	$480,000	$22,031,000
Surface - KANGAROO VALLEY RD - ch 9.066 to ch 10.066	31	$432,000	$22,463,000
Surface - LAKE CONJOLA ENTRANCE RD - ch.0.3 to ch.0.78	31	$276,480	$22,739,000
Surface - LAKEHAVEN DR - ch 0.285 to ch 0.493	31	$111,488	$22,850,000
Surface - MANNING AVE - ch 0.173 to ch 0.278	31	$69,720	$22,920,000
Surface - MURRAYS RD (CONJOLA) - ch 1.263 to ch 1.629	31	$102,480	$23,022,000
Surface - NORTH ST (WEST) - ch 0.576 to ch 0.676	31	$85,600	$23,108,000
Surface - RIVERSDALE AVE - ch 0.000 to ch 0.475	31	$266,000	$23,374,000
Surface - STATION RD - ch 0.000 to ch 0.128	31	$81,920	$23,456,000
Surface - TIMELONG RD - ch 0.000 to ch 0.131	31	$33,536	$23,490,000
Surface - UPPER KANGAROO RIVER RD - ch.3.82 to ch.4.55	31	$292,000	$23,782,000
Surface - WASON ST (STH) - ch.0.098 to ch.0.388	31	$190,240	$23,972,000
Surface - WORRIGEE RD - ch.2.095 to ch.3.48	31	$686,960	$24,659,000

Attachment 2 – Condition Rating Procedure

RSM – Data Management Procedures

June, 2011

1. INTRODUCTION

Shoalhaven City Council has purchased the Conquest ***Road Surface Manager (RSM)*** to assist in the determining of annual and long term Reseal and Rehabilitation Programs.

This Procedure has been prepared to document how the system has been configured and also the road rating methodology.
The configuration has been based on the long term experience of the author (Robert Sutherland – former Infrastructure Planning Manager) in determining road repair programs and in using road Pavement Management Systems.

The configuration has also involved field inspections to verify the accuracy of system predictions and has been configured so that system predictions best reflect requirements determined by field inspection.

Data from the exiting RMS will be transportable to the new dTims pavement management system.

2. SYSTEM SET-UP

2.1 Seal and Treatment Types

The following surface types have been incorporated in the system –

Surface Type	Useful Life (yrs)
Asphalt (Rural)	40
Asphalt (Urban)-Arterial	25
Asphalt (Urban)-Collector	30
Asphalt (Urban)-Local	40
Flush Seal-Arterial	14
Flush Seal-Collector	18
Flush Seal-Local	24
Car Park-Surface-Asphalt	35
Car Park-Surface-Flush Seal	18
Surface-Regional-Asphalt	25
Surface-Regional-Flush Seal	14

The ‘Surface Type’ of ‘Cold Overlay’ has been added to the system; however, there are currently no segments of this Surface Type. Details of this ‘Surface Type’ can be added when required.

The selected treatment types for each Surface Type are as follows –

Surface Type	Treatment Type	PCI Range for Treatment	PCI after Treatment	Treatment Unit Cost
Asphalt Rural	AC Overlay	65-75	5	$24.00
	Rehabilitation of Asphalt Pavement	75-100	0	$80.00
Asphalt (Urban)-Arterial	AC Overlay	60-70	5	$20.00
	Mill + AC Overlay	70-75	5	$40.00
	Rehabilitation of Asphalt Pavement	75-100	0	$120.00
Asphalt (Urban)-Collector	AC Overlay	60-70	5	$20.00
	Mill + AC Overlay	70-75	5	$40.00
	Rehabilitation of Asphalt Pavement	75-100	0	$120.00
Asphalt (Urban)-Local	AC Overlay	60-70	5	$20.00
	Mill + AC Overlay	70-75	5	$40.00
	Rehabilitation of Asphalt Pavement	75-100	0	$120.00
Flush Seal-Arterial	SS Reseal (Light Repairs)	50-70	5	$8.60
	DD Reseal (Heavy Repairs)	70-75	5	$15.00
	Rehabilitate Flush Seal Pavement	75-100	0	$100.00
Flush Seal-Collector	SS Reseal (Light Repairs)	50-70	5	$6.00
	DD Reseal (Heavy Repairs)	70-75	5	$15.00
	Rehabilitate Flush Seal Pavement	75-100	0	$100.00
Flush Seal-Local	SS Reseal (Light Repairs)	50-70	5	$6.00
	DD Reseal (Heavy Repairs)	70-75	5	$15.00
	Rehabilitate Flush Seal Pavement	75-100	0	$100.00
Car Park-Surface-Asphalt	Mill + AC Overlay	70-75	5	$40.00
	Reconstruct Asphalt Pavement	75-100	0	$85.00
Car Park-Surface-Flush Seal	SS Reseal (Light Repairs)	50-70	5	$5.00

	DD Reseal (Heavy Repairs)	70-75	5	$15.00
	Rehabilitate Flush Seal Pavement	75-100	0	$80.00
Surface-Regional-Asphalt	AC Overlay	60-70	5	$20.00
	Mill + AC Overlay	70-75	5	$40.00
	Rehabilitation of Asphalt Pavement	75-100	0	$120.00
Surface-Regional-Flush Seal	SS Reseal (Light Repairs)	50-70	5	$8.60
	DD Reseal (Heavy Repairs)	70-75	5	$15.00
	Rehabilitate Flush Seal Pavement	75-100	0	$100.00

2.2Deterioration Curve

The Deterioration Curve (Named – 'another') has been used to model PCI increases with time. The selected deterioration curve is a straight line as it is considered that this best suits the deterioration of a bitumen surface. A number of curves were trialled; however, the straight line curve gave more accurate outcomes.

2.3Scores and Weightings

The following ratings are to be undertaken to each segment.

Surface Defect rating	Rating	Rating Description	Score
Cracking	0	Not Applicable/Gravel Rds	
(cracking weighting – 2)	1	No area affected	0
	2	1% to 5% affected area	25
	3	5% to 10% affected area	50
	4	10% to 20% affected area	75
	5	>20% affected area	100
Deformation/Rutting	0	Not Applicable/Gravel Rds	
(deformation weighting – 2)	1	No loss of road shape	0
	2	<10% area; < 50mm	25
	3	>10% area; <50mm	50
	4	10% area; >50mm	75
	5	>10% area; >50mm	100
Binder	0	Not Applicable/Gravel Rds	
(binder weighting – 3)	1	Very Good – as new	0
	2	Good – some signs of bitumen hardening	25
	3	Fair – some stone loss. Bitumen hardening	50

	4	Poor – minor stone loss, minor surface erosion to AC surfaces, bitumen starting to grey	75
	5	Very Poor – significant stone loss, AC surface eroding, bitumen light grey in colour	100
Patching/Repairs	0	Not Applicable/Gravel Rds	
(patching weighting – 1)	1	No area affected	0
	2	Affected area 1% to 5%	25
	3	Affected area 5% to 10%	50
	4	Affected area 10% to 20%	75
	5	Affected area >20%	100

The formula used to calculate the PCI is –

(C*CW+D*DW+B*BW+P*PW)/(CW+DW+BW+PW)

Where
- C=crack rating; CW=crack weighting
- D=deformation rating; DW=deformation weighting
- B=binder rating; BW=binder weighting
- P=patching rating; PW=patching weighting

2.4Priority Options

'Priority Options' (available in RSM) have not been utilised. When set up this can allow for priority to be given, when distributing available funds, to say, arterial roads over local roads.

3. MODELLING

A number of model 'scenarios' have been set-up. These 'scenarios' were then run and the results then proofed by inspection in the field. This resulted in the selection of the 'weighting' factors for each defect type.

4. ANNUAL PROGRAMS

It is recommended that annual programs be determined by –

- Ensuring that Conquest is updated for works undertaken in previous year
- Update treatment unit rates, if required
- Running the applicable scenario
- Downloading to spreadsheet
- Inspecting and verifying the suitable treatment for each segment for the first 2 years from the scenario.
    - Add in 'enrichment' treatments where deemed suitable.
- Edit the list to conform to available funds.