University of Southern Queensland
Faculty of Engineering and Surveying

Development of a Bridge Asset Management Plan for Southern Downs Regional Council

A dissertation submitted by

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In fulfilment of the requirements of

Courses: ENG4111 & ENG4112 Research Project

Towards the degree of

Bachelor of Engineering (Civil)

November 2010

ABSTRACT

Asset Management is defined as the combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required level of service in the most cost effective way (IIMM 2006, p. xii).

Southern Downs Regional Council's bridge network represents a large investment and many thousands of dollars are spent annually on maintenance and management. This project aims to develop a core Asset Management Plan for bridges.

The main objective of the dissertation is to compile a core Bridge Asset Management Plan for Southern Downs Regional Council Specific objectives are as follows:

- Minimise the whole of life cycle costs of bridge assets.
- Clearly justify forward works programs and expenditure.
- Ensure that legal obligations are met through compliance with relevant acts and policies.
- Report on asset description including current conditions and general overview of existing bridges.
- Determine the future demand and the effects of changing demand on the bridge assets.
- Produce a financial summary including long-term financial expenditure.
- Ensure that asset/service is maintained for present and future generations at an equitable cost.

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CERTIFICATION

I certify that the ideas, designs and experimental work, results, analyses and conclusions set out in this dissertation are entirely my own effort, except where otherwise indicated and acknowledged.

I further certify that the work is original and has not been previously submitted for assessment in any other course or institution, except where specifically stated.

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Date

ACKNOWLEDGEMENTS

I would like to thank a number of people for their assistance, support and patience over the last 12 months in helping me complete this dissertation. Firstly I would like to thank my project supervisor Dr David Thorpe (USQ) who has guided me through this project with his extensive experience and in depth knowledge in the Asset Management field. I would like to thank Christoph Eicher (Assets Engineer SDRC), for his invaluable experience and knowledge he has shared and the patience he has shown with some of the questions and scenarios that I have put to him. Lastly I would like to thank my family, friends and my fiancé Corina Gooden for their constant support and understanding for the duration of this project.

Without all of your help I would not have been able to complete this project.

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EXECUTIVE SUMMARY

This research project has developed a starting point for a core asset management plan, based on the methodology and processes from the International Infrastructure Management Manual. The project details;

- Background of the project;
- the purpose of the core asset management plan;
- current asset description and condition;
- details draft levels of service;
- considers the future demand;
- gives five examples of a lifecycle management plan;
- formulates a financial summary for the next 10 years; and
- suggests improvements to the plan.

The project has found that the timber bridge structures cost alot more to maintain during their life cycle than the concrete structures and that they are in much worse condition. It has found that the budgeted amounts for maintenance and capital renewal are well below what is required if the draft levels of service are adopted.

It is recommended that an annual timber bridge replacement program be instigated and the gap in funding required to deliver the draft levels of service be addressed.

1 INTRODUCTION

This chapter details the background, scope, objectives, key stakeholders, methodology, consequences, risks and the outline of this dissertation.

1.1 Background

Southern Downs Regional Council (SDRC) is located in southern Queensland about two hours drive south west of Brisbane. It has a population of 32,600 people spread between Warwick, Stanthorpe and surrounding areas. It covers an area of 7,120 square km and is bounded by Toowoomba Regional Council, Goondiwindi Regional Council, Lockyer Valley Regional Council, Scenic Rim Regional Council and the New South Wales border. The climate of the region ranges from mild summers to cold winters. The major industries of the downs are agriculture, horticulture, commerce, manufacturing and tourism and the region has an annual growth rate of approximately two percent. The major towns and villages located within the region include the main towns of Warwick and Stanthorpe and the smaller towns of Killarney, Allora, Leyburn, Maryvale and Dalveen.

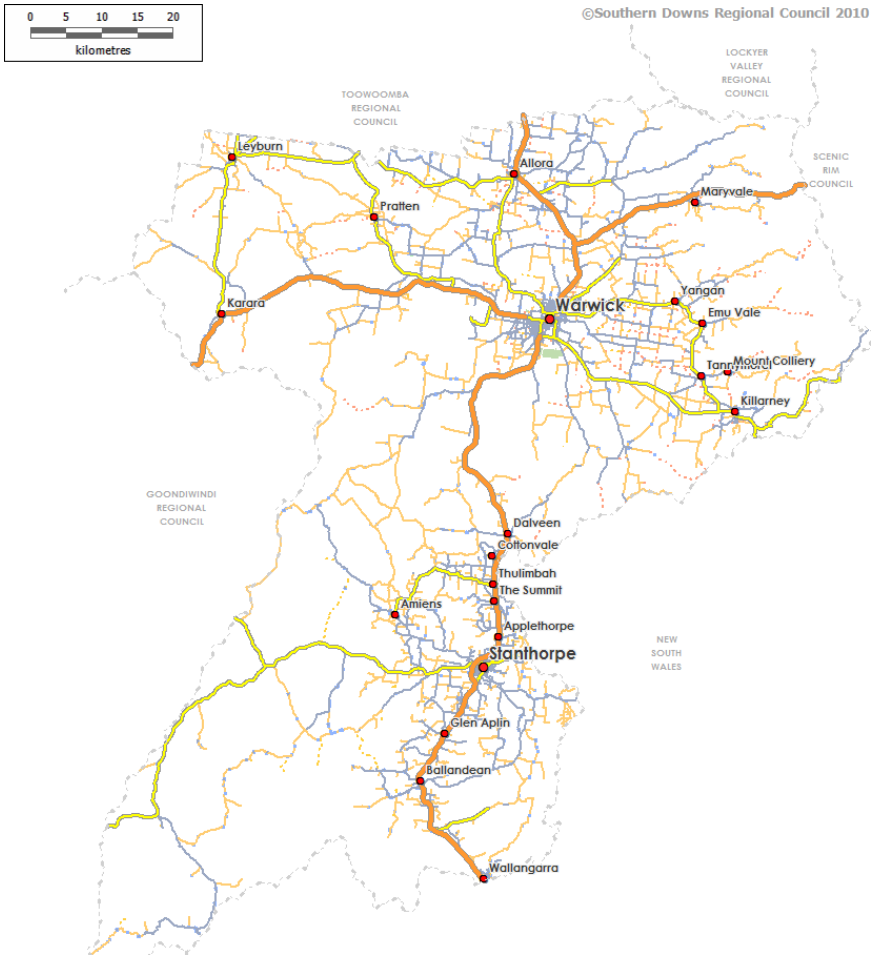

Figure 1 Map of Region

Southern Downs Regional Council was formed by two former councils, Warwick Shire Council and Stanthorpe Shire Council in 2008 as a result of forced Queensland council amalgamations. The former Warwick Shire Council was rated as weak in regards to its financial sustainability due to its high rate of depreciation. There is still ongoing work in integrating the two former councils into one organisation in relation to management and delivery of assets and services to the community.

Southern Downs is famous for a number of local attractions and festivals. These include many sandstone heritage listed buildings from the early settlements, wineries and events like the famous Warwick Rodeo. There are also many natural attractions located in the region, and include Queen Mary Falls, Goomburra National Park and Girraween National Park.

Currently Southern Downs Regional Council does not have any asset management plans in place. Asset data has been recorded in various spreadsheets haphazardly over the years and stored in varying locations and on differing mediums. There has not been any integration of former Warwick and Stanthorpe bridge asset data records since the amalgamations. Council's main GIS system MapInfo has been updated to include the location of all bridge assets throughout the council region, however the only other piece of information attached to the record is a one word description on the type of asset (bridge, culvert, floodway, etc) and an old asset id number.

Council has adopted a strategic plan called Vision 2040 and a 2009 – 2014 Cooperate Plan which are important drivers in establishing Southern Downs Regional Council in the future. These plans outline many strategic plans and in relation to the management of assets owned by council. Recent new legislation 'Local Government Act 2009' requires Southern Downs Regional Council to produce a core asset management plan for all assets including bridges by December 2010.

1.2 Purpose of the Asset Management Plan

The aim of this dissertation is to create a core asset management plan for bridges located in the Southern Downs Regional Council. The main objective of the plan is to minimise the whole of life costs of the assets whilst maintaining an acceptable level of service and ensuring that the asset meets all safety and legislative requirements. The core asset management plan in conjunction with other infrastructure asset management plans will help ensure that Council assets remain economically viable and that the council as a whole is sustainable. The plan will link with current corporate and strategic plans and policies and ensure that all legislative requirements are met.

Bridges are part of the road infrastructure assets which is one of the most significant groups of community assets managed by Southern Downs Regional Council. Bridges are key elements in the road network and represent a substantial investment over an extended period of time. Every year many thousands of dollars are spent in maintaining, renewing and replacing these assets. Currently there is very little in the way of documentation of the processes and maintenance expenditure and it is conducted in a reactive way. This is one of the reasons why it is so important to have an asset management plan, which will employ the best practice and management to ensure that services are delivered in a consistent, economical and sustainable way.

From 1950's through to the 1970's council spent a considerable amount of money on creation of new bridge assets without much regard to the long term life cycle costs and total community benefit. This has resulted in a number of large timber bridge structures (3 spans or more) which require costly annual maintenance and inspections and have a big replacement cost with very little community benefit. This plan will ensure that any new bridge works are clearly justified and will generate significant community benefit for the investment outlay by council.

This project will produce the first bridge asset management plan developed for the council and will reform the current practices of asset management, seeking to ensure a more formal approach through the employment of asset management principles and methodology. The asset management plan is aimed at delivering the desired level of service at the least cost and moving the organisation away from the budget driven framework to service driven framework.

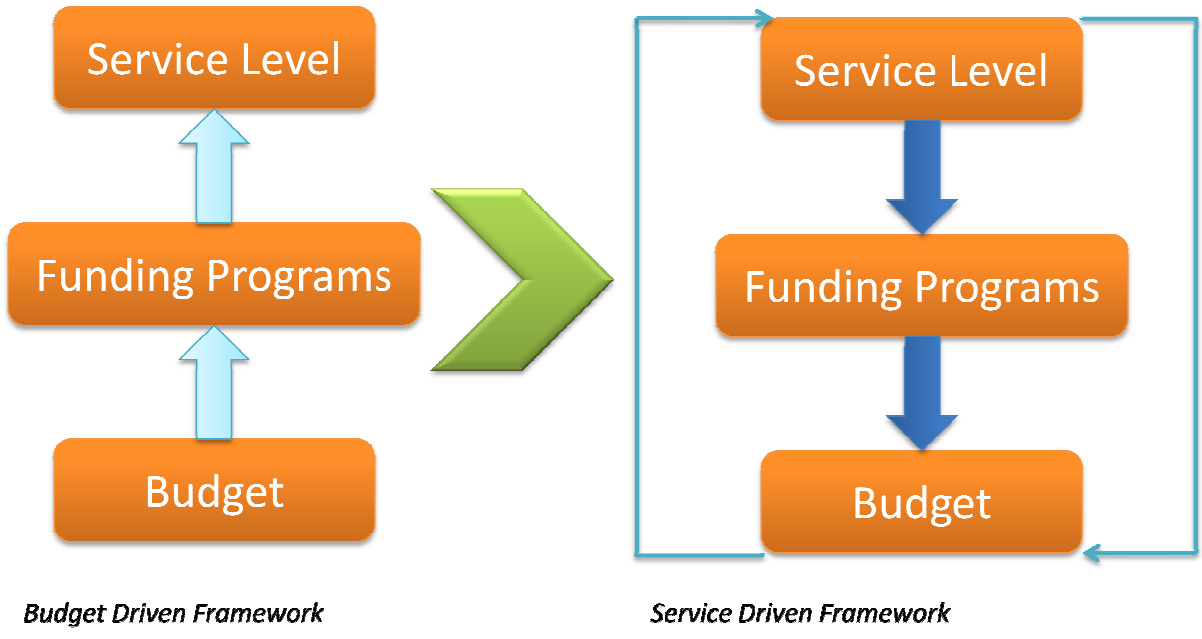

Figure 2 Budget driven framework versus service driven framework

From the diagram it is easy to see that currently the service levels are constrained by the budget which is based on historical data and increased at the rate of CPI each year. It is envisaged that through the adoption of this asset management plan the desired level of service will in fact drive the funds budgeted for bridges.

1.3 Aims and Specific Objectives

The specific objectives and purposes of this core asset management plan are as follows:

- Demonstration of responsible asset stewardship;
- engagement of the community and relevant stakeholders to determine appropriate levels of service;
- supporting long term financial planning;
- minimise the whole of life cycle costs of bridge assets through asset management principles and methodology;
- production of a clearly justified forward works programs and expenditure;
- management of risk associated with asset failure;
- ensure that SDRC legal obligations are met through compliance with the relevant acts and policies;
- ensure the asset/service is maintained for present and future generations at an equitable cost;
- improved efficiency through better asset lifecycle management;
- accountability and transparency in council expenditure; and
- continual monitoring and improvement of the asset management plan and practices.

The outcomes of the plan will include;

- Adopted levels of service;
- quantification of the future demand and the impact this will have on the bridge assets;
- a lifecycle management plan for selected* bridges including operations, maintenance and disposal; and
- a financial summary for the selected* bridges including the required long-term future expenditure.

**This will be extended to all bridge assets once this initial plan is reviewed and adopted by council.*

1.4 Definitions of Bridge Assets

This asset management plan will apply to the following structures:

- **Bridges**
- **Large Drainage Structures**

Adopted definitions of the two structures are detailed below;

- **Bridge** – A structure which allows traffic be it pedestrian or vehicular to traverse an obstacle through elevation. It must consist of at least one or more of the following elements; piles, piers, headstocks or decking.

- **Large Drainage Structure** – A major drainage structure which allows traffic, be it pedestrian or vehicular to traverse a watercourse through elevation. It is a self contained structure that has an opening span, height or diameter greater than 1.8 metres and a waterway area in excess of 3.0 square metres.

Figure 3 A typical bridge structure

Figure 4 Typical large drainage structure

1.5 Key Stakeholders

The relevant stakeholders are considered any group or individual that has an interest in the services provided by SDRCs bridge infrastructure assets. The relevant key stakeholders include;

- Southern Downs Regional Council;
- Federal and State Government Agencies including Department of Transport and Main roads, Emergency Services, Army etc;
- grant funding bodies;
- local residents which include vehicular, cyclists and pedestrian traffic;
- local industries;
- commercial operators including tourist and transport operators;
- tourists and visitors to the region; and
- seasonal workers who relocate to the region for periods of up to six months a year.

These individuals and groups of stakeholders all have needs and expectations related to the standard of services delivered by the bridge infrastructure. These include providing quality, accessible (especially in times of flood), value for money services without negative impacts on the environment and community.

1.6 Relationships with other Plans

This asset management plan will become a key document in councils planning and budgeting processes, linking with the following cooperate and strategic documents;

- Southern Downs Regional Councils;
    - Strategic Plan
    - Corporate Plan
    - Relevant Policies & Strategies
    - Asset Management Policy

1.7 Project Methodology

The methodology that has been used in completing the dissertation is outlined in the steps below:

1. Research background information on Bridge Asset Management Plans. A review of previous literature and information related to asset management plans, both in Australia and worldwide.
2. Define the purpose of the core AMP including the definitions of bridges.
3. Report on asset description including current conditions and general overview of existing bridges.

4. Determine the levels of service (LOS) for approximately five (5) selected bridges in relation to council's strategic goals and based on customer expectation and statutory requirements.

5. Determine the future demand and the effects of changing demand on the selected bridge assets.

6. Create a life cycle management plan for the selected bridges including operations, maintenance, and disposal, etc.

7. For the selected bridges, produce a financial summary including long-term future expenditure.

8. Present finding to peer group and submit dissertation in required format.

If time permits:

9. Extend the study to additional bridges.

10. Produce Asset Management practices including summary of Asset Management data, information systems, processes and implementation tactics.

11. Include a recommendation for improvement of the plan from the findings, including improvement strategy.

1.8 Consequences and Risks

Southern Downs Regional Councils risk management policy follows the process outlined in the AS/NZS 4360: 2004 and is detailed in the diagram below;

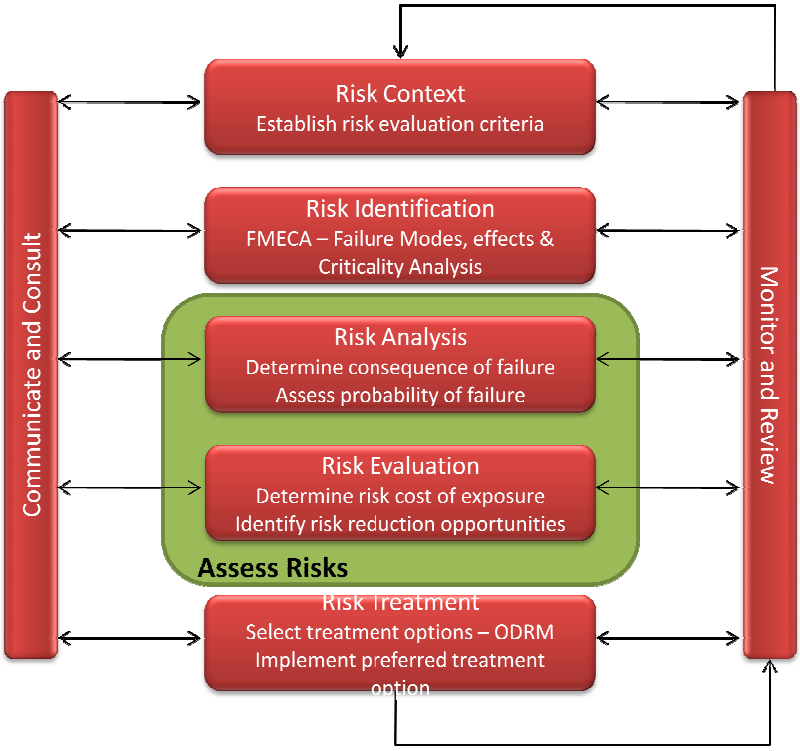

Figure 5 Risk Management Plan

Assess the likelihood and consequences from the hazard or risk					
Likelihood	***Consequences***				
	Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost Certain	*High*	*High*	*Extreme*	*Extreme*	*Extreme*
Likely	*Moderate*	*High*	*High*	*Extreme*	*Extreme*
Possible	*Low*	*Moderate*	*High*	*High*	*Extreme*
Unlikely	*Low*	*Low*	*Moderate*	*High*	*Extreme*
Rare	*Low*	*Low*	*Low*	*High*	*High*

Table 1 Risk Matrix

1.8.1 Risks whilst undertaking Project

This is not a too many risks apparent whilst undertaking the project. The expected risks to be managed during the execution of project are detailed below.

During inspection of bridges;

- Snakes which are common to the area and often located in the long grass, which is common along sides of roads and under bridges etc.
- Falls from heights whilst inspecting the bridges.
- Traffic is an ever-present factor along roads and needs to be managed with appropriate signage plans when activities and inspections will impact on travelled path.

All of these risks are very minor if managed effectively and can be minimised through a workplace health and safety plan, traffic management plans and the correct use of personal protective equipment. For instance a high visibility vest must be worn during all inspections.

During compiling of information and write-up;

- No risks apparent.

Hazard	Consequence	Likelihood	Risk	Control
Snakes	Moderate	Rare	Low	Awareness of risk
Falls	Minor	Rare	Low	Awareness of risk
Traffic	Moderate	Unlikely	Moderate	Traffic Management Plan – Signage etc

Table 2 Risk Summary

1.8.2 Risk beyond completion of project:

The implementation of this asset management plan will manage to reduce most risks faced by council in relation to is delivery of services and is of critical importance in the safe management of assets. This is highlighted and detailed in the literature review with the case of Brodie vs Singleton Shire Council (Burns, 2001) which outlines the importance of effective management and records of council assets. It is through this core bridge asset management plan that will ensure the bridges under the control of Southern Downs Regional Council remain safe for use and are inspected regularly. It will also help demonstrate that council is managing the assets in the most effective way possible.

1.9 Dissertation Outline

This dissertation seeks to create a core asset management plan through the combination of management, financial and engineering principles and practices to deliver pre-defined levels of service in the most economical way.

The figure below outlines the formation of the core asset management plan;

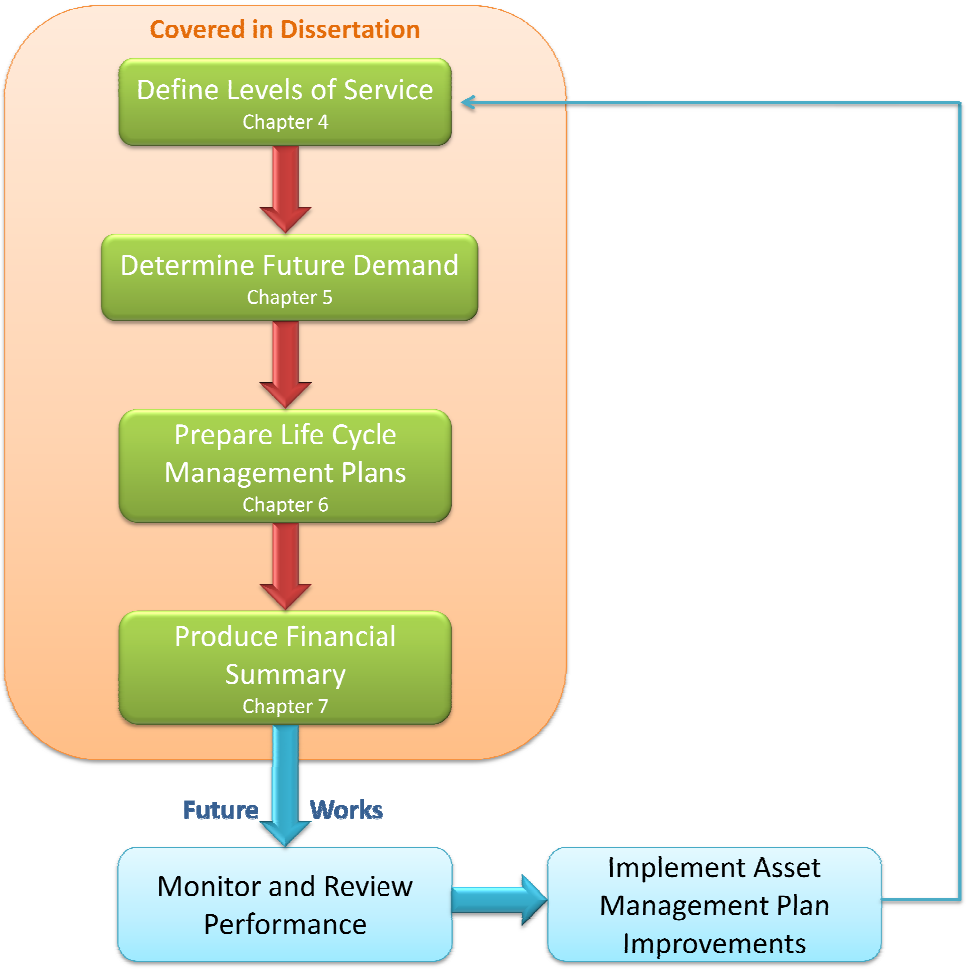

Figure 6 Overview of the Asset Management Process

It must be noted that this dissertation is the start of the asset management process for bridge assets. The plan will become a living document and will be continually monitored and improved over future years. Included as chapter 8 is a brief overview of suggested improvement measures to the asset management plan.

2 ASSET MANAGEMENT BACKGROUND

2.1 Introduction

This chapter will review literature related to the topic of Asset Management. It will outline the history and development of asset management and the impact it has had. The components of a core asset management plan will also be explored.

2.2 What is Asset Management?

Asset Management is defined as the combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required level of service in the most cost effective way (IIMM, 2006).

The word asset in relation to accounting means a thing of value that could be tangible or intangible. Assets can be classified as either physical or financial in nature. Physical assets can be both tangible and intangible. Tangible physical assets include roads, parks, bridges and stormwater infrastructure. Intangible physical assets can be in the form of intellectual property, patents or software. Financial assets include cash, stocks or other forms of financial investments. This is broken down further into current and non-current assets. Current Assets are those assets which are expected to be realised in cash or sold within one year of an organisation's balance date (IIMM, 2006). Non-current are all assets other than current assets, including assets held but not traded by a business in order to carry out its activities (IIMM, 2006). The focus of this literature review is non-current physical tangible infrastructure assets.

Examples of infrastructure assets under the control of local government include;

- Road networks (local)
- Bridges
- Stormwater networks
- Public buildings such as civic buildings, libraries etc.
- Parks and recreation facilities
- Water networks
- Sewerage networks

An asset management plan covers the description of the asset a, the levels of service that the asset provides, the future demand, lifecycle management plan, financial summary, asset management practices and a monitoring and improvement programme.

2.3 History of Asset Management

The concept of asset management was first formally adopted within the engineering profession during the privatisation of water utilities in Great Britain in the 1980s (Stapelberg, 2006).

The move towards asset management marks a change from reactive management which was the main method used for determining maintenance and replacement of infrastructure in the past.

2.4 Asset Management in New Zealand

New Zealand has been recognised as a world leader in asset management practices related to local government. Over the past 15 years New Zealand has seen a number of successive government reforms which have been aimed at improving the efficiency of asset management of local government infrastructure.

In the past the local government sector focused on capital works and had little documentation on the condition and location of existing assets. The maintenance of these existing assets was not recorded and as such councils operated in a largely reactive way only when the asset started to demonstrate failures and had already reached the end of is first lifecycle.

To combat these issues a national body was formed in 1995. The New Zealand National Asset Management Steering group (NAMS) is made up of representatives from the following major infrastructure related associations in New Zealand.

- INGENIUM—Association of Local Government Engineering NZ
- SOLGM—Society of Local Government Managers NZ
- Local Government Association of New Zealand
- Office of the Auditor-General
- New Zealand Water and Wastes Association
- New Zealand Recreation Association
- Association of Local Government Information Managers

2.5 The development of Asset Management in the Australian Local Government Sector

There are a number of important factors which are impacting on the adoption of asset management practices in Australia. The Commonwealth government has set a target to have all infrastructure asset classes managed by councils covered by core asset management plans with a deadline of December 2010.

In the early 1990s AAS27 legislation was introduced. This legislation required the reporting of asset values (replacement cost) and depreciation. Many councils in Australia then took on massive asset data collection to comply with AAS27. It was soon realised that this practice was beneficial not only to the accountants but also the engineering departments were able to use this information to help with decisions related to capital works and maintenance.

Perhaps the most important development for asset management in relation to local government came in 2001 after a landmark decision in the case of Brodie v Singleton

Shire Council. The high court found that Singleton Shire Council did not demonstrate that it had sufficiently inspected and maintained a timber bridge which collapsed whilst Mr Brodie was using it. This ruling removed the immunity for non-feasance from councils (Dr Morrison A.S., 2002).

The result of this court decision was that local councils had to be able to demonstrate that they are correctly allocating resources and that they are doing the best they can within their limited budget (Burns, 2010).

2.6 Bridge Asset Management Queensland

Bridges are a critical part of local, state and national road infrastructure assets. Due to their strategic locations over natural rivers and streams or over other obstacles, any bridge failure can have a severe impact on the community.

2.6.1 Department of Transport and Main Roads

The department of Transport and Main Roads Queensland bridge stock comprises of some 2700 bridges and in excess of 10,000 major culverts with a combined replacement value in excess of $2 billion (Main Roads, 2002). This ageing asset class is of critical important for maintaining a sufficient level of service to the general public. Department of Transport and Main Roads (DTMR) have been working on a state-wide integrated strategy for bridge management. This includes Bridge inspection and condition rating policy and procedures which have been well documented in the “Bridge Inspection Manual,” information management though the Bridge Information System (BIS), load capacity and heavy load management policies and procedures and bridge maintenance policy and procedures.

2.7 Components of a Core Asset Management Plan

The components of a core asset management plan are as follows;

- Description of the purpose of the plan;
- report on current asset condition and description;
- statements on the levels of service which the asset provides and how they are measured;
- consideration of the future demand on the assets;
- construction of a lifecycle management plan which includes strategies and costs covering the assets life;
- a financial summary of long term expenditure;
- asset management practices; and
- monitoring and improvement program.

Each of these components are explained in greater detail as they are discussed in the following chapters of this dissertation.

2.8 Southern Downs Regional Councils Current Asset Management Plans and Practices

Currently SDRC has no asset management plans in place for any of its asset classes. Most maintenance work in relation to council infrastructure is of a reactive nature. There is a re-seal program in which road conditions are assessed annually and given a condition rating, which is then used to program the re-seals. This program however is limited by the budget and even though more money is required to keep the roads from getting worse overall no levels of service are set, so it is hard to justify the request more money from council.

3 CURRENT ASSET OVERVIEW

This chapter details the asset hierarchy, current condition and the technical information which has been collected.

3.1 Introduction

The assets covered in this plan are shown below;

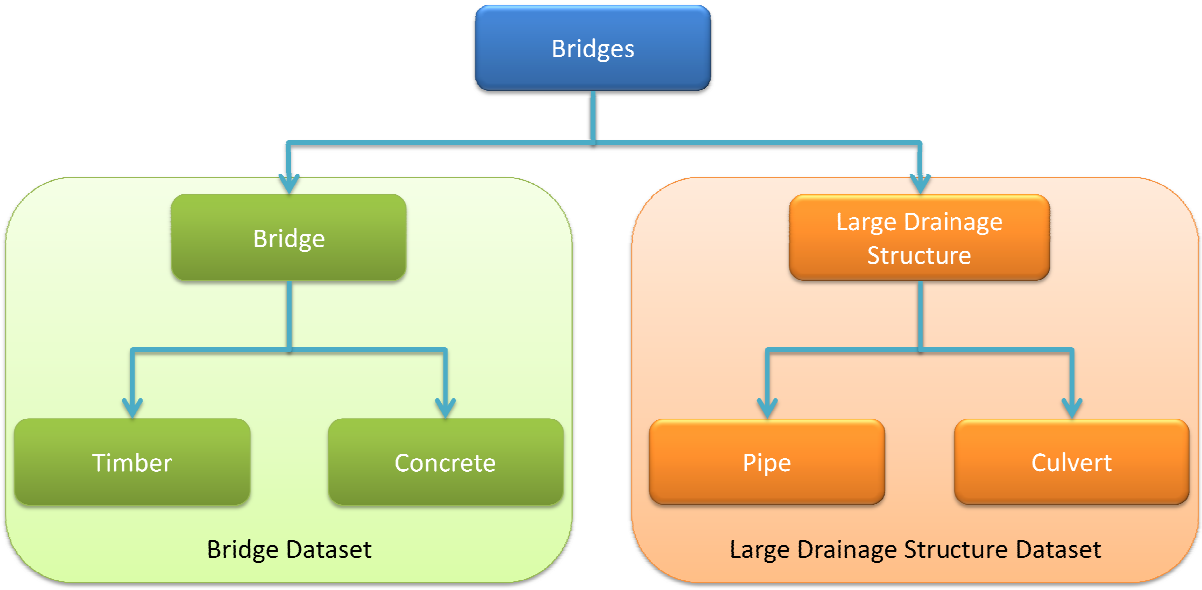

Figure 7 Overview of the Asset Management Process

As can be seen from the diagram there are two datasets for the assets. This simplifies the data capture and storage process as the data fields are significantly different between the two asset types.

3.2 Description of Assets

Council currently looks after a total of 125 bridges, made up of 68 bridges and 78 large drainage structures. Attached n Appendix B is the 09/10 financial summary detailing the values of the bridges. Below is a pie chart summarising the number of each asset class and their respected values. As mentioned there is a huge amount of spreadsheets and records kept on these assets stored all over the council network. Work is currently underway in sorting, deleting duplicates and combining records into one master dataset which will be used with a program called my data and continually updated and maintained.

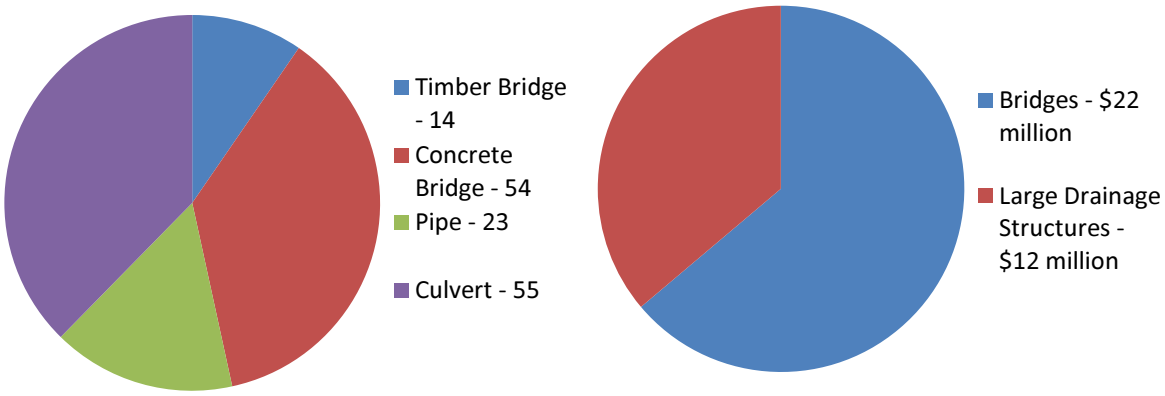

Figure 8 Numbers in each asset class and values of each asset group

The total replacement value of assets cover in this plan for the 09/10 financial year is $33,962,642. Depreciation for this period was $180,683.

3.3 Inspection Procedure

Council currently has contractors engaged undertaking level two bridge inspections on all the bridges in the region. It was expected that the condition reports would be in early September but due to rain delays and resource issues they will not be ready until early December. The inspections have been carried out in accordance with Department of Transport and Main Roads Bridge Inspection Manual. This manual was created out of a need for a systematic state-wide management system as individual inspection regimes had been developed and managed at various District offices and were restricted by lack of funding and limited resources.

There are three levels of inspections detailed in the manual. These are;

- Level One – which is a routine maintenance inspection carried out by trained council staff. The general functionality of the structure is assessed and any major problems or defects are identified for investigation.
- Level Two – is a detailed inspection which requires specialist trained persons and involves drilling of the timber bridge components and identifies any issues with the structure. An overall condition rating is given and recommends remedial action and possible further investigation.
- Level Three – is a detailed structural inspection carried out by a structural engineer. These are carried out when a structure is deemed to have major structural deterioration, damage or is behaving in a way different to the original design.

3.4 Condition States

All of the structures inspected at level two are given an overall condition rating. There are five condition ratings which are outlined below;

Condition State	Subjective Rating	Description
1	**Good** / As new	Free of any defects with very little deterioration.
2	**Fair**	Free of any structural defects, and only deterioration of a minor nature evident i.e. in the protective coating etc.
3	**Poor** (requires monitoring)	Minor defects affecting the durability and serviceability. Structure may require monitoring and possibly remedial action or further inspection by a structural engineer.
4	**Very Poor** (immediate remedial action required)	Defects affecting the durability and serviceability which require immediate intervention and inspection.
5	**Unsafe** (bridge must be closed until inspection has been carried out by structural engineer)	The structural integrity is severely comprised and bridge must be closed to traffic immediately until a full inspection is carried out and the subsequent recommended remedial action is carried out.

The last inspection of bridge assets (timber and concrete bridges) was carried out in 2004 and the summary of the condition states is detailed below.

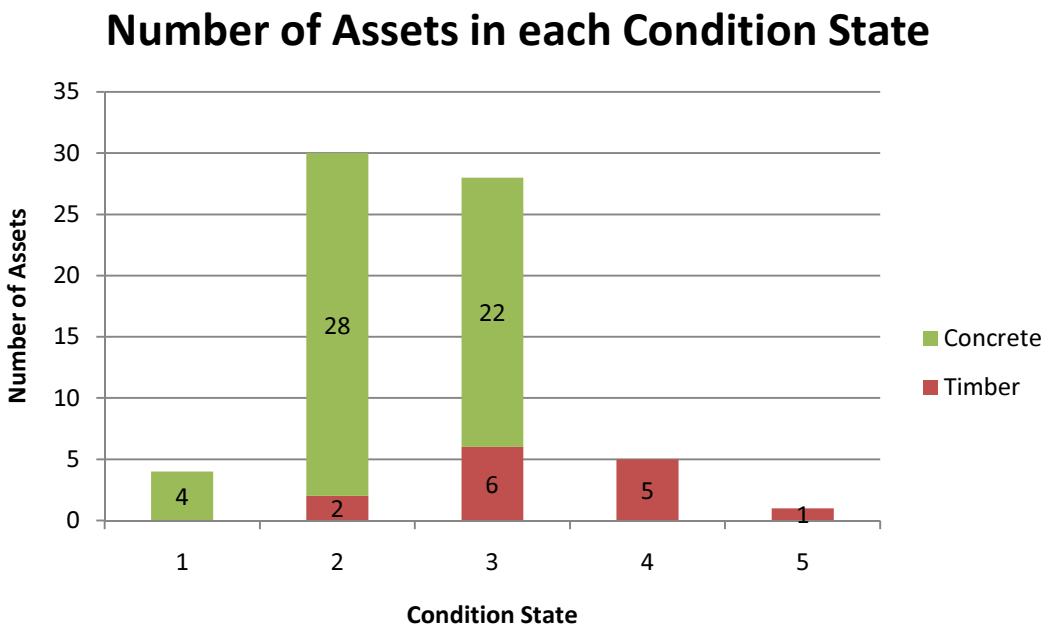

Figure 9 Condition State of Bridge Asset group

It must be noted that all of the condition state 4 and 5 structures are timber. Due to this there will be a focus on the replacement and management program for the timber structures. All of the concrete bridges are condition state 1 through to 3. They have only minor issues currently and are not expected to have deteriorated much over the last six years.

A typical level two inspection report has been attached as Appendix C. Note the recommended maintenance and defects listed. Kital Road bridge will be looked at in more detail in chapter 6.

3.5 Conclusion

The current asset condition has been gathered through level 2 inspections on all bridge assets in accordance with the Main Roads Bridge Inspection Manual. The large drainage structures are currently having level one inspections carried out by trained council staff. Inspection reports for 2010 are not available in time to be considered for this dissertation. Therefore reference is made to the 2004 Bridge Inspection Reports to outline the process and methodology. The simple demonstration of condition four and five bridges is a representation of ‘Gap Analysis’ later in the financial section of this dissertation.

4 LEVELS OF SERVICE

This chapter details the proposed levels of service set out for the bridge assets and the factors behind their adoption. The levels of service set out to support councils strategic goals, community expectations and to meet relevant legislation and statutory requirements.

4.1 Introduction

The level of service can be defined as the service quality / quantity for a particular activity or service area against which the service performance is measured. The levels of service are divided into the community and technical levels of service.

- Customer / Community LoS – is defined as how the customer receives / perceives the service.
- Technical LoS – is defined as the plans / measures in technical terms measured against a benchmark.

Since this is the first attempt to quantify the levels of service provided by bridge assets the core approach of documenting existing service levels has been undertaken. This has been achieved through consultation with relevant works supervisors, engineers and managers in a series of meetings. As a result of these consultations it was discovered that there was very little work carried out in regards to bridge maintenance and regular inspections due to a combination of staff turn-over and poor record keeping. The only work carried out on bridges over the last two financial years was of a reactive nature driven by customer requests.

4.2 Proposed Levels of Service

Due to the fact that levels of service form the basis of the maintenance and inspection programs it is imperative that all legislative, safety and community requirements are met. Currently there has not been any formal community consultation to determine community expectations and satisfaction. These expectations and satisfaction has been assumed for the first draft levels of service in consideration of complaints or requests lodged with councils customer service section. For some timber bridge replacements council has been dealing with effected stakeholders on a political level and design options have been produced and considered. A community consultation process has been suggested for improving the levels of service in future years and is detailed in the recommendations section.

The following table outlines the assumed community levels of service that I have proposed and the derived technical levels of services designed to meet them. The performance targets and measurements are in the draft stages and are yet to be formally adopted by council. The inspection frequencies based on condition states have been adopted from the Bridge Inspection Manual (DTMR).

Key Performance Measure	Level of Service	Reason for Activity	Intervention Level	Hierarchy	Frequency / Responsiveness	Performance Indicator	Target Performance	Current Performance
Draft Community Levels of Service								
Quality	Provide a smooth ride	Community expectations	NA	ALL	NA	Customer service requests	Less than 10 per month	Currently performance tracking does not exist
Function	Ensure that the bridge meets user requirements for accessibility	Community expectations	NA	ALL	NA	Customer service requests	Less than 4 per month	Currently performance tracking does not exist
Safety	Provide safe suitable bridges, free from hazards	Community expectations	NA	ALL	NA	Customer service requests	Less than 10 per year	Currently performance tracking does not exist
Draft Technical Levels of Service								
Condition	Level 1 inspections	Identifying work needs to assist in maintenance program	NA	Concrete Bridges Timber Bridges Culverts / Pipes	12 months 12 months 12 months	Frequency of inspections	100%	Currently performance tracking does not exist

Condition	Level 2 and 3 inspections	To assess the structural integrity and capacity of the bridge substructure and superstructure. Inspections will be carried out in accordance with DMR Bridge Inspection Manual	NA	Concrete Bridges Timber Bridges Culverts / Pipes ALL	CS1-2 5 years 5 years 5 years CS4 12 months staggered at 6 monthly intervals with Level 1 inspection	CS3 3 years 3 years 3 years	Frequency of inspections	90%	Currently performance tracking does not exist
Accessibility	Provide appropriate hazard free access on bridge and approaches.	To ensure that emergency works are performed to remove dangerous hazards to road users	Notification of hazard to bridge users	ALL	24 hours after event. Must be made safe within 6 hours of event.		All emergency works including barricades & bridge closures within 6 hours of event.	100%	Currently performance tracking does not exist
Quality	Routine maintenance	To ensure asset is well maintained		ALL	Carried out in conjunction with Level 1 inspections				Currently performance tracking does not exist
Safety	Minor repairs identified in Level 1 inspection	To ensure asset is well maintained		ALL	Within 4 months of identification of hazard.			90%	Currently performance tracking does not exist

Safety	Major repairs / refurbishment identified in level 2 and 3 inspections	To ensure bridge remains in a safe and serviceable condition		ALL	Annual program, ranked according to risk and viability.		90%	Currently performance tracking does not exist

Table 3 Draft Levels of Service

4.3 Summary

These draft levels of service will ensure that the bridges remain safe for use and that any problems or damage will be identified before they have an adverse impact on users. It is envisaged that these levels of service will be constantly reviewed and improved over time. The community levels of service should be obtained in future via questionnaires and surveys, e.g. telephone, door to door, public meetings, etc. The technical levels of service can be used to develop maintenance levels of service to describe the specific work and response in the workforce, which would be measurable.

5 FUTURE DEMAND

This chapter will detail the expected future demand, the changes in technology and a proposal for the demand management plan.

5.1 Demand Forecast

The factors which are influencing the future demand include;

- Population increase;
- tourism industry growth;
- residential developments;
- change and growth of local industry; and
- changing demand from users.

The population of the region is expected to rise at 2% per annum. This growth is focused mainly in the towns of Warwick and Stanthorpe. Growth in the outer rural areas remains mostly stagnant. The tourism industry has remained steady over the last few years and currently no major increases are expected. As mentioned most residential developments are happening in and around the main towns in the region where the bridge assets are in good repair and handling the traffic volume well. With any change in local industry, for instance a new dairy farm, council considers the impact this would have on local infrastructure and any foreseeable issues are determined and remediated before approval is given.

The only issue which will be of concern to council will be changing demand of the users. This will be indentified through proposed community consultation in relation to satisfaction levels and expected levels of service. Any issues which arise from this will have to be addressed once the community consultation has been undertaken.

5.2 Changes in Technology

The changes in technology over the years which have an impact on bridges is the size and weights of the heavy vehicles. When the timber bridges and early concrete bridges were initially designed and constructed the heavy vehicle mass and dimensions were less than they are today. Currently all of the remaining timber structures are located in rural areas with few heavy vehicle traffic. Where there are load limits in place which would restrict heavy vehicles alternate routes are available. Therefore any changes in technology in the near future is not expected to impact on the current bridge assets.

5.3 Demand Management Plan

Typically when a planned road upgraded is designed to cater for increased traffic or heavy vehicles any bridge assets are located along road are investigated and either planned upgrade assets it is recommended that the demand management plan and strategies be adopted directly from the roads asset demand management plan.

6 LIFE CYCLE MANAGEMENT PLAN

For this chapter 5 bridges have been selected and a life cycle management plan detail for each one. This will give an indication of the methodology and will be extended to cover the rest of the assets in due course. Four bridges (2 timber & 2 concrete) and one large drainage structure will be investigated.

6.1 Life Cycle of an Asset

The costs involved in the lifecycle of an asset are maintenance, renewal/ refurbishment, disposal and initial capital cost. When an asset is constructed it is considered to be at the start of its life. It will be providing the designed level of service and in the case of a concrete bridge has an estimated remaining life of 80 years. As the asset progresses through its service life the level of service it provides reduces until it reaches a critical intervention point. The intervention point is a predetermined point at which an asset will need to be refurbished or replaced as it does not provide an appropriate level of service. Consideration is then given to the differing options involved in replacement. For example a timber bridge may have many major defects, which would cost far too much to repair and there would be no choice but to replace it. The replacement of the bridge with a similar type of structure could be very expensive, and there are other options such as a set of culverts, a floodway or closure of the road. It comes down to community benefit versus whole of life cost of the asset.

A diagram outline the lifecycle of an asset is given below:

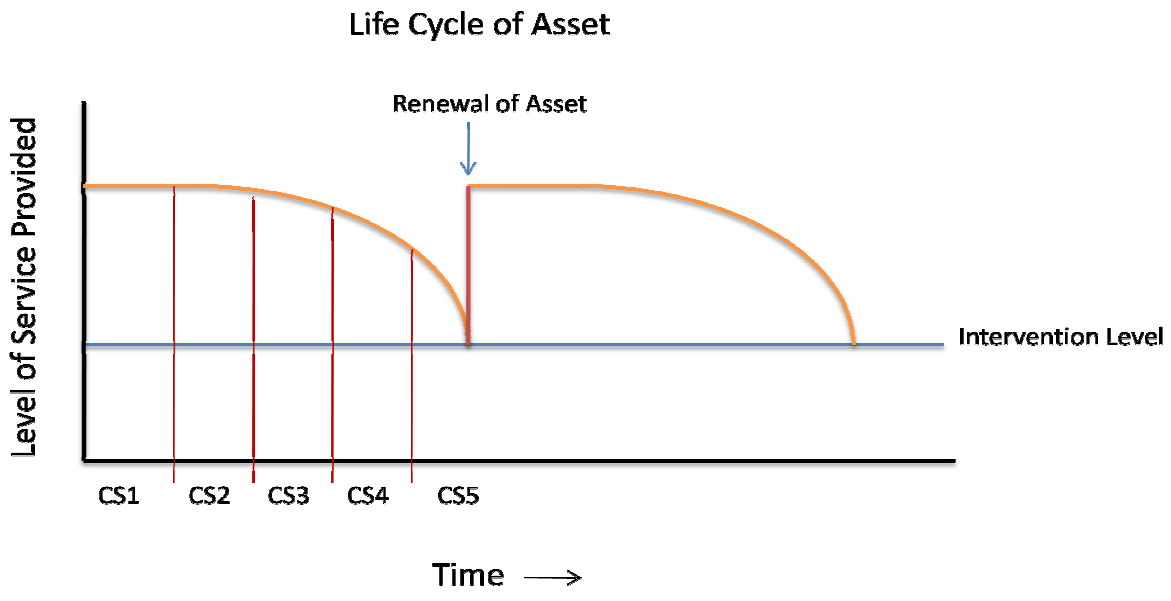

Figure 10 Asset Life Cycle

Where a particular asset will appear on the graph depends on its condition rating. It is proposed that the overall condition rating be used to calculate its remaining useful life, which is used to calculate the remaining life cycle cost of the asset and determine approximately when an asset will need to be renewed or replaced.

It is assumed that the useful life of a bridge will be 80 years then by correlating this to remaining useful life we get for the condition states;

- Condition State 1: 80 – 60 years remaining useful life.
- Condition State 2: 60 – 40 years remaining useful life.
- Condition State 3: 40 – 20 years remaining useful life.
- Condition State 4: 20 – 1 years remaining useful life.
- Condition State 5: No remaining useful life. The bridge needs to be rehabilitated, replaced or the level of service which it provides needs to be revised, ie load limits etc.

It should be noted that an asset can have a longer than expected life and this methodology ensures that the focus is on remaining useful life rather than age of a structure. For instance if a structure is 60 years old and is still in condition state 2 this means that the expected remaining life can be as high as 80 years, even though it is 20 years away from the end of its theoretical design life.

The lifecycle costs of an asset are demonstrated below in the graph. There is an initial construction cost of building the asset, then as the asset progresses through its useful life the costs of maintaining it grow steadily until it reaches a point where it needs to be refurbished. This cycle continues until the asset reaches the end of its useful life and needs to be disposed and replaced.

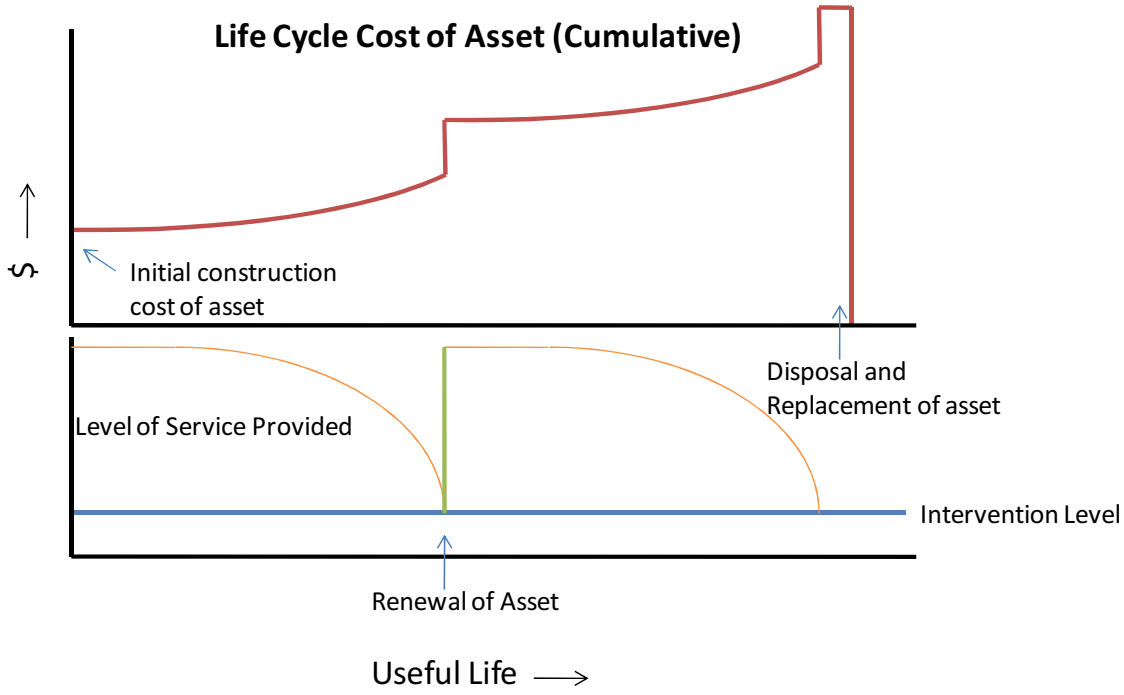

Figure 11 Asset Life Cycle Costs

6.2 Kital Road Bridge Life Cycle

Attached as appendix C is the bridge inspection notes from Kital Road Bridge. It is located near the town of Allora. It is on a very low trafficked road with only 6 vehicles per day. The bridge is a three span timber bridge. From the 2004 level two inspections the bridge has been classed as condition state four. The bridge is in very poor condition with numerous major faults. It is uneconomical to replace all the components which are at the end of the life, so it has been decided to replace the structure this financial year. Four replacement strategies will be investigated along with the life cycle cost of each option for comparison. The four options to be considered are;

1. Replacement of structure with a composite structure;
2. Replacement of structure with a low flow floodway with twin 2100 RC pipes;
3. Replacement of structure with a low level crossing;
4. Removal of structure and closure of crossing.

The factors which will be considered are financial, community, life cycle costing and environmental impact. The life cycle costs are determined using the draft levels of service for inspection intervals and the maintenance, materials and labour are averages taken from past bridge works.

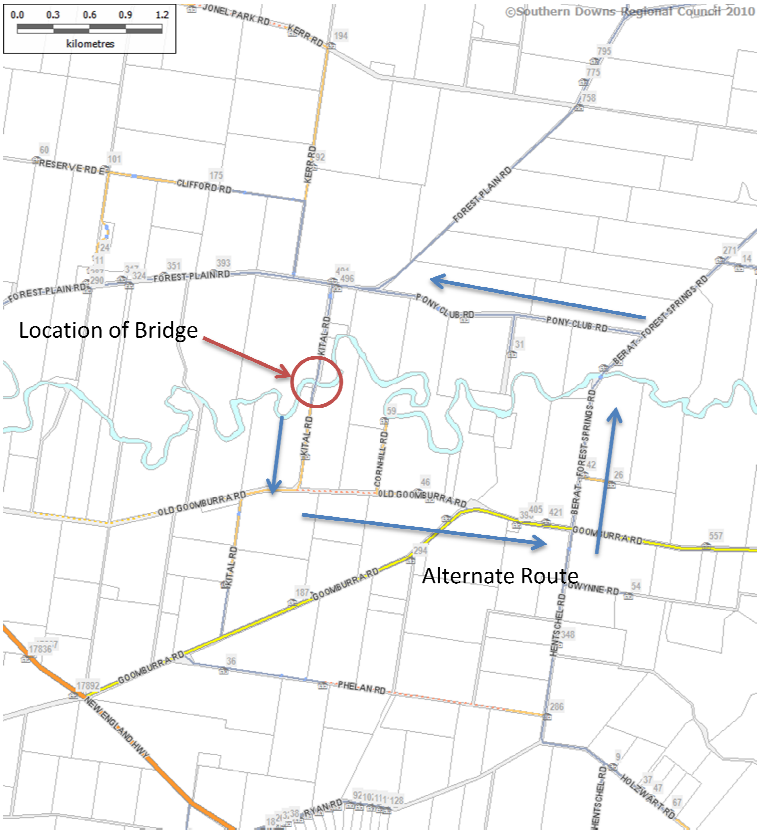

Figure 12 Location of Bridge

6.2.1 Option 1 Replacement of Structure with a Composite Structure

Wangers Toowoomba have developed composite materials which can be used to rehabilitate or replace a timber bridge. The composite materials behave in a similar way to timber allowing them to be used in conjunction with existing timber piles. During discussion with Wagners it was proposed that Wagners could design, certify, supply and install a composite bridge utilising existing timber piles. The structure would offer the same flood immunity as the existing bridge and would have a similar expected lifespan with very little maintenance required. The total cost from Wagners was $200,000 + GST. This would include the design and certification, fabrication and supply of composite components to replace the timber components, the removal of the existing structure, and installation of composite components including piers, headstocks, girders, decking and kerbs.

The following table details the annual cost of the bridge as it would be for each condition state. The inspection times have been assumed and current council labour and plant hire rates have been used. The total cost is based on an expected life of 80 years and 20 years spent in each condition state.

	Type	Frequency (years)	Cost	Annual Cost
	Initial Cost	1	$ 200,000	$ 200,000
Condition State 1	Level 1 Inspection	1	$ 463	$ 463
	Level 2 Inspection	5	$ 1,200	$ 240
	Routine Maintenance	1	$ -	$ -
	Materials	1	$ -	$ -
			Total Annual Cost	$ 703
Condition State 2	Level 1 Inspection	1	$ 463	$ 463
	Level 2 Inspection	5	$ 1,200	$ 240
	Routine Maintenance	1	$ 347	$ 347
	Materials	1	$ 500	$ 500
			Total Annual Cost	$ 1,550
Condition State 3	Level 1 Inspection	1	$ 463	$ 463
	Level 2 Inspection	3	$ 1,200	$ 400
	Routine Maintenance	1	$ 463	$ 463
	Materials	1	$ 1,500	$ 1,500
			Total Annual Cost	$ 2,826
Condition State 4	Level 1 Inspection	1	$ 463	$ 463
	Level 2 Inspection	1	$ 1,200	$ 1,200
	Routine Maintenance	1	$ 926	$ 926
	Materials	1	$ 4,000	$ 4,000
			Total Annual Cost	$ 6,589
			Total Cost	$ 433,360

Table 4 Cost over the life-cycle of asset

The community benefits would be minimal as this bridge only services six vehicles per day. The environmental impact of this structure would be minimal as it utilises existing piles, thus reducing the amount of river bank disturbance. The total life cycle cost of this asset, assuming 20 years in each condition state is $433,360.

6.2.2 Option 2 Replacement of Structure with a Low Flow Floodway

After surveying the site a design has been drawn up by the design department incorporating two 2100mm diameter reinforced concrete pipes and a concrete running surface. The layout and long section have been attached in Appendix D. The total cost for supply and construction for this option is $319,108.34 + GST. The estimate is attached as Appendix E.

The following table outlines the annual costs of this option for each condition state. The inspection times have been assumed and current council labour and plant hire rates have been used. The cost of inspections, maintenance etc is a lot less than that of a typical bridge. Again this structure has a design life of 80 years.

	Type	Frequency (years)	Cost	Annual Cost
	Initial Cost	1	$ 319,108	$ 319,108
Condition State 1	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	5	$ 900	$ 180
	Routine Maintenance	1	$ -	$ -
	Materials	1	$ -	$ -
			Total Annual Cost	$ 527
Condition State 2	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	5	$ 900	$ 180
	Routine Maintenance	1	$ 347	$ 347
	Materials	1	$ 500	$ 500
			Total Annual Cost	$ 1,374
Condition State 3	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	3	$ 900	$ 300
	Routine Maintenance	1	$ 635	$ 635
	Materials	1	$ 1,000	$ 1,000
			Total Annual Cost	$ 2,282
Condition State 4	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	1	$ 900	$ 900
	Routine Maintenance	1	$ 1,225	$ 1,225
	Materials	1	$ 2,000	$ 2,000
			Total Annual Cost	$ 4,472
			Total Cost	$ 492,208

Table 5 Cost over the life-cycle of asset

The reduced community benefits from the lower level of flood immunity would be have very little impact as it services only six vehicles per day. The environmental impact of this structure would be moderate as there will be a lot of disturbance to the creek during construction, however the long term impact would be minimal. The total life cycle cost of this asset, assuming 20 years in each condition state is $92,208.

6.2.3 Option 3 Replacement of Structure with a Low Level Crossing

After surveying the site a design has been drawn up by the design department a low level floodway crossing with a concrete running surface. The layout and long section have been attached in Appendix F. The total cost for supply and construction for this option is $155,852.23 + GST. The estimate is attached as Appendix G.

The following table outlines the annual costs of this option for each condition state. Again this structure would have a design life of 80 years. Since this structure does not meet the requirements to be covered in this plan the inspections are not required, therefore the operating cost is very low for this asset as it would only require minor maintenance over its life.

	Type	Frequency (years)	Cost	Annual Cost
	Initial Cost	1	$ 155,852	$ 155,852
Condition State 1	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	5	$ 900	$ 180
	Routine Maintenance	1	$ -	$ -
	Materials	1	$ -	$ -
			Total Annual Cost	$ 527
Condition State 2	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	5	$ 900	$ 180
	Routine Maintenance	1	$ 347	$ 347
	Materials	1	$ 500	$ 500
			Total Annual Cost	$ 1,374
Condition State 3	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	3	$ 900	$ 300
	Routine Maintenance	1	$ 635	$ 635
	Materials	1	$ 1,000	$ 1,000
			Total Annual Cost	$ 2,282
Condition State 4	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	1	$ 900	$ 900
	Routine Maintenance	1	$ 1,225	$ 1,225
	Materials	1	$ 2,000	$ 2,000
			Total Annual Cost	$ 4,472
			Total Cost	$ 328,952

Table 6 Cost over the life-cycle of asset

The reduced community benefits from the lower level of flood immunity would be have very little impact as it services only six vehicles per day. The environmental impact of this structure would be moderate as there will be a lot of disturbance to the creek during construction, however the long term impact would again be minimal. The total life cycle cost of this asset, assuming 20 years in each condition state is $328,952.

6.2.4 Option 4 Removal of Bridge and Closure of Crossing

The final option is to remove the bridge and close the crossing to all traffic. This would cost $15,000 + GST and is easily the cheapest option, however the bridge is used by a local farmer who has paddocks either side of the river. Whilst there are alternative routes, it is approximately a 5km round trip for the farmer, this is a long way to take farm machinery.

6.2.5 Recommended Option

It is recommended that council adopts the fourth option of closing the crossing as it is by far the cheapest option and only has a minor impact on the community. This issue went to council in August and after a public consultation process it was decided that option three was the best outcome for council and the community. Work is due to start in December 2010.

6.3 William Deacon Bridge Life Cycle

Structure Condition Inspection Report — B2/1 — Sheet 1 of 2

Structure ID	10021	Structure Name	William Deacon Bridge		
Road Type	Local Arterial				
Structure Type	Bridge	Road Number	N/A		
Construction Type	Deck Unit	Road Name	Allora Drive		
Construction Material	Concrete	Crossing	Dalrymple Creek		
Date Of Construction	Unknown	Suburb	Allora		
District	SDRC	Owner	Southern Downs Regional Council		
UBD Reference	Allora F-4	Local Authority	SDRC		
Latitude (dec deg)	-28.028420	Number Of Spans		2	
Longitude (dec deg)	151.982590	Length (m) (Abutment to Abutment)		28.40	
Date Of Last Inspection	Unknown	Height (m) (Ground/Water to Deck Unit)		5.20	
Inspection Date	13/08/2010	Width (m) (Outside kerb to kerb)		9.30	
Future Inspection Date	13/08/2015	Cell Length	N/A		
Filled in By	MEF	Cell Width	N/A		
Inspection	Level 2	Cell Height	N/A		
Inspectors	PH,MEF	Checked by	NL		
Chainage (km)	0.53	on	Allora Drive		

Cracks marked for monitoring? Yes

Inspection Type Programmed

Other Remarks: Structure is a 2 span concrete road bridge, 2 traffic lanes wide.

Component Location: Modification	Group	Component	Standard Number	Exposure Class	Quantity	Unit	Quantity Per Condition State: 1	2	3	4	Maintanance Required	Comments (Location of item/condition; Description of defects by location type; References of sketches and photos (Photo Reference Numbers))
O	AP1	GR1	72S	1	1.0	Each		1			✓	The end treatments on the guard rails may need to be assessed if they meet current safety or design standards.
O	AP1	AP	70S	1	1.0	-		1				
O	AP1	GR	72S	1	1.0	Each		1			✓	The end treatments on the guard rails may need to be assessed if they meet current safety or design standards.
O	A1	J1	15O	1	8.7	Lin m	X	X	X	X		Believed to be a fixed joint. Unable to be seen.
O	S1	K1	3P	1	14.2	Lin m		14.2				Traffic kerb is part of the pre cast outside deck unit.
O	S1	WS	1O	1	123.0	m²		94.6	28.4		✓	Moderate cracking of the wearing surface above the abutment 2 joint location. Scuppers need to be checked regularly to keep clear. Stripping of the surface is also occurring near the kerbs. Photo 0005; Photo 0006; Photo 0007; Photo 0015; Photo: 0016
O	S1	K2	3P	1	14.2	Lin m		14.2				Traffic kerb is part of the pre cast outside deck unit.
O	P1	J1	15O	1	8.7	Lin m	X	X	X	X		Believed to be a fixed joint. Unable to be seen.
O	S2	K1	3P	1	14.2	Lin m		14.2				Traffic kerb is part of the pre cast outside deck unit.

Overall Ratings		1	2	3	4	5	Comments
Original	O		✓				Structure was in good condition at the time of inspection.

Widening (WLn , WRn), Lengthening (L1, L2), Raised (Ra), Redecked (Re), Shortening (S1, S2), Strengthening (St)

Overall Inspection Comments: Repairs requires to cracks in the wearing surface above the joint locations.
The batter protection on abutment 2 has severe erosion at the base of the wall.

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Figure 13 Draft summary of recent ARRB level two inspection

ARRB have recently completed their level two inspections on all of councils bridge assets and they are in the process of writing up the condition reports. The figure above is the front page of a draft inspection report for a concrete two span bridge located in Allora. The structure has been given an overall condition state rating of two. This means that the bridge has an expected remaining useful life of between 40 – 60 years. A life cycle management plan is outlined and costed below.

	Type	Frequency (years)	Cost	Annual Cost
	Initial MTCE cost	1	$ 7,500	**$ 7,500**
Condition State 2	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	5	$ 900	$ 180
	Routine Maintenance	1	$ 347	$ 347
	Materials	1	$ 500	$ 500
			Total Annual Cost	**$ 1,374**
Condition State 3	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	3	$ 900	$ 300
	Routine Maintenance	1	$ 635	$ 635
	Materials	1	$ 1,000	$ 1,000
			Total Annual Cost	**$ 2,282**
Condition State 4	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	1	$ 900	$ 900
	Routine Maintenance	1	$ 1,225	$ 1,225
	Materials	1	$ 2,000	$ 2,000
			Total Annual Cost	**$ 4,472**
			Total Cost	**$ 170,060**

Table 7 Cost over the life-cycle of asset

The repairs suggested by ARRB are estimated to cost approximately $7,500. For the rest of the life of the asset it has been assumed that it will be in each condition state for 20 years. It is expected to cost $1,374 annually while is remains in condition state two. This then increases to $2,282 for CS3 and $4,472 for CS4. The total estimate cost of operating this bridge until it is replaced is $170,060. Note that this is only an approximation and CPI has not been applied to the figures.

6.4 Bourke Road Bridge Life Cycle

Structure Condition Inspection Report — B2/1 — Sheet 1 of 1

Structure ID	10081	Structure Name	None
Road Type	Local Access		
Structure Type	Bridge	Road Number	N/A
Construction Type	Timber Girder	Road Name	Bourke Rd
Construction Material	Timber	Crossing	Condamine River
Date Of Construction	Unknown	Suburb	Elbow Valley
District	SDRC	Owner	Southern Downs Regional Council
UBD Reference	40 F-12	Local Authority	SDRC
Latitude (dec deg)	-28.363340	Number Of Spans	1
Longitude (dec deg)	152.208290	Length (m) (Abutment to Abutment)	9.80
Date Of Last Inspection	Unknown	Height (m) (Ground/Water to Deck Unit)	3.10
Inspection Date	08/10/2010	Width (m) (Outside kerb to kerb)	4.60
Future Inspection Date	08/10/2013	Cell Length	N/A
Filled in By	MEF	Cell Width	N/A
Inspection	Level 2	Cell Height	N/A
Inspectors	MEF	Checked by	AV
Chainage (km)	4.10	on	Bourke Rd

Cracks marked for monitoring?	No
Inspection Type	Programmed

Other Remarks

Structure is a 1 span timber road bridge, 1 traffic lane wide.
Approach 1 is from the Killarney Rd end of the bridge.
A load limit of 32t has been applied to the bridge.

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintanance Required	Comments
Modification	Group	Component	Standard Number				1	2	3	4		• Location of item/condition • Description of defects by location type, • References of sketches and photos (Photo Reference Numbers)
O	AP1	AP	70O	1	1.0	Each			1		✓	Approach wearing surface is dirt and is in poor condition. No give way or bridge end markers on approach. Photo 0002
O	S1	K1	3T	1	9.8	Lin m			9.8		✓	Timber has a large split in the end. Moderate weathering of the timber kerbs is occurring.; Photo: 0014
O	S1	D	20T	1	49.0	m²			49		✓	Moderate weathering, splintering and lose of section of the timber deck planks is occurring. Dirt needs removing from the timber deck in places.; Photo: 0013
O	S1	K	3T	1	9.8	Lin m		9.8				Moderate weathering of the timber kerbs is occurring.
O	AP2	AP	70O	1	1.0	Each			1		✓	Approach wearing surface is dirt and is in poor condition. No give way or bridge end markers on approach. Photo 0005
O	S1	G	22T	1	4.0	Each		3		1	✓	Only the outside girders (1 and 4) were drilled. End 2 of girder 1 was has a very severe pipe inside the girder.

Overall Ratings		1	2	3	4	5	Comments
Original	O			✓			Structure was in poor condition at the time of inspection.

Widening (WLn , WRn), Lengthening (L1, L2), Raised (Ra), Redecked (Re), Shortening (S1, S2), Strengthening (St)

Overall Inspection Comments

Bridge should have had the Underbridge inspection unit to inspect the bridge.
It was deemed to unsafe to use ladders to drill the girders.
Only the end of a number of girders could be drilled from the deck. It is recommended that a full drill survey be conducted as soon as possible.
An UBIU is required for ARRB to undertake a full drilling survey of the bridge.

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Figure 14 Draft summary of recent ARRB level two inspection

The figure is the front page of a draft inspection report for a timber single span bridge located in Elbow Valley. The structure has been given an overall condition state rating of three. This means that the bridge has an expected remaining useful life of between 20 – 40 years. A life cycle management plan is outlined and costed below.

	Type	Frequency (years)	Cost	Annual Cost
	Initial MTCE cost	1	$ 12,500	$ 12,500
Condition State 3	Level 1 Inspection	1	$ 463	$ 463
	Level 2 Inspection	3	$ 1,200	$ 400
	Routine Maintenance	1	$ 463	$ 463
	Materials	1	$ 1,500	$ 1,500
			Total Annual Cost	**$ 2,826**
Condition State 4	Level 1 Inspection	1	$ 463	$ 463
	Level 2 Inspection	1	$ 1,200	$ 1,200
	Routine Maintenance	1	$ 926	$ 926
	Materials	1	$ 4,000	$ 4,000
			Total Annual Cost	**$ 6,589**
			Total Cost	$ 200,800

Table 8 Cost over the life-cycle of asset

The repairs suggested by ARRB are estimated to cost approximately $12,500. For the rest of the life of the asset it has been assumed that it will be in each condition state for 20 years. It is expected to cost $2,826 annually while is remains in condition state three. This then increases to $6,589 for CS4. The total estimate cost of operating this bridge until it is replaced is $200,800. Note that this is only an approximation and CPI has not been applied to the figures.

6.5 Bellinghams Road Bridge Life Cycle

Structure Condition Inspection Report — B2/1 — Sheet 1 of 2

Structure ID	10041	Structure Name	None
Road Type	Local Collector		
Structure Type	Bridge	Road Number	N/A
Construction Type	Timber Girder	Road Name	Bellinghams Rd
Construction Material	Timber	Crossing	Condamine River
Date Of Construction	Unknown	Suburb	Elbow Valley
District	SDRC	Owner	Southern Downs Regional Council
UBD Reference	39 I-13	Local Authority	SDRC
Latitude (dec deg)	-28.373430	Number Of Spans	1
Longitude (dec deg)	152.142390	Length (m) (Abutment to Abutment)	10.70
Date Of Last Inspection	Unknown	Height (m) (Ground/Water to Deck Unit)	1.70
Inspection Date	08/10/2010	Width (m) (Outside kerb to kerb)	5.90
Future Inspection Date	08/10/2013	Cell Length	N/A
Filled in By	MEF	Cell Width	N/A
Inspection	Level 2	Cell Height	N/A
Inspectors	MEF	Checked by	AV
Chainage (km)	6.80	on	Bellinghams Rd

Cracks marked for monitoring? No

Inspection Type Programmed

Other Remarks

Structure is a 1 span timber road bridge, 1 traffic lane wide.
Approach 1 is from the north.
Structure has a signed load limit of 24t.

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintanance Required	Comments
Modification	Group	Component	Standard Number				1	2	3	4		▫ Location of item/condition ▫ Description of defects by location type, ▫ References of sketches and photos (Photo Reference Numbers)
O	AP1	AP	70O	1	1.0	Each			1		✓	The approach asphalt wearing surface is in poor condition. No give way or bridge end markers on approach. Photo 0002
O	S1	K1	3T	1	10.7	Lin m		10.7				
O	S1	D	20T	1	63.0	m²		63				The timber deck planks are weathering moderately with none in need of replacement at this stage.; Photo: 0011
O	S1	K	3T	1	10.7	Lin m		9.7	1		✓	The abutment 1 end of the kerb has moderate splitting visible.; Photo: 0009
O	AP2	AP	70O	1	1.0	Each			1		✓	The approach asphalt wearing surface is in poor condition. No give way or bridge end markers on approach. Photo 0008
O	A1	H	54T	1	1.0	Each		1				Large internal piping was found in the LHS end of the headstock.; Photo: 0015
O	A1	PRO	53O	1	12.0	m²		12				Rock and concrete type batter protection.
O	S1	G	22T	1	5.0	Each		5				Minor rot in the sapwood on girder 1. Only minor internal piping was found in the timber girders.; Photo: 0018
O	A1	PRO	53O	1	12.0	m²		12				Rock and concrete type batter protection.

Overall Ratings		1	2	3	4	5	Comments
Original	O			✓			Structure was in fair condition at the time of inspection.

Widening (WLn , WRn), Lengthening (L1, L2), Raised (Ra), Redecked (Re), Shortening (S1, S2), Strengthening (St)

Overall Inspection Comments

Monitoring of the timber headstocks is recommended as large internal 'piping' was found.
No give way or bridge end marker signs on approaches.

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Figure 15 Draft summary of recent ARRB level two inspection

The figure is the front page of a draft inspection report for a timber single span bridge located in Elbow Valley. The structure has been given an overall condition state rating of three. This means that the bridge has an expected remaining useful life of between 20 – 40 years. A life cycle management plan is outlined and costed below.

	Type	Frequency (years)	Cost	Annual Cost
	Initial MTCE cost	1	$ 1,500	**$ 1,500**
Condition State 3	Level 1 Inspection	1	$ 463	$ 463
	Level 2 Inspection	3	$ 1,200	$ 400
	Routine Maintenance	1	$ 463	$ 463
	Materials	1	$ 1,500	$ 1,500
			Total Annual Cost	**$ 2,826**
Condition State 4	Level 1 Inspection	1	$ 463	$ 463
	Level 2 Inspection	1	$ 1,200	$ 1,200
	Routine Maintenance	1	$ 926	$ 926
	Materials	1	$ 4,000	$ 4,000
			Total Annual Cost	**$ 6,589**
			Total Cost	**$ 189,800**

Table 9 Cost over the life-cycle of asset

The repairs suggested by ARRB are estimated to cost approximately $1,500 as they are only very minor in nature. For the rest of the life of the asset it has been assumed that it will be in each condition state for 20 years. It is expected to cost $2,826 annually while is remains in condition state three. This then increases to $6,589 for CS4. The total estimate cost of operating this bridge until it is replaced is $189,800. Note that this is only an approximation and CPI has not been applied to the figures.

6.6 Hermitage Emuvale Road Bridge Life Cycle

Structure Condition Inspection Report — B2/1 — Sheet 1 of 2

Structure ID	10441	Structure Name	None
Road Type	Local Collector		
Structure Type	Bridge	Road Number	N/A
Construction Type	Deck Unit	Road Name	Hermitage Emuvale Rd
Construction Material	Concrete	Crossing	Swan Creek
Date Of Construction	Unknown	Suburb	The Hermitage
District	SDRC	Owner	Southern Downs Regional Council
UBD Reference	29 F-7	Local Authority	SDRC
Latitude (dec deg)	-28.210720	Number Of Spans	1
Longitude (dec deg)	152.107260	Length (m) (Abutment to Abutment)	11.80
Date Of Last Inspection	Unknown	Height (m) (Ground/Water to Deck Unit)	3.10
Inspection Date	06/10/2010	Width (m) (Outside kerb to kerb)	5.30
Future Inspection Date	06/10/2013	Cell Length	N/A
Filled in By	MEF	Cell Width	N/A
Inspection	Level 2	Cell Height	N/A
Inspectors	MEF	Checked by	AV
Chainage (km)	0.88	on	Hermitage Emuvale Rd

Cracks marked for monitoring? No

Inspection Type Programmed

Other Remarks

Structure is a 1 span concrete road bridge, 1 traffic lane wide.
Approach 1 is from the Yangan Rd end of the bridge.

Component Location: Modification	Group	Component	Standard Number	Exposure Class	Quantity	Unit	Quantity Per Condition State: 1	2	3	4	Maintenance Required	Comments
O	AP1	AP	70O	1	1.0	Each		1				
O	A1	J1	15O	1	4.5	Lin m	X	X	X	X		Believed to be a fixed joint. Unable to be seen.
O	S1	K1	3P	1	11.8	Lin m			11.8		✓	Outside deck units continue to the superstructure to form the bridge kerbs. Painting is required to the top surface of the kerb.; Photo: 0009
O	S1	WS	1O	1	53.0	m²		53				
O	S1	K	3P	1	11.8	Lin m			11.8		✓	Outside deck units continue to the superstructure to form the bridge kerbs. Painting is required to the top surface of the kerb.; Photo: 0011
O	A2	J	15O	1	4.5	Lin m	X	X	X	X		Believed to be a fixed joint. Unable to be seen.
O	AP2	AP	70O	1	1.0	Each		1				
O	A1	WW	51O	1	2.0	Each		1	1		✓	The RHS wing wall is separating from the headstock.; Photo: 0014

Overall Ratings		1	2	3	4	5	Comments
Original	O			✓			Structure was in fair condition at the time of inspection.

Widening (WLn , WRn), Lengthening (L1, L2), Raised (Ra), Redecked (Re), Shortening (S1, S2), Strengthening (St)

Overall Inspection Comments

Possibly ASR/AAR related cracking in the deck units. Further investigation of the cracking is required.

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Figure 16 Draft summary of recent ARRB level two inspection

The figure above is the front page of a draft inspection report for a concrete single span bridge located in The Hermitage. The structure has been given an overall condition state rating of three. This means that the bridge has an expected remaining useful life of between 20 – 40 years. A life cycle management plan is outlined and costed below.

	Type	Frequency (years)	Cost	Annual Cost
	Initial MTCE cost	1	$ 9,000	$ 9,000
Condition State 3	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	3	$ 900	$ 300
	Routine Maintenance	1	$ 635	$ 635
	Materials	1	$ 1,000	$ 1,000
			Total Annual Cost	$ 2,282
Condition State 4	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	1	$ 900	$ 900
	Routine Maintenance	1	$ 1,225	$ 1,225
	Materials	1	$ 2,000	$ 2,000
			Total Annual Cost	$ 4,472
			Total Cost	$ 144,080

Table 10 Cost over the life-cycle of asset

The repairs suggested by ARRB are estimated to cost approximately $9,000. For the rest of the life of the asset it has been assumed that it will be in each condition state for 20 years. It is expected to cost $2,282 annually while is remains in condition state three. This then increases to $4,472 for CS4. The total estimate cost of operating this bridge until it is replaced is $144,080. Note that this is only an approximation and CPI has not been applied to the figures.

6.7 Conclusion

It can be seen very easily that the life cycle cost of a timber bridge is substantially more than that of a concrete bridge. This is one of the reasons behind the proposed program to replace the timber bridges on an annual basis to reduce the maintenance costing which is detailed in the following chapter.

7 FINANCIAL SUMMARY

7.1 Introduction

For a core asset management plan the financial summary should cover the next 10 years. Once the plan is improved this should be extended out to 25 years. Since the recent level two inspection reports are not available currently assumptions will be made as to the current conditions of the bridges. It is anticipated that all of the concrete bridges will be in condition states one, two and three and most of the large drainage structures will be in good repair also. The focus of the capital renewal and replacement of bridges will be on the timber structures as they are typically the oldest and most deteriorated assets. From the 2004 inspections it was found that five bridges were condition state 4 or worse. This means that four bridges have an expected remaining life of less than 20 years and one will need to be replaced very soon. After reading through the condition reports for the condition state 4 timber bridges, they were found to all be in very poor condition and close to the point of intervention (replacement/renewal) in their life cycle. It is recommended that council budget for the replacement of one timber bridge structure every year for the next 10 years to ensure that all timber bridges are replaced before they become unsafe. The location of the remaining timber bridges are in the rural areas of council, however some have quite a high traffic volume with no alternative routes available. In factoring an amount for replacement the case of Kital Road bridge is considered. It is anticipated that none of the timber bridges can be removed and the crossing closed so an average figure of $250,000 is to be budgeted each year for a timber bridge replacement. The typical figures for annual operating costs are based on the trends of the previous three years for each asset class in each condition state and is outlined below.

	Type	Frequency (years)	Cost	Annual Cost
Condition State 1	Level 1 Inspection	1	$ 463	$ 463
	Level 2 Inspection	5	$ 1,200	$ 240
	Routine Maintenance	1	$ -	$ -
	Materials	1	$ -	$ -
			Total Annual Cost	$ 703
Condition State 2	Level 1 Inspection	1	$ 463	$ 463
	Level 2 Inspection	5	$ 1,200	$ 240
	Routine Maintenance	1	$ 347	$ 347
	Materials	1	$ 500	$ 500
			Total Annual Cost	$ 1,550
Condition State 3	Level 1 Inspection	1	$ 463	$ 463
	Level 2 Inspection	3	$ 1,200	$ 400
	Routine Maintenance	1	$ 463	$ 463
	Materials	1	$ 1,500	$ 1,500
			Total Annual Cost	$ 2,826
Condition State 4	Level 1 Inspection	1	$ 463	$ 463
	Level 2 Inspection	1	$ 1,200	$ 1,200
	Routine Maintenance	1	$ 926	$ 926
	Materials	1	$ 4,000	$ 4,000
			Total Annual Cost	$ 6,589

Table 11 Timber Bridge Operating Costs

	Type	Frequency (years)	Cost	Annual Cost
Condition State 1	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	5	$ 900	$ 180
	Routine Maintenance	1	$ -	$ -
	Materials	1	$ -	$ -
			Total Annual Cost	$ 527
Condition State 2	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	5	$ 900	$ 180
	Routine Maintenance	1	$ 347	$ 347
	Materials	1	$ 500	$ 500
			Total Annual Cost	$ 1,374
Condition State 3	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	3	$ 900	$ 300
	Routine Maintenance	1	$ 635	$ 635
	Materials	1	$ 1,000	$ 1,000
			Total Annual Cost	$ 2,282
Condition State 4	Level 1 Inspection	1	$ 347	$ 347
	Level 2 Inspection	1	$ 900	$ 900
	Routine Maintenance	1	$ 1,225	$ 1,225
	Materials	1	$ 2,000	$ 2,000
			Total Annual Cost	$ 4,472

Table 12 Concrete Bridge Operating Costs

	Type	Frequency (years)	Cost	Annual Cost
Condition State 1	Level 1 Inspection	1	$ 232	$ 232
	Level 2 Inspection	5	$ 600	$ 120
	Routine Maintenance	1	$ -	$ -
	Materials	1	$ -	$ -
			Total Annual Cost	$ 352
Condition State 2	Level 1 Inspection	1	$ 232	$ 232
	Level 2 Inspection	5	$ 600	$ 120
	Routine Maintenance	1	$ 347	$ 347
	Materials	1	$ 500	$ 500
			Total Annual Cost	$ 1,199
Condition State 3	Level 1 Inspection	1	$ 232	$ 232
	Level 2 Inspection	3	$ 600	$ 200
	Routine Maintenance	1	$ 635	$ 635
	Materials	1	$ 1,000	$ 1,000
			Total Annual Cost	$ 2,067
Condition State 4	Level 1 Inspection	1	$ 232	$ 232
	Level 2 Inspection	1	$ 600	$ 600
	Routine Maintenance	1	$ 1,225	$ 1,225
	Materials	1	$ 2,000	$ 2,000
			Total Annual Cost	$ 4,057

Table 13 Large Drainage Structures Operating Costs

These annual costs have been combined with the 2004 condition state reports to calculate the funding required for maintenance of the assets over the next 10 financial years. The summary tables for each financial year is presented below.

Condition States	1	2	3	4	Totals
Annual Coast	$ 527	$ 1,374	$ 2,282	$ 4,472	
Concrete Bridges	4	28	22	0	
	$ 2,108	$ 38,472	$ 50,204	$ -	$ 90,784
Annual Coast	$ 703	$ 1,550	$ 2,826	$ 6,589	
Timber Bridges	0	2	6	5	
	$ -	$ 3,100	$ 16,956	$ 32,945	$ 53,001
Annual Coast	$ 352	$ 1,199	$ 2,067	$ 4,057	
Large Drainage Structures	7	26	38	7	
	$ 2,464	$ 31,174	$ 78,546	$ 28,399	$ 140,583
				Total	$ 284,368

Table 14 Maintenance Costs based on trends from previous 3 years for the 2011/2012 financial year

This equates to an annual maintenance expense of $284,368 for next financial year. The condition states have been assumed to remain the same for the bridges which are not replaced over the ten year period as all identified maintenance items will be addressed, following recommendations from inspections. The following years maintenance expenses have not been indexed at CPI nor has the replacement/ renewal costs. These costs will be tabulated against the proposed budgeted amounts for the next ten years (refer to Appendix H for detail). It should be noted that council has used today's values in terms of the

budgeted amounts, and it is updated annually. There is not expected to be any new works in the next 10 years.

Condition States	1	2	3	4	Totals
Annual Coast	$ 527	$ 1,374	$ 2,282	$ 4,472	
Concrete Bridges	4	28	22	0	
	$ 2,108	$ 38,472	$ 50,204	$ -	$ 90,784
Annual Coast	$ 703	$ 1,550	$ 2,826	$ 6,589	
Timber Bridges	0	2	6	4	
	$ -	$ 3,100	$ 16,956	$ 26,356	$ 46,412
Annual Coast	$ 352	$ 1,199	$ 2,067	$ 4,057	
Large Drainage Structures	8	26	38	7	
	$ 2,816	$ 31,174	$ 78,546	$ 28,399	$ 140,935
				Total	$ 278,131

Table 15 Maintenance Costs for the 2012/2013 financial year

Condition States	1	2	3	4	Totals
Annual Coast	$ 527	$ 1,374	$ 2,282	$ 4,472	
Concrete Bridges	4	28	22	0	
	$ 2,108	$ 38,472	$ 50,204	$ -	$ 90,784
Annual Coast	$ 703	$ 1,550	$ 2,826	$ 6,589	
Timber Bridges	0	2	6	3	
	$ -	$ 3,100	$ 16,956	$ 19,767	$ 39,823
Annual Coast	$ 352	$ 1,199	$ 2,067	$ 4,057	
Large Drainage Structures	9	26	38	7	
	$ 3,168	$ 31,174	$ 78,546	$ 28,399	$ 141,287
				Total	$ 271,894

Table 16 Maintenance Costs for the 2013/2014 financial year

Condition States	1	2	3	4	Totals
Annual Coast	$ 527	$ 1,374	$ 2,282	$ 4,472	
Concrete Bridges	4	28	22	0	
	$ 2,108	$ 38,472	$ 50,204	$ -	$ 90,784
Annual Coast	$ 703	$ 1,550	$ 2,826	$ 6,589	
Timber Bridges	0	2	6	2	
	$ -	$ 3,100	$ 16,956	$ 13,178	$ 33,234
Annual Coast	$ 352	$ 1,199	$ 2,067	$ 4,057	
Large Drainage Structures	10	26	38	7	
	$ 3,520	$ 31,174	$ 78,546	$ 28,399	$ 141,639
				Total	$ 265,657

Table 17 Maintenance Costs for the 2014/2015 financial year

Condition States	1	2	3	4	Totals
Annual Coast	$ 527	$ 1,374	$ 2,282	$ 4,472	
Concrete Bridges	4	28	22	0	
	$ 2,108	$ 38,472	$ 50,204	$ -	$ 90,784
Annual Coast	$ 703	$ 1,550	$ 2,826	$ 6,589	
Timber Bridges	0	2	6	1	
	$ -	$ 3,100	$ 16,956	$ 6,589	$ 26,645
Annual Coast	$ 352	$ 1,199	$ 2,067	$ 4,057	
Large Drainage Structures	11	26	38	7	
	$ 3,872	$ 31,174	$ 78,546	$ 28,399	$ 141,991
				Total	$ 259,420

Table 18 Maintenance Costs for the 2015/2016 financial year

Condition States	1	2	3	4	Totals
Annual Coast	$ 527	$ 1,374	$ 2,282	$ 4,472	
Concrete Bridges	4	28	22	0	
	$ 2,108	$ 38,472	$ 50,204	$ -	$ 90,784
Annual Coast	$ 703	$ 1,550	$ 2,826	$ 6,589	
Timber Bridges	0	2	6	0	
	$ -	$ 3,100	$ 16,956	$ -	$ 20,056
Annual Coast	$ 352	$ 1,199	$ 2,067	$ 4,057	
Large Drainage Structures	12	26	38	7	
	$ 4,224	$ 31,174	$ 78,546	$ 28,399	$ 142,343
				Total	$ 253,183

Table 19 Maintenance Costs for the 2016/2017 financial year

Condition States	1	2	3	4	Totals
Annual Coast	$ 527	$ 1,374	$ 2,282	$ 4,472	
Concrete Bridges	4	28	22	0	
	$ 2,108	$ 38,472	$ 50,204	$ -	$ 90,784
Annual Coast	$ 703	$ 1,550	$ 2,826	$ 6,589	
Timber Bridges	0	2	5	0	
	$ -	$ 3,100	$ 14,130	$ -	$ 17,230
Annual Coast	$ 352	$ 1,199	$ 2,067	$ 4,057	
Large Drainage Structures	13	26	38	7	
	$ 4,576	$ 31,174	$ 78,546	$ 28,399	$ 142,695
				Total	$ 250,709

Table 20 Maintenance Costs for the 2017/2018 financial year

Condition States	1	2	3	4	Totals
Annual Coast	$ 527	$ 1,374	$ 2,282	$ 4,472	
Concrete Bridges	4	28	22	0	
	$ 2,108	$ 38,472	$ 50,204	$ -	$ 90,784
Annual Coast	$ 703	$ 1,550	$ 2,826	$ 6,589	
Timber Bridges	0	2	4	0	
	$ -	$ 3,100	$ 11,304	$ -	$ 14,404
Annual Coast	$ 352	$ 1,199	$ 2,067	$ 4,057	
Large Drainage Structures	14	26	38	7	
	$ 4,928	$ 31,174	$ 78,546	$ 28,399	$ 143,047
				Total	$ 248,235

Table 21 Maintenance Costs for the 2018/2019 financial year

Condition States	1	2	3	4	Totals
Annual Coast	$ 527	$ 1,374	$ 2,282	$ 4,472	
Concrete Bridges	4	28	22	0	
	$ 2,108	$ 38,472	$ 50,204	$ -	$ 90,784
Annual Coast	$ 703	$ 1,550	$ 2,826	$ 6,589	
Timber Bridges	0	2	3	0	
	$ -	$ 3,100	$ 8,478	$ -	$ 11,578
Annual Coast	$ 352	$ 1,199	$ 2,067	$ 4,057	
Large Drainage Structures	15	26	38	7	
	$ 5,280	$ 31,174	$ 78,546	$ 28,399	$ 143,399
				Total	$ 245,761

Table 22 Maintenance Costs for the 2019/2020 financial year

Condition States	1	2	3	4	Totals
Annual Coast	$ 527	$ 1,374	$ 2,282	$ 4,472	
Concrete Bridges	4	28	22	0	
	$ 2,108	$ 38,472	$ 50,204	$ -	$ 90,784
Annual Coast	$ 703	$ 1,550	$ 2,826	$ 6,589	
Timber Bridges	0	2	2	0	
	$ -	$ 3,100	$ 5,652	$ -	$ 8,752
Annual Coast	$ 352	$ 1,199	$ 2,067	$ 4,057	
Large Drainage Structures	16	26	38	7	
	$ 5,632	$ 31,174	$ 78,546	$ 28,399	$ 143,751
				Total	$ 243,287

Table 23 Maintenance Costs for the 2020/2021 financial year

The maintenance costs have taken into account that with the replacement of one timber bridge every year – the CS4 maintenance cost (for the first 5 bridges then CS3) was reduced by one and replaced with a CS1 maintenance cost for a large drainage structure

(new structure). Hence it shows that the operating expenditure will be reduced over time due to the renewal program.

Financial Year	Pedicted Maintenance Expenditure	Predicted Capital Renewal	Current Proposed Funding		Difference	
			Maintenance	Capital Renewal	Maintenance	Capital Renewal
2011/2012	$ 284,368	$ 250,000	90000	$ 255,000.00	-$ 194,368	$ 5,000
2012/2013	$ 278,131	$ 250,000	100000	$ 350,000.00	-$ 178,131	$ 100,000
2013/2014	$ 271,894	$ 250,000	100000	$ 135,000.00	-$ 171,894	-$ 115,000
2014/2015	$ 265,657	$ 250,000	100000	$ -	-$ 165,657	-$ 250,000
2015/2016	$ 259,420	$ 250,000	100000	$ -	-$ 159,420	-$ 250,000
2016/2017	$ 253,183	$ 250,000	100000	$ -	-$ 153,183	-$ 250,000
2017/2018	$ 250,709	$ 250,000	100000	$ -	-$ 150,709	-$ 250,000
2018/2019	$ 248,235	$ 250,000	100000	$ -	-$ 148,235	-$ 250,000
2019/2020	$ 245,761	$ 250,000	100000	$ -	-$ 145,761	-$ 250,000
2020/2021	$ 243,287	$ 250,000	100000	$ -	-$ 143,287	-$ 250,000

Table 24 Summary of Predicted Expenditure versus Budgeted Expenditure

From the above table it is evident that if council decides to adopt the draft levels of service, that the maintenance funding will need to be increased by close to $200,000 next year or over 300%. There is also a lack of funding for renewal of bridges after the 2013/2014 financial year. This will also require more funding if the proposed intervention level is adopted.

Other options to reduce the funding required is to consider reducing the draft levels of service. Another important life cycle management tool is to consider changing the operating levels of service of individual bridges. For instance a timber bridge with no load limit imposed with a condition state of four could have its life extended with a structural inspection and a load limit posted. This would not cost the council too much and would still allow for most traffic to use the bridge. A management method like this could greatly extend the useful life of a bridge. These options will need to be considered along with more detailed replacement strategy once the level two inspection reports are made available to council.

7.2 Gap Analysis

Based on the draft level of service statements that Southern Downs Regional Council will continue to maintain the assets until replaced, it shows that the funding allocated at present of $100,000 is not enough to maintain the timber structures as per the planned maintenance proposal. Over the ten years the maintenance budget would be short $1.6 million.

In the renewal program council has only made provisions in the current 10 year plan for three bridge replacements. The funding is falling short by $1.8 million over the next ten years.

8 RECOMMENDATIONS FOR IMPROVEMENT OF THE ASSET MANAGEMENT PLAN

Recommended improvement strategies are outlined below;

- Develop advanced asset management plan and link it up with the new requirement of a ‘Community Plan’ under the LGA 2009.
- Develop for each bridge asset its own long term whole of life plan, cost, risk adn performance optimisation.
- Develop database register that is kept up to date.
- Refine levels of service.
- Establish predictive modelling with software ‘My Predictor’
- Annual review of the asset management plan and devised actions.
- Council adoption of levels of service.
- Community consultation.
- Extend level two inspections to large drainage structures.

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APPENDIX A PROJECT SPECIFICATION

University of Southern Queensland

FACULTY OF ENGINEERING AND SURVEYING

ENG 4111/4112 Research Project
PROJECT SPECIFICATION

FOR: Nathan Johan WALTER

TOPIC: BRIDGE ASSET MANAGEMENT PLAN

SUPERVISORS: Dr David Thorpe
Christoph Eicher, Asset Engineer, Southern Downs Regional Council.

PROJECT AIM: This project aims to develop a core Asset Management Plan (AMP) for bridges in the Southern Downs Regional Council (SDRC).

SPONSORSHIP: Southern Downs Regional Council.

PROGRAM:

1. Research background information on Bridge Asset Management Plans.
2. Define the purpose of the core AMP including the definitions of bridges.
3. Report on asset description including current conditions and general overview of existing bridges.
4. Determine the levels of service (LOS) for approximately five (5) selected bridges in relation to council's strategic goals and based on customer expectation and statutory requirements.
5. Determine the future demand and the effects of changing demand on the selected bridge assets.
6. Create a life cycle management plan for the selected bridges including operations, maintenance, and disposal, etc.
7. For the selected bridges, produce a financial summary including long-term future expenditure.
8. Present finding to peer group and submit dissertation in required format.

If time permits:

9. Extend the study to additional bridges.
10. Produce Asset Management practices including summary of Asset Management data, information systems, processes and implementation tactics.
11. Include a recommendation for improvement of the plan from the findings, including improvement strategy.

APPENDIX B – DATA VALUATION BRIDGES

BR_Amenity	BR_MyValuer_ID	BR_Asset ID	BR_Asset Name	BR_Segment Name	BR_Hierarchy	BR_Length	Width	BR_Road Name	BR_Suburb	BR_Carriageway Code	BR_Locality (old council)	BR_Valuation Year	BR_Super_Structure Type	BR_Super_Structure Condition	BR_Super_Structure Gross	BR_Super_Structure Pattern	BR_Super_Structure Residual Value	BR_Super_Structure Useful lIfe	BR_Super_Structure RUL	BR_Super_Structure WDV	BR_Super_Structure Depr Exp	BR_Total Gross Replacement Cost	BR_Total WDV	BR_Total Depr Exp
Bridges	1	10021	Allora Drive	530.00	B	28.00	8.70	William Deacon Bridge	ALLORA		WarwickShire	2009	C	2H	633360.00	APV High	0.40	100.00	50.00	576357.60	2280.10	633360.00	576357.60	2280.10
Bridges	2	10041	Bellingham's Road - Ch 6863	6863.00	B	9.60	5.30		ELBOW		WarwickShire	2009	T	2H	132288.00	APV High	0.40	100.00	50.00	120382.08	476.24	132288.00	120382.08	476.24
Bridges	3	10061	Berat Forest Springs Road - Ch 1290	1290.00	B	25.80	4.80		BERAT		WarwickShire	2009	T	3H	321984.00	APV High	0.40	100.00	25.00	264026.88	3219.84	321984.00	264026.88	3219.84
Bridges	5	10081	Bourkes Road (Loch Lomond)	4110.00	B	9.50	3.90		ELBOW		WarwickShire	2009	T	2H	96330.00	APV High	0.40	100.00	50.00	87660.30	346.79	96330.00	87660.30	346.79
Bridges	8	10141	Junabee Road	4950.00	B	22.00	8.35	Braithwaites Bridge	JUNABEE		WarwickShire	2009	C	3H	477620.00	APV High	0.40	100.00	25.00	391648.40	4776.20	477620.00	391648.40	4776.20
Bridges	9	10161	Cedars Crossing Road - Ch 0464	464.00	B	22.50	3.70	The Cedars Bridge	JUNABEE		WarwickShire	2009	C	3H	216450.00	APV High	0.40	100.00	25.00	177489.00	2164.50	216450.00	177489.00	2164.50
Bridges	11	10241	Condamine River Road	2800.00	B	22.05	4.21	Brosnans Bridge	KILLARNEY		WarwickShire	2009	C	3H	241359.30	APV High	0.40	100.00	25.00	197914.63	2413.59	241359.30	197914.63	2413.59
Bridges	12	10261	Condamine River Road	5950.00	B	8.60	5.40		KILLARNEY		WarwickShire	2009	C	3H	120744.00	APV High	0.40	100.00	25.00	99010.08	1207.44	120744.00	99010.08	1207.44
Bridges	13	10281	Connells Bridge Road - Ch 0050	50.00	B	37.60	3.60	Rocky Crossing	WHEATVALE		WarwickShire	2009	C	2H	351936.00	APV High	0.40	100.00	50.00	320261.76	1266.97	351936.00	320261.76	1266.97
Bridges	14	10301	Connells Bridge Road - Ch 1060	1060.00	B	20.35	5.10		WHEATVALE		WarwickShire	2009	C	2H	269841.00	APV High	0.40	100.00	50.00	245555.31	971.43	269841.00	245555.31	971.43
Bridges	15	10321	Connells Bridge Road - Ch 1125	1125.00	B	9.50	6.90		WHEATVALE		WarwickShire	2009	C	2H	170430.00	APV High	0.40	100.00	50.00	155091.30	613.55	170430.00	155091.30	613.55
Bridges	19	10401	Grafton Street	0.00	B	32.00	10.10		WARWICK		WarwickShire	2009	C	1H	840320.00	APV High	0.40	100.00	75.00	815110.40	2016.77	840320.00	815110.40	2016.77
Bridges	20	10421	Hendon - Ellinthorpe Road - Ch 1120	1120.00	B	8.65	3.10		TALGAI		WarwickShire	2009	C	3H	69719.00	APV High	0.40	100.00	25.00	57169.58	697.19	69719.00	57169.58	697.19
Bridges	21	10441	Hermitage - Emuvale Road - Ch 0875	875.00	B	11.00	3.70		THE		WarwickShire	2009	C	2H	105820.00	APV High	0.40	100.00	50.00	96296.20	380.95	105820.00	96296.20	380.95
Bridges	23	10481	Kadows Road	1220.00	B	7.40	6.10		CLINTONVAL		WarwickShire	2009	C	3H	117364.00	APV High	0.40	100.00	25.00	96238.48	1173.64	117364.00	96238.48	1173.64
Bridges	24	10501	Kital Road	2330.00	B	38.00	5.60		ALLORA		WarwickShire	2009	C	4H	553280.00	APV High	0.40	100.00	10.00	370697.60	14938.56	553280.00	370697.60	14938.56
Bridges	25	10521	Lairds Lane	960.00	B	8.60	3.75		YANGAN		WarwickShire	2009	C	3H	83850.00	APV High	0.40	100.00	25.00	68757.00	838.50	83850.00	68757.00	838.50
Bridges	26	10541	Longs Bridge Road - Ch 1665	1665.00	B	13.90	4.40		MURRAYS		WarwickShire	2009	C	2H	159016.00	APV High	0.40	100.00	50.00	144704.56	572.46	159016.00	144704.56	572.46
Bridges	27	10561	Mapes Road - Ch 5238	5238.00	B	24.00	4.50	Wilkies Bridge	MURRAYS		WarwickShire	2009	C	1H	280800.00	APV High	0.40	100.00	75.00	272376.00	673.92	280800.00	272376.00	673.92
Bridges	28	10581	Maryvale Road	540.00	B	38.00	4.20		MARYVALE		WarwickShire	2009	C	3H	414960.00	APV High	0.40	100.00	25.00	340267.20	4149.60	414960.00	340267.20	4149.60
Bridges	31	10641	Mullins Road - Ch 2435	2435.00	B	17.20	4.80	Cowley's Bridge	TALGAI		WarwickShire	2009	C	3H	214656.00	APV High	0.40	100.00	25.00	176017.92	2146.56	214656.00	176017.92	2146.56
Bridges	33	10681	Rockland Road - Ch 8399	8399.00	B	9.90	3.68		LESLIE DAM		WarwickShire	2009	C	2H	94723.20	APV High	0.40	100.00	50.00	86198.11	341.00	94723.20	86198.11	341.00
Bridges	34	10721	Sandy Creek Road - Ch 5773	5773.00	B	28.70	6.05		LESLIE		WarwickShire	2009	C	2H	451451.00	APV High	0.40	100.00	50.00	410820.41	1625.22	451451.00	410820.41	1625.22
Bridges	35	10741	Swanfels Road	6340.00	B	43.10	3.95	Swanfels Bridge	SWANFELS		WarwickShire	2009	C	2H	442637.00	APV High	0.40	100.00	50.00	402799.67	1593.49	442637.00	402799.67	1593.49
Bridges	37	10781	Toolburra Plains Road	3360.00	B	17.65	5.55	Afflecks Bridge	TOOLBURRA		WarwickShire	2009	C	2H	254689.50	APV High	0.40	100.00	50.00	231767.45	916.88	254689.50	231767.45	916.88
Bridges	38	10801	Tralee Road - Ch 4500	4500.00	B	12.40	5.60		PRATTEN		WarwickShire	2009	C	2H	180544.00	APV High	0.40	100.00	50.00	164295.04	649.96	180544.00	164295.04	649.96
Bridges	40	10841	Upper Forest Springs Road	370.00	B	9.40	7.30		FOREST		WarwickShire	2009	C	3H	178412.00	APV High	0.40	100.00	25.00	146297.84	1784.12	178412.00	146297.84	1784.12
Bridges	41	10861	Wheatvale Plains Road	190.00	B	28.30	6.30		WHEATVALE		WarwickShire	2009	C	2H	463554.00	APV High	0.40	100.00	50.00	421834.14	1668.79	463554.00	421834.14	1668.79
Bridges	43	10885	Scrymgeour Road bridge	100.00	B	5.00	3.00				WarwickShire	2009	C	2H	39000.00	APV High	0.40	100.00	50.00	35490.00	140.40	39000.00	35490.00	140.40
Bridges	298	12818	Freestone Road	13233.00	B	31.00	6.50				WarwickShire	2009	T	2H	525200.00	APV High	0.40	100.00	50.00	477932.00	1890.72	525200.00	477932.00	1890.72
Bridges	299	12819	Goomburra Road	19204.00	B	40.00	5.00				WarwickShire	2009	C	2H	520000.00	APV High	0.40	100.00	50.00	473200.00	1872.00	520000.00	473200.00	1872.00
Bridges	304	12828	School of Arts Road	1985.00	B	65.00	3.50				WarwickShire	2009	C	2H	592800.00	APV High	0.40	100.00	50.00	539448.00	2134.08	592800.00	539448.00	2134.08
Bridges	306	12830	Tummaville Road	45.00	B	21.00	5.00				WarwickShire	2009	T	4H	546000.00	APV High	0.40	100.00	10.00	365820.00	14742.00	546000.00	365820.00	14742.00
Bridges	310	12834	Mullins Road - Warwick	466.00	B	11.00	4.50				WarwickShire	2009	T	3H	130000.00	APV High	0.40	100.00	25.00	106600.00	1300.00	130000.00	106600.00	1300.00
Bridges	312	12856	Sundown Road	1112.00	B	16.40	3.90	Ballandean's	Ballandean		Stanthorpe	2009	C	2H	166296.00	APV High	0.40	100.00	50.00	151329.36	598.67	166296.00	151329.36	598.67
Bridges	313	12857	Mt Stirling Road	314.00	B	69.30	4.50		Glen Aplin		Stanthorpe	2009	C	2H	810810.00	APV High	0.40	100.00	50.00	737837.10	2918.92	810810.00	737837.10	2918.92
Bridges	314	12858	Reid Road	120.00	B	20.20	5.70		Severnlea		Stanthorpe	2009	C	2H	299364.00	APV High	0.40	100.00	50.00	272421.24	1077.71	299364.00	272421.24	1077.71
Bridges	315	12859	Pyramids Road	795.00	B	10.00	3.70	Bill Goebel Bridge	Girraween		Stanthorpe	2009	C	2H	96200.00	APV High	0.40	100.00	50.00	87542.00	346.32	96200.00	87542.00	346.32
Bridges	317	12861	Amiens Road	4706.00	B	46.50	7.00	Broadwater Bridge	Broadwater		Stanthorpe	2009	C	2H	846300.00	APV High	0.40	100.00	50.00	770133.00	3046.68	846300.00	770133.00	3046.68
Bridges	318	12862	Glenlyon Dam Road	3700.00	B	92.50	6.80	Barelli	Glenlyon		Stanthorpe	2009	C	1H	1635400.00	APV High	0.40	100.00	75.00	1586338.00	3924.96	1635400.00	1586338.00	3924.96
Bridges	319	12863	Mingoola Road	1274.00	B	55.00	6.90		Mingoola		Stanthorpe	2009	C	2H	986700.00	APV High	0.40	100.00	50.00	897897.00	3552.12	986700.00	897897.00	3552.12
Bridges	320	12844	Railway Street	277.00	B	28.00	6.30	McGregor Bridge	Stanthorpe		Stanthorpe	2009	C	2H	458640.00	APV High	0.40	100.00	50.00	417362.40	1651.10	458640.00	417362.40	1651.10
Bridges	321	12845	Lock Street	418.00	B	16.80	7.80		Stanthorpe		Stanthorpe	2009	C	2H	340704.00	APV High	0.40	100.00	50.00	310040.64	1226.53	340704.00	310040.64	1226.53
Bridges	322	12846	Britannia Street	132.00	B	12.90	7.40		Stanthorpe		Stanthorpe	2009	C	2H	248196.00	APV High	0.40	100.00	50.00	225858.36	893.51	248196.00	225858.36	893.51
Bridges	323	12847	Bents Road	3000.00	B	9.20	5.20	First Crossing - Ballandean	Ballandean		Stanthorpe	2009	C	1H	124384.00	APV High	0.40	100.00	75.00	120652.48	298.52	124384.00	120652.48	298.52
Bridges		12864	North Branch Road	3766	B	8.1	4.9		Goomburra		WarwickShire	2010	C	2H	94723.20	APV High	0.40	100.00	50.00	96296.20	380.95	105820.00	96296.20	380.95
Bridges		12865	Pyramids Road	16115	B	9.1	3.6		Girraween		Stanthorpe	2010	C	2H	69719.00	APV High	0.40	100.00	25.00	96238.48	1173.64	117364.00	96238.48	1173.64
Bridges	7	10121	Boxs Road - Ch 0226	226.00	B	12.95	4.80		TANNYMORE		WarwickShire	2009	C	2H	94723.20	APV High	0.40	100.00	50.00	87542.00	346.32	96200.00	87542.00	346.32
Bridges	324	12849	Bents Road		B	9.20	5.20	First Crossing - Anabranch	Ballandean		Stanthorpe	2009	C	1H	451451.00	APV High	0.40	100.00	75.00	770133.00	3046.68	846300.00	770133.00	3046.68
Bridges	4.00	10071	Boundary Road	476.00	B	7.50	5.00		WOMINA		WarwickShire	2009	T	3H	97500.00	APV High	0.40	100.00	25.00	79950.00	975.00	97500.00	79,950.00	975.00
Bridges	10.00	10221	Clintonvale - Goomburra Road - Ch	2269.00	B	8.40	4.50		CLINTONVAL		WarwickShire	2009	C	4H	98280.00	APV High	0.40	100.00	10.00	65847.60	2653.56	98280.00	65847.60	2653.56
Bridges	17.00	10361	Freestone Road	1880.00	B	25.00	5.50	Palmers Bridge	FREESTONE		WarwickShire	2009	C	1H	357500.00	APV High	0.40	100.00	75.00	346775.00	858.00	357500.00	346,775.00	858.00
Bridges	18.00	10381	Goomburra Road	1320.00	B	38.30	6.85		GLADFIELD		WarwickShire	2009	C	2H	682123.00	APV High	0.40	100.00	50.00	620731.93	2455.64	682123.00	620,731.93	2,455.64
Bridges	22.00	10461	Inverramsay Road - Ch 11300	11300.00	B	8.90	5.60		GOOMBURR		WarwickShire	2009	C	2H	129584.00	APV High	0.40	100.00	50.00	117921.44	466.50	129584.00	117921.44	466.50
Bridges	29.00	10591	Mountside Road - Ch 1800	1800.00	B	3.20	6.00		THE GLEN		WarwickShire	2009	C	3H	49920.00	APV High	0.40	100.00	25.00	40934.40	499.20	49920.00	40,934.40	499.20
Bridges	32.00	10661	North Branch Road	560.00	B	8.10	4.90		GOOMBURR		WarwickShire	2009	C	2H	103194.00	APV High	0.40	100.00	50.00	93906.54	371.50	103194.00	93906.54	371.50
Bridges	39.00	10821	Tummaville Road	1480.00	B	19.80	5.90		LEYBURN		WarwickShire	2009	C	3H	303732.00	APV High	0.40	100.00	25.00	249060.24	3037.32	303732.00	249,060.24	3,037.32
Bridges	42.00	10881	Womina - Willowvale Road	4860.00	B	7.00	5.00		WILLOWVAL		WarwickShire	2009	C	1H	91000.00	APV High	0.40	100.00	75.00	88270.00	218.40	91000.00	88,270.00	218.40
Bridges	296.00	12816	Condamine River Road - Killarney (CH	6662.00	B	12.00	4.00				WarwickShire	2009	T	3H	124800.00	APV High	0.40	100.00	25.00	102336.00	1248.00	124800.00	102,336.00	1,248.00
Bridges	297.00	12817	Forest Springs -Goomburra Road	401.00	B	34.00	3.60				WarwickShire	2009	C	2H	317200.00	APV High	0.40	100.00	50.00	288652.00	1141.92	317200.00	288,652.00	1,141.92
Bridges	300.00	12821	Junabee Road	4984.00	B	20.00	5.00				WarwickShire	2009	C	2H	260000.00	APV High	0.40	100.00	50.00	236600.00	936.00	260000.00	236,600.00	936.00
Bridges	301	12822	Kerrick Road	2160	B	18	3				WarwickShire	2009	T	1H	140,400.00	APV High	40%	100	75	136,188.00	336.96	140,400.00	136,188.00	336.96
Bridges	305.00	12829	Spring Creek Road - Killarney	25339.00	B	65.00	4.00				WarwickShire	2009	T	2H	676000.00	APV High	0.40	100.00	50.00	615160.00	2433.60	676000.00	615160.00	2433.60
Bridges	307	12831	Carbean Road	1920	B	7	4				WarwickShire	2009	C	1H	72800	APV High	0	100	75	70616	175	72800	70616	175
Bridges	308.00	12832	Condamine River Road - Killarney	6054.00	B	8.00	4.00				WarwickShire	2009	C	1H	83200.00	APV High	0.40	100.00	75.00	80704.00	199.68	83200.00	80,704.00	199.68
Bridges	309.00	12833	Mullins Road - Allora	3769.00	B	19.00	3.50				WarwickShire	2009	C	1H	174200.00	APV High	0.40	100.00	75.00	168974.00	418.08	174200.00	168,974.00	418.08
Bridges	311.00	12835	Wiyarra - Cedar Crossing Road	450.00	B	25.00	4.00				WarwickShire	2009	C	3H	260000.00	APV High	0.40	100.00	25.00	213200.00	2600.00	260000.00	213,200.00	2,600.00
Bridges	303.00	12824	McMasters Road	6156.00	B	18.00	4.00				WarwickShire	2009	C	2H	187200.00	APV High	0.40	100.00	50.00	170352.00	673.92	187200.00	170352.00	673.92

APPENDIX C – TYPICAL LEVEL TWO INSPECTION REPORT

Structure Condition Inspection Report | **B2/1** | Sheet 1 Of 4

Structure Id	70108 Kital Rd	Name	Dalrymple Creek
Crossing Name		Alt. Name	
Structure Type	Bridge	Owner	110 Warwick Shire Council
Construction Type	Girder/Beam	District	5 Border District (Mr)
Construction Material	Timber	LGA Id	110 Warwick Shire Council
Inspector	Malcolm J Brodie	Date	24-MAY-2004
Inspection Level 2	✓	Programmed	✓
Level 3		Exceptional	
		Undersize Components	
		Underwater	

Road Section Id	Description	Start S	Start Cway	Start S	Start RPC	Start Dist	End RPC	End Dist	TDist Start	TDist End
188L	Kital Road	C	1	C	1	2.330	1	2.368	2.330	2.368

Overall Ratings	1	2	3	4	5	Comments
Original Structure (O)				✓		This bridge is VERY POOR condition as can be seen by look as Form 2.2 and 2.5.

Widening (WLn, WRn), Lengthening (L1, L2), Raised (Ra), Redecked (Re), Shortening (S1, S2), Strengthening (St)

Structure Condition Inspection Report

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Structure Id 70108 Name Dalrymple Creek

Inspection Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Reqd	Comments * Location of item/condition * Description of defects by location type, magnitude,extent * References of sketches and photos (Roll/Exposure Nos)
Modification	Group	Component	Standard Number				1	2	3	4		
O	AP1	AP	70O	1	1.0	EACH				1.0		The approach is very rough as can be seen in Photo 1 & 2. This should be trimmed over as a new seal placed.
O	AP1	GR	72T	1	2.0	EACH				2.0		This are not very safe being timber as can be seen in Photo 8. These should be replaced with steel guardrail.
O	AP1	PRO	53O	1	200.0	M2		200.0				
O	S1	BR	2T	1	19.0	LINM				19.0		This are not very safe being timber as can be seen in Photo 1. These should be replaced with steel guardrail.
O	S1	K	3P	1	19.0	LINM			19.0			The kerb is badly cracked with area broken away as can be seen in Photo 3 & 4. This kerb should be monitored.
O	S1	WS	1O	1	53.2	M2				53.2		The wearing surface is badly broken up as can be seen in Photo 5 & 6. This should be replaced.
O	S2	BR	2T	1	19.0	LINM				19.0		This are not very safe being timber as can be seen in Photo 1. These should be replaced with steel guardrail.
O	S2	K	3P	1	19.0	LINM			19.0			The kerb is badly cracked with area broken away as can be seen in Photo 3 & 4. This kerb should be monitored.
O	S2	WS	1O	1	53.2	M2				53.2		The wearing surface is badly broken up as can be seen in Photo 5 & 6. This should be replaced.
O	S3	BR	2T	1	19.0	LINM				19.0		This are not very safe being timber as can be seen in Photo 1. These should be replaced with steel guardrail.
O	S3	K	3P	1	19.0	LINM			19.0			The kerb is badly cracked with area broken away as can be seen in Photo 3 & 4. This kerb should be monitored.
O	S3	WS	1O	1	53.2	M2				53.2		The wearing surface is badly broken up as can be seen in Photo 5 & 6. This should be replaced.
O	S4	BR	2T	1	19.0	LINM				19.0		This are not very safe being timber as can be seen in Photo 1. These should be replaced with steel guardrail.
O	S4	K	3P	1	19.0	LINM			19.0			The kerb is badly cracked with area broken away as can be seen in Photo 3 & 4. This kerb should be monitored.
O	S4	WS	1O	1	53.2	M2				53.2		The wearing surface is badly broken up as can be seen in Photo 5 & 6. This should be replaced.
O	AP2	AP	70O	1	1.0	EACH				1.0		The approach is very rough as can be seen in Photo 1 & 7. This should be trimmed over as a new seal placed.
O	AP2	GR	72T	1	2.0	EACH				2.0		This are not very safe being timber as can be seen in Photo 8. These should be replaced with steel guardrail.
O	AP2	PRO	53O	1	200.0	M2		200.0				
O	A1	H	54T	1	2.0	EACH		2.0				
O	A1	ABS	52P	1	10.0	M2				10.0		The abs has dropped over 40 mm as can be seen in Photo 10. This should be replaced to stop soil spilling through.
O	A1	PRO	53O	1	10.0	M2		10.0				
O	A1	P	56T	1	4.0	EACH	1.0		1.0	2.0		Pile 1 has a very large pipe at the top and some rot at ground level as can be seen in Form 2.5. This pile should be replaced. Pile 2 has some rot at the top that should be monitored. Pile 4 has a very large pipe at the top and at ground level as can be seen in Form 2.5. This pile should be replaced.
O	A1	WW	51O	1	2.0	EACH		2.0				
O	S1	D	29T	1	54.0	M2				54.0		There are alot of the deck units that are roted back past the kerbs as can be seen in Photo 11 & 19 and Photo 16 shows that there are some units that are allmost rotted away giving no support to the DWS. The deck should be replaced.
O	S1	SP	33T	1	19.0	LINM		19.0				

Structure Condition Inspection Report

B2/2 | Sheet 3 Of 4

Structure Id 70108 Name Dalrymple Creek

Inspection Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Reqd	Comments
Modification	Group	Component	Standard Number				1	2	3	4		* Location of item/condition * Description of defects by location type, magnitude,extent * References of sketches and photos (Roll/Exposure Nos)
O	S1	G	22T	1	5.0	EACH		2.0		3.0		
Girder 1 has a very large snipe with rot at E1 and a large snipe at E2 as can be seen in Form 2.5 that place it in condition state 4 and should be replaced. Girder 2 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced. Girder 5 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced.												
O	S1	W	71O	2	1.0	EACH		1.0				
O	P1	COR	27T	1	5.0	EACH		4.0		1.0		
Corbel 5 drilled sound but the end of the corbel is badly cracked as can be seen in Photo 12 which moved this corbel to condition state 4. This corbel should be replaced.												
O	P1	H	54T	1	2.0	EACH				2.0		
Both headstocks are not supported on the pile correctly as can beseen in Photo 14 & 15. Photo 14 shows that there is less then 1/2 of the headstock on the shoulder and 15 shows that there is a gap between the headstock and the shoulder. These should be fixed.												
O	P1	P	56T	2	4.0	EACH			1.0	3.0		
Pile 1 has a very large section rotting away as can be seen in Form 2.5. This pile should be spliced at a point where the pile is sound. Pile 2 has a very large section rotting away as can be seen in Form 2.5. This pile should be spliced at a point where the pile is sound. Pile 3 has a very large pipe as can be seen in Form 2.5. This pile should be spliced at a point where the pile is sound. Pile 4 has a very large pipe as can be seen in Form 2.5. This pile should be spliced at a point where the pile is sound.												
O	P1	WAL	57T	2	8.0	EACH		8.0				
O	S2	D	29T	1	54.0	M2				54.0		
There are alot of the deck units that are roted back past the kerbs as can be seen in Photo 11 & 19 and Photo 16 shows that there are some units that are allmost rotted away giving no support to the DWS. The deck should be replaced.												
O	S2	SP	33T	1	19.0	LINM		19.0				
O	S2	G	22T	1	5.0	EACH		3.0	1.0	1.0		
Girder 1 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced. Girder 4 has a large snipe with pipe at E2 as can be seen in Form 2.5 that place it in condition state 3 and should be monitored.												
O	S2	W	71O	2	1.0	EACH		1.0				
O	P2	COR	27T	1	5.0	EACH		5.0				
O	P2	H	54T	1	2.0	EACH		2.0				
O	P2	P	56T	2	4.0	EACH	3.0			1.0		
Pile 2 has a very large section rotting away with the start of a pipe as can be seen in Form 2.5. This pile should be spliced at a point where the pile is sound.												
O	P2	WAL	57T	2	8.0	EACH		8.0				
O	S3	D	29T	1	54.0	M2				54.0		
There are alot of the deck units that are roted back past the kerbs as can be seen in Photo 11 & 19 and Photo 16 shows that there are some units that are allmost rotted away giving no support to the DWS. The deck should be replaced.												
O	S3	SP	33T	1	19.0	LINM		19.0				
O	S3	G	22T	1	5.0	EACH		1.0	2.0	2.0		
Girder 1 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced. Girder 2 has a large snipe with pipe at E1 as can be seen in Form 2.5 that place it in condition state 3 and should be monitored. Girder 4 has a large snipe with pipe at E2 as can be seen in Form 2.5 that place it in condition state 3 and should be monitored. Girder 5 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced.												
O	S3	W	71O	2	1.0	EACH			1.0			There is a lot of debra in the creek that should be clean out.

Structure Condition Inspection Report

B2/2 | Sheet 4 Of 4

Structure Id 70108 Name Dalrymple Creek

Inspection Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Component Location							Quantity Per Condition State					
Modification	Group	Component	Standard Number	Exposure Class	Quantity	Unit	1	2	3	4	Maintenance Reqd	Comments * Location of item/condition * Description of defects by location type, magnitude,extent * References of sketches and photos (Roll/Exposure Nos)
O	P3	COR	27T	1	5.0	EACH		3.0	1.0	1.0		
Corbel 1 has a large pipe in it as can be seen in Form 2.5 and a crack in the side as can be seen in 18. This corbel should be monitored. Corbel 4 has a very large pipe in it as can be seen in Form 2.5 which places it condition state 4 and should be replaced.												
O	P3	H	54T	1	2.0	EACH		2.0				
O	P3	P	56T	2	4.0	EACH		4.0				
O	P3	WAL	57T	2	8.0	EACH		8.0				
O	S4	D	29T	1	54.0	M2				54.0		
There are alot of the deck units that are roted back past the kerbs as can be seen in Photo 11 & 19 and Photo 16 shows that there are some units that are allmost rotted away giving no support to the DWS. The deck should be replaced.												
O	S4	SP	33T	1	19.0	LINM		19.0				
O	S4	G	22T	1	5.0	EACH		1.0	1.0	3.0		
Girder 1 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced. Girder 2 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced. Girder 3 has a large snipe with pipe at E1 as can be seen in Form 2.5 that place it in condition state 3 and should be monitored. Girder 5 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced.												
O	S4	W	71O	2	1.0	EACH				1.0		There is a lot of debra in the creek as can be seen in Photo 20 & 21 that should be clean out.
O	A2	H	54T	1	2.0	EACH		2.0				
O	A2	ABS	52P	1	10.0	M2		10.0				
O	A2	PED	44O	2	10.0	EACH		10.0				
O	A2	P	56T	2	4.0	EACH			1.0	3.0		
Pile 1 has a very large pipe at the top and at ground level as can be seen in Form 2.5. This pile should be replaced. Pile 2 has a large pipe at the top that should be monitored. Pile 3 has a very large pipe at the top and at ground level as can be seen in Form 2.5. This pile should be replaced. Pile 4 has a very large pipe at the top and at ground level as can be seen in Form 2.5. This pile should be replaced. These can be seen in Photo 22.												
O	A2	WW	51O	2	2.0	EACH		2.0				

Defective Components Report

B2/3 — Sheet 1 Of 5

Structure Id 70108 — Name Dalrymple Creek
Crossing Name — Alt. Name
Structure Type Bridge — Owner 110 Warwick Shire Council
Construction Type Girder/Beam — District 5 Border District (Mr)
Construction Material Timber — LGA Id 110 Warwick Shire Council
Inspector Malcolm J Brodie — Date 24-MAY-2004
Inspection Level 2 ✓ — Programmed ✓
Level 3 — Exceptional — Underwater

Road Section Id	Description	S	Cway	S	Start RPC	Start Tdist	End RPC	End Tdist	TDist Start	TDist End
188L	Kital Road	C	1	C	1	2.330	1	2.368	2.330	2.368

Component Location: Modification	Group	Component	Standard Number	Exposure Class	Condition State	Description of Defect (* Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos))	Required Action: Monitor	Level 3 Inspection	Other
O	AP1	AP	70O	1	4				✓
The approach is very rough as can be seen in Photo 1. This should be trimmed over as a new seal placed.									
O	AP1	GR1	72T	1	4				✓
This are not very safe being timber as can be seen in Photo 8. These should be replaced with steel guardrail.									
O	AP1	GR2	72T	1	4				✓
The are not very safe being timber as can be seen in Photo 8. These should be replaced with steel guardrail.									
O	S1	BR1	2T	1	4				✓
This are not very safe being timber as can be seen in Photo 1. These should be replaced with steel guardrail.									
O	S1	BR2	2T	1	4				✓
This are not very safe being timber as can be seen in Photo 1. These should be replaced with steel guardrail.									
O	S1	K1	3P	1	3		✓		
The kerb is badly cracked with area broken away as can be seen in Photo 3 & 4. This kerb should be monitored.									
O	S1	K2	3P	1	3		✓		
The kerb is badly cracked with area broken away as can be seen in Photo 3 & 4. This kerb should be monitored.									
O	S1	WS	1O	1	4				✓
The wearing surface is badly broken up as can be seen in Photo 5 & 6. This should be replaced.									
O	S2	BR1	2T	1	4				✓
This are not very safe being timber as can be seen in Photo 1. These should be replaced with steel guardrail.									
O	S2	BR2	2T	1	4				✓
This are not very safe being timber as can be seen in Photo 1. These should be replaced with steel guardrail.									

Defective Components Report

B2/3 | Sheet 2 Of 5

Structure Id 70108 Name Dalrymple Creek

Inspection Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Component Location				Exposure Class	Condition State	Description of Defect * Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos)	Required Action (✓)		
Modification	Group	Component	Standard Number				Monitor	Level 3 Inspection	Other
O	S2	K1	3P	1	3		✓		
The kerb is badly cracked with area broken away as can be seen in Photo 3 & 4. This kerb should be monitored.									
O	S2	K2	3P	1	3		✓		
The kerb is badly cracked with area broken away as can be seen in Photo 3 & 4. This kerb should be monitored.									
O	S2	WS	1C	1	4				✓
The wearing surface is badly broken up as can be seen in Photo 5 & 6. This should be replaced.									
O	S3	BR1	2T	1	4				✓
This are not very safe being timber as can be seen in Photo 1. These should be replaced with steel guardrail.									
O	S3	BR2	2T	1	4				✓
This are not very safe being timber as can be seen in Photo 1. These should be replaced with steel guardrail.									
O	S3	K1	3P	1	3		✓		
The kerb is badly cracked with area broken away as can be seen in Photo 3 & 4. This kerb should be monitored.									
O	S3	K2	3P	1	3		✓		
The kerb is badly cracked with area broken away as can be seen in Photo 3 & 4. This kerb should be monitored.									
O	S3	WS	1C	1	4				✓
The wearing surface is badly broken up as can be seen in Photo 5 & 6. This should be replaced.									
O	S4	BR1	2T	1	4				✓
This are not very safe being timber as can be seen in Photo 1. These should be replaced with steel guardrail.									
O	S4	BR2	2T	1	4				✓
This are not very safe being timber as can be seen in Photo 1. These should be replaced with steel guardrail.									
O	S4	K1	3P	1	3		✓		
The kerb is badly cracked with area broken away as can be seen in Photo 3 & 4. This kerb should be monitored.									
O	S4	K2	3P	1	3		✓		
The kerb is badly cracked with area broken away as can be seen in Photo 3 & 4. This kerb should be monitored.									
O	S4	WS	1C	1	4				✓
The wearing surface is badly broken up as can be seen in Photo 5 & 6. This should be replaced.									
O	AP2	AP	70C	1	4				✓

Defective Components Report

B2/3 | Sheet 3 Of 5

Structure Id 70108 Name Dalrymple Creek

Inspection Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Component Location				Exposure Class	Condition State	Description of Defect * Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos)	Required Action (✓)		
Modification	Group	Component	Standard Number				Monitor	Level 3 Inspection	Other
						The approach is very rough as can be seen in Photo 1 & 7. This should be trimmed over as a new seal placed.			
O	AP2	GR1	72T	1	4				✓
						This are not very safe being timber as can be seen in Photo 8. These should be replaced with steel guardrail.			
O	AP2	GR2	72T	1	4				✓
						This are not very safe being timber as can be seen in Photo 8. These should be replaced with steel guardrail.			
O	A1	ABS	52P	1	4				✓
						The abs has dropped over 40 mm as can be seen in Photo 10. This should be replaced to stop soil spilling through.			
O	A1	P1	56T	1	4				✓
						Pile 1 has a very large pipe at the top and some rot at ground level as can be seen in Form 2.5. This pile should be replaced.			
O	A1	P2	56T	1	3	Pile 2 has some rot at the top that should be monitored.	✓		
O	A1	P3	56T	1	4				✓
						Pile 4 has a very large pipe at the top and at ground level as can be seen in Form 2.5. This pile should be replaced.			
O	S1	D1	29T	1	4				✓
						There are alot of the deck units that are roted back past the kerbs as can be seen in Photo 11 & 19 and Photo 16 shows that there are some units that are allmost rotted away giving no support to the DWS. The deck should be replaced.			
O	S1	G1	22T	1	4				✓
						Girder 1 has a very large snipe with rot at E1 and a large snipe at E2 as can be seen in Form 2.5 that place it in condition state 4 and should be replaced.			
O	S1	G2	22T	1	4				✓
						Girder 2 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced.			
O	S1	G5	22T	1	4				✓
						Girder 5 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced.			
O	P1	COR5	27T	1	4				✓
						Corbe 5 drilled sound but the end of the corbe is badly cracked as can be seen in Photo 12 which moved this corbel to condition state 4. This corbel should be replaced.			
O	P1	H1	54T	1	4				✓
						Both headstocks are not supported on the pile correctly as can beseen in Photo 14 & 15. Photo 14 shows that there is less then 1/2 of the headstock on the shoulder and 15 shows that there is a gap between the headstock and the shoulder. These should be fixed.			
O	P1	H2	54T	1	4				✓
						Both headstocks are not supported on the pile correctly as can beseen in Photo 14 & 15. Photo 14 shows that there is less then 1/2 of the headstock on the shoulder and 15 shows that there is a gap between the headstock and the shoulder. These should be fixed.			

Defective Components Report

B2/3 | Sheet 4 Of 5

Structure Id 70108 Name Dalrymple Creek

Inspection Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Component Location				Exposure Class	Condition State	Description of Defect * Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos)	Required Action (✓)		
Modification	Group	Component	Standard Number				Monitor	Level 3 Inspection	Other
O	P1	P1	56T	2	4				✓
Pile 1 has a very large section rotting away as can be seen in Form 2.5. This pile should be spiced at a point where the pile is sounc.									
O	P1	P2	56T	2	3		✓		
Pile 2 has a very large section rotting away as can be seen in Form 2.5. This pile should be spiced at a point where the pile is sounc.									
O	P1	P3	56T	2	4				✓
Pile 3 has a very large pipe as can be seen in Form 2.5. This pile should be spliced at a point where the pile is sound.									
O	P1	P4	56T	2	4				✓
Pile 4 has a very large pipe as can be seen in Form 2.5. This pile should be spliced at a point where the pile is sound.									
O	S2	D1	29T	1	4				✓
There are alot of the deck units that are rated back past the kerbs as can be seen in Photo 11 & 19 and Photo 16 shows that there are some units that are allmost rotted away giving no support to the DWS. The deck should be replaced.									
O	S2	G1	22T	1	4				✓
Girder 1 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced.									
O	S2	G4	22T	1	3		✓		
Girder 4 has a large snipe with pipe at E2 as can be seen in Form 2.5 that place it in condition state 3 and should be monitored.									
O	P2	P2	56T	2	4				✓
Pile 2 has a very large section rotting away with the start of a pipe as can be seen in Form 2.5. This pile should be spliced at a point where the pile is sound.									
O	S3	D1	29T	1	4				✓
There are alot of the deck units that are rated back past the kerbs as can be seen in Photo 11 & 19 and Photo 16 shows that there are some units that are allmost rotted away giving no support to the DWS. The deck should be replaced.									
O	S3	G1	22T	1	4				✓
Girder 1 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced.									
O	S3	G2	22T	1	3		✓		
Girder 2 has a large snipe with pipe at E1 as can be seen in Form 2.5 that place it in condition state 3 and should be monitored.									
O	S3	G4	22T	1	3		✓		
Girder 4 has a large snipe with pipe at E2 as can be seen in Form 2.5 that place it in condition state 3 and should be monitored.									
O	S3	G5	22T	1	4				✓
Girder 5 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced.									
O	S3	W	71O	2	3	There is a lot of bodrs in the creek that should be clean out.			✓

Defective Components Report

B2/3 | Sheet 5 Of 5

Structure Id 70108 Name Dalrymple Creek

Inspection Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Component Location						Description of Defect * Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos)	Required Action (✓)		
Modification	Group	Component	Standard Number	Exposure Class	Condition State		Monitor	Level 3 Inspection	Other
O	P3	COR1	27T	1	3		✓		
Corbel 1 has a large pipe in it as can be seen in Form 2.5 and a crack in the side as can be seen in 18. This corbel should be monitored.									
O	P3	COR4	27T	1	4				✓
Corbel 4 has a very large pipe in it as can be seen in Form 2.5 which places it condition state 4 and should be replaced.									
O	S4	D1	29T	1	4				✓
There are alot of the deck units that are rotted back past the kerbs as can be seen in Photo 11 & 19 and Photo 16 shows that there are some units that are allmost rotted away giving no support to the DWS. The deck should be replaced.									
O	S4	G1	22T	1	4				✓
Girder 1 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced.									
O	S4	G2	22T	1	4				✓
Girder 2 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced.									
O	S4	G3	22T	1	3		✓		
Girder 3 has a large snipe with pipe at E1 as can be seen in Form 2.5 that place it in condition state 3 and should be monitored.									
O	S4	G5	22T	1	4				✓
Girder 5 has a very large pipe throughout it length as can be seen in Form 2.5 that place it in condition state 4 and should be replaced.									
O	S4	W	71C	2	4				✓
There is a lot of debra in the creek as can be seen in Photo 20 & 21 that should be clean out.									
O	A2	P1	56T	2	4				✓
Pile 1 has a very large pipe at the top and at ground level as can be seen in Form 2.5. This pile should be replaced.									
O	A2	P2	56T	2	3	Pile 2 has a large pipe at the top that should be monitored.	✓		
O	A2	P3	56T	2	4				✓
Pile 3 has a very large pipe at the top and at ground level as can be seen in Form 2.5. This pile should be replaced.									
O	A2	P4	56T	2	4				✓
Pile 4 has a very large pipe at the top and at ground level as can be seen in Form 2.5. This pile should be replaced.									

Timber Drilling Survey Report

B2/5 | Sheet 1 Of 8

Structure Id	70108	Name	Dalrymple Creek
Crossing Name		Alt. Name	
Structure Type	Bridge	Owner	110 Warwick Shire Council
Construction Type	Girder/Beam	District	5 Border District (Mr)
Construction Material	Timber	LGA Id	110 Warwick Shire Council
Inspector	Malcolm J Brodie	Date	24-MAY-2004

Inspection Level 2 [✓] Programmed [ ]
Level 3 [ ] Exceptional [ ] All Elements Drilled [✓] Underwater [ ]

Road Section Id	Description	S	Cway	S	RPC	Start Dist	RPC	End Dist	TDist Start	TDist End
188L	Kital Road	C	1	C	1	2.330	1	2.368	2.330	2.368

Component Location					Test Details			Test Results (mm)						Comments
Modification	Group	Component	Standard Number	Diameter (mm)	Location	Diameter	Orientation (H, V, Other)	Solid	Rot	Pipe	% Consumed	Condition State	Undersize	
O	A1	P 1	56	400	T	16	H	180		220	55	4		
O	A1	P 1	56	400	GL	16	H	220	180		45	4		
O	A1	P 2	56	400	T	16	H	300	100		25	3		
O	A1	P 2	56	400	GL	16	H	400		0	0	1		
O	A1	P 3	56	400	T	16	H	400		0	0	1		
O	A1	P 3	56	400	GL	16	H	400		0	0	1		
O	A1	P 4	56	400	T	16	H	180		220	55	4		
O	A1	P 4	56	400	GL	16	H	190		210	53	4		
O	S1	G 1	22	530	E1	16	H	430	100		19	2		

* Test Locations

Component	Defect	Location (Abbreviation) *(Describe Other (O) in comments)*	% Consumed CS 2 E	CS 2 MS	CS 3 E	CS 3 MS	CS 4 E	CS 4 MS
Pile	*Pipe*	Top (T), Ground Level (GL), (O) Other	1-20	1-20	21-35	21-35	36-50	36-50
Girder	*Pipe*	End1 (E1), Midspan (MS), End 2 (E2), Other (O)	1-20	1-30	21-35	31-50	36-50	51-70
Corbel	*Pipe*	End1 (E1), End 2 (E2), Other (O)	1-20	1-20	21-35	21-35	36-50	36-50
Headstock[1]	*Edge Area*	End1 (E1), End 2 (E2), Other (O)	1-5	1-5	6-10	6-10	11-20	11-20
Headstock[2]	*Pipe*	End1 (E1), End 2 (E2), Other (O)	1 - 45mm		46 - 65mm		66 - 90mm	

Other Component - Enter relevant component code and describe location in comments field.

1. Area of headstock (%) for external loss of section (top, bottom or sides).
2. Maximum pipe diameter (mm) in headstock for internal piping defects.
3. Members in excess of CS4 deterioration are critical and should be replaced immediately.

Timber Drilling Survey Report

B2/5 | Sheet 2 Of 8

Structure Id 70108 Name Dalrymple Creek

Survey Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Component Location					Test Details			Test Results (mm)						Comments
Modification	Group	Component	Standard Number	Diameter (mm)	Location	Diameter	Orientation (H, V, Other)	Solid	Rot	Pipe	% Consumed	Condition State	Undersize	
O	S1	G 1	22	530	E1	16	V	90	170	270	83	4		
O	S1	G 1	22	530	MS	16	H	530		0	0	1		
O	S1	G 1	22	530	MS	16	V	380		150	28	2		
O	S1	G 1	22	530	E2	16	H	530		0	0	1		
O	S1	G 1	22	530	E2	16	V	350		180	34	3		
O	S1	G 2	22	440	E1	16	H	340		100	23	3		
O	S1	G 2	22	440	E1	16	V	240		200	45	4		
O	S1	G 2	22	440	MS	16	H	240		200	45	3		
O	S1	G 2	22	440	MS	16	V	240		200	45	3		
O	S1	G 2	22	440	E2	16	H	240		200	45	4		
O	S1	G 2	22	440	E2	16	V	240		200	45	4		
O	S1	G 3	22	500	E1	16	H	500		0	0	1		
O	S1	G 3	22	500	E1	16	V	425		75	15	2		
O	S1	G 3	22	500	MS	16	H	500		0	0	1		
O	S1	G 3	22	500	MS	16	V	500		0	0	1		
O	S1	G 3	22	500	E2	16	H	500		0	0	1		
O	S1	G 3	22	500	E2	16	V	470		30	6	2		
O	S1	G 4	22	470	E1	16	H	470		0	0	1		
O	S1	G 4	22	470	E1	16	V	420		50	11	2		
O	S1	G 4	22	470	MS	16	H	450	20	0	4	2		
O	S1	G 4	22	470	MS	16	V	450	20	0	4	2		
O	S1	G 4	22	470	E2	16	H	470		0	0	1		
O	S1	G 4	22	470	E2	16	V	470		0	0	1		
O	S1	G 5	22	500	E1	16	H	260		240	48	4		
O	S1	G 5	22	500	E1	16	V	110		390	78	4		

Timber Drilling Survey Report

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Structure Id 70108 Name Dalrymple Creek

Survey Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Component Location					Test Details			Test Results (mm)						Comments
Modification	Group	Component	Standard Number	Diameter (mm)	Location	Diameter	Orientation (H, V, Other)	Solid	Rot	Pipe	% Consumed	Condition State	Undersize	
O	S1	G 5	22	500	MS	16	H	500		0	0	1		
O	S1	G 5	22	500	MS	16	V	350		150	30	2		
O	S1	G 5	22	500	E2	16	H	380		120	24	3		
O	S1	G 5	22	500	E2	16	V	100		400	80	4		
O	P1	(OR 1	27	500	E2	16	H	500		0	0	1		
O	P1	(OR 1	27	500	E2	16	V	500		0	0	1		
O	P1	(OR 2	27	500	E2	16	H	500		0	0	1		
O	P1	(OR 2	27	500	E2	16	V	500		0	0	1		
O	P1	(OR 3	27	500	E2	16	H	500		0	0	1		
O	P1	(OR 3	27	500	E2	16	V	500		0	0	1		
O	P1	(OR 4	27	500	E2	16	H	500		0	0	1		
O	P1	(OR 4	27	500	E2	16	V	500		0	0	1		
O	P1	(OR 5	27	500	E1	16	H	300	200	0	40	4		
O	P1	(OR 5	27	500	E1	16	V	300	200	0	40	4		
O	P1	P 1	56	410	T	16	H	210	200	0	49	4		
O	P1	P 2	56	410	T	16	H	310	100	0	24	3		
O	P1	P 3	56	410	T	16	H	250		160	39	4		
O	P1	P 4	56	410	T	16	H	110		300	73	4		
O	S2	G 1	22	500	E1	16	H	450	50	0	10	2		
O	S2	G 1	22	500	E1	16	V	450	50	0	10	2		
O	S2	G 1	22	500	MS	16	H	430	70	0	14	2		
O	S2	G 1	22	500	MS	16	V	430	70	0	14	2		
O	S2	G 1	22	500	E2	16	H	500		0	0	1		
O	S2	G 1	22	500	E2	16	V	425		75	15	2		
O	S2	G 2	22	500	E1	16	H	250		250	50	4		

Timber Drilling Survey Report

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Structure Id 70108 Name Dalrymple Creek

Survey Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Component Location					Test Details			Test Results (mm)						Comments
Modification	Group	Component	Standard Number	Diameter (mm)	Location	Diameter	Orientation (H, V, Other)	Solid	Rot	Pipe	% Consumed	Condition State	Undersize	
O	S2	G 2	22	500	E1	16	V	250		250	50	4		
O	S2	G 2	22	500	MS	16	H	250		250	50	3		
O	S2	G 2	22	500	MS	16	V	250		250	50	3		
O	S2	G 2	22	500	E2	16	H	470	30		6	2		
O	S2	G 2	22	500	E2	16	V	420	30	50	16	2		
O	S2	G 3	22	500	E1	16	H	500		0	0	1		
O	S2	G 3	22	500	E1	16	V	500		0	0	1		
O	S2	G 3	22	500	MS	16	H	460		40	8	2		
O	S2	G 3	22	500	MS	16	V	460		40	8	2		
O	S2	G 3	22	500	E2	16	H	500		0	0	1		
O	S2	G 3	22	500	E2	16	V	475		25	5	2		
O	S2	G 4	22	500	E1	16	H	500		0	0	1		
O	S2	G 4	22	500	E1	16	V	500		0	0	1		
O	S2	G 4	22	500	MS	16	H	500		0	0	1		
O	S2	G 4	22	500	MS	16	V	500		0	0	1		
O	S2	G 4	22	500	E2	16	H	500		0	0	1		
O	S2	G 4	22	500	E2	16	V	450		50	10	2		
O	S2	G 5	22	500	E1	16	H	430		70	14	2		
O	S2	G 5	22	500	E1	16	V	380		120	24	3		
O	S2	G 5	22	500	MS	16	H	500		0	0	1		
O	S2	G 5	22	500	MS	16	V	500		0	0	1		
O	S2	G 5	22	500	E2	16	H	500		0	0	1		
O	S2	G 5	22	500	E2	16	V	400		100	20	2		
O	P2	KOR 1	27	500	E2	16	H	450		50	10	2		
O	P2	KOR 1	27	500	E2	16	V	450		50	10	2		

Timber Drilling Survey Report

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Structure Id 70108 Name Dalrymple Creek

Survey Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Component Location					Test Details			Test Results (mm)						
Modification	Group	Component	Standard Number	Diameter (mm)	Location	Diameter	Orientation (H, V, Other)	Solid	Rot	Pipe	% Consumed	Condition State	Undersize	Comments
0	P2	(OR 2	27	500	E2	16	H	450		50	10	2		
0	P2	(OR 2	27	500	E2	16	V	450		50	10	2		
0	P2	(OR 3	27	500	E2	16	H	400		100	20	2		
0	P2	(OR 3	27	500	E2	16	V	400		100	20	2		
0	P2	(OR 4	27	500	E2	16	H	500		0	0	1		
0	P2	(OR 4	27	500	E2	16	V	500		0	0	1		
0	P2	(OR 5	27	500	E2	16	H	500		0	0	1		
0	P2	(OR 5	27	500	E2	16	V	500		0	0	1		
0	P2	P 1	56	400	T	16	H	400		0	0	1		
0	P2	P 2	56	400	T	16	H	200	150	50	50	4		
0	P2	P 3	56	400	T	16	H	400		0	0	1		
0	P2	P 4	56	400	T	16	H	400		0	0	1		
0	S3	G 1	22	570	E1	16	H	430	140	0	25	3		
0	S3	G 1	22	570	E1	16	V	280	140	150	51	4		
0	S3	G 1	22	570	MS	16	H	490		80	14	2		
0	S3	G 1	22	570	MS	16	V	270		300	53	4		
0	S3	G 1	22	570	E2	16	H	520		50	9	2		
0	S3	G 1	22	570	E2	16	V	470		100	18	2		
0	S3	G 2	22	470	E1	16	H	420		50	11	2		
0	S3	G 2	22	470	E1	16	V	370		100	21	3		
0	S3	G 2	22	470	MS	16	H	470		0	0	1		
0	S3	G 2	22	470	MS	16	V	470		0	0	1		
0	S3	G 2	22	470	E2	16	H	440	30	0	6	2		
0	S3	G 2	22	470	E2	16	V	390	30	50	17	2		
0	S3	G 3	22	500	E1	16	H	500		0	0	1		

Timber Drilling Survey Report

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Structure Id 70108 Name Dalrymple Creek

Survey Date 24-MAY-2004 Inspection Level 2 ✓ Level 3 [ ] Underwater [ ]

Component Location					Test Details			Test Results (mm)						Comments
Modification	Group	Component	Standard Number	Diameter (mm)	Location	Diameter	Orientation (H, V, Other)	Solid	Rot	Pipe	% Consumed	Condition State	Undersize	
O	S3	G 3	22	500	E1	16	V	425		75	15	2		
O	S3	G 3	22	500	MS	16	H	390	110		22	2		
O	S3	G 3	22	500	MS	16	V	390	110		22	2		
O	S3	G 3	22	500	E2	16	H	500		0	0	1		
O	S3	G 3	22	500	E2	16	V	450		50	10	2		
O	S3	G 4	22	470	E1	16	H	470		0	0	1		
O	S3	G 4	22	470	E1	16	V	420		50	11	2		
O	S3	G 4	22	470	MS	16	H	470		0	0	1		
O	S3	G 4	22	470	MS	16	V	470		0	0	1		
O	S3	G 4	22	470	E2	16	H	420	50	0	11	2		
O	S3	G 4	22	470	E2	16	V	370	50	50	21	3		
O	S3	G 5	22	550	E1	16	H	350		200	36	4		
O	S3	G 5	22	550	E1	16	V	175		375	68	4		
O	S3	G 5	22	550	MS	16	H	480		70	13	2		
O	S3	G 5	22	550	MS	16	V	345		205	37	3		
O	S3	G 5	22	550	E2	16	H	450	100		18	2		
O	S3	G 5	22	550	E2	16	V	275	100	175	50	4		
O	P3	KOR 1	27	500	E2	16	H	380		120	24	3		
O	P3	KOR 1	27	500	E2	16	V	350		150	30	3		
O	P3	KOR 2	27	500	E2	16	H	500		0	0	1		
O	P3	KOR 2	27	500	E2	16	V	500		0	0	1		
O	P3	KOR 3	27	500	E2	16	H	500		0	0	1		
O	P3	KOR 3	27	500	E2	16	V	450		50	10	2		
O	P3	KOR 4	27	500	E2	16	H	440		60	12	2		
O	P3	KOR 4	27	500	E2	16	V	260		240	48	4		

Timber Drilling Survey Report

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Structure Id 70108 Name Dalrymple Creek

Survey Date 24-MAY-2004 Inspection Level 2 ✓ Level 3 ☐ Underwater ☐

Component Location					Test Details			Test Results (mm)						Comments
Modification	Group	Component	Standard Number	Diameter (mm)	Location	Diameter	Orientation (H, V, Other)	Solid	Rot	Pipe	% Consumed	Condition State	Undersize	
O	P3	(OR 5	27	500	E2	16	H	500		0	0	1		
O	P3	(OR 5	27	500	E2	16	V	500		0	0	1		
O	P3	P 1	56	400	T	16	H	400		0	0	1		
O	P3	P 2	56	400	T	16	H	340		60	15	2		
O	P3	P 3	56	400	T	16	H	320		80	20	2		
O	P3	P 4	56	400	T	16	H	400		0	0	1		
O	S4	G 1	22	500	E1	16	H	400	100	0	20	2		
O	S4	G 1	22	500	E1	16	V	280	100	120	44	4		
O	S4	G 1	22	500	MS	16	H	500		0	0	1		
O	S4	G 1	22	500	MS	16	V	380		120	24	2		
O	S4	G 1	22	500	E2	16	H	290	210		42	4		
O	S4	G 1	22	500	E2	16	V	30	230	240	94	4		
O	S4	G 2	22	470	E1	16	H	330	140		30	3		
O	S4	G 2	22	470	E1	16	V	300	140	30	36	4		
O	S4	G 2	22	470	MS	16	H	330	140		30	2		
O	S4	G 2	22	470	MS	16	V	140	330		70	4		
O	S4	G 2	22	470	E2	16	H	140	330		70	4		
O	S4	G 2	22	470	E2	16	V	110	330	30	77	4		
O	S4	G 3	22	500	E1	16	H	410	90		18	2		
O	S4	G 3	22	500	E1	16	V	380	90	30	24	3		
O	S4	G 3	22	500	MS	16	H	450	50		10	2		
O	S4	G 3	22	500	MS	16	V	450	50		10	2		
O	S4	G 3	22	500	E2	16	H	500		0	0	1		
O	S4	G 3	22	500	E2	16	V	475		25	5	2		
O	S4	G 4	22	470	E1	16	H	470		0	0	1		

Timber Drilling Survey Report

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Structure Id 70108 Name Dalrymple Creek

Survey Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Component Location					Test Details			Test Results (mm)						Comments
Modification	Group	Component	Standard Number	Diameter (mm)	Location	Diameter	Orientation (H, V, Other)	Solid	Rot	Pipe	% Consumed	Condition State	Undersize	
O	S4	G 4	22	470	E1	16	V	440		30	6	2		
O	S4	G 4	22	470	MS	16	H	400	70		15	2		
O	S4	G 4	22	470	MS	16	V	400	70		15	2		
O	S4	G 4	22	470	E2	16	H	470		0	0	1		
O	S4	G 4	22	470	E2	16	V	440		30	6	2		
O	S4	G 5	22	550	E1	16	H	490		60	11	2		
O	S4	G 5	22	550	E1	16	V	360		190	35	3		
O	S4	G 5	22	550	MS	16	H	550		0	0	1		
O	S4	G 5	22	550	MS	16	V	550		0	0	1		
O	S4	G 5	22	550	E2	16	H	550		0	0	1		
O	S4	G 5	22	550	E2	16	V	320		230	42	4		
O	A2	P 1	56	400	T	16	H	100		300	75	4		
O	A2	P 1	56	400	GL	16	H	100		300	75	4		
O	A2	P 2	56	400	T	16	H	300		100	25	3		
O	A2	P 2	56	400	GL	16	H	300		100	25	3		
O	A2	P 3	56	400	T	16	H	250		150	38	4		
O	A2	P 3	56	400	GL	16	H	300		100	25	3		
O	A2	P 4	56	400	T	16	H	150		250	63	4		
O	A2	P 4	56	400	GL	16	H	150		250	63	4		

Level 2 Inspection Report - Photos & Sketches Record

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Structure Id 70108 Name Dalrymple Creek
Crossing Name Alt. Name
Structure Type Bridge Owner 110 Warwick Shire Council
Construction Type Girder/Beam District 5 Border District (Mr)
Construction Material Timber LGA Id 110 Warwick Shire Council
Inspector Malcolm J Brodie Date 24-MAY-2004
Inspection Level 2 ✓ Programmed ✓
Level 3 Exceptional Underwater

Road Section Id	Description	S	Cway	S	RPC	Start Dist	RPC	End Dist	TDist Start	TDist End
188L	Kital Road	C	1	C	1	2.330	1	2.368	2.330	2.368

Film/Exposure Number	Sketch No	Location: Modification	Location: Group	Location: Component	Description (* Deck Surface (full width and alignment) * Side View (waterway, spans, piers, etc) * Underside (deck and pier construction) * Deficient Component and Major Defects * Undefined Elements)	Id
Photo 1		O	AP1	AP	This shows the alignment over the bridge.	1800000172
Photo 10		O	A1	ABS	This shows the under side of the bridge at this location.	1800000180
Photo 11		O	S1	D1	This shows the state of the deck.	1800000182
Photo 12		O	P1	COR5	This shows the state of the corbel.	1800000187
Photo 13		O	P1	P1	This shows the underside of the bridge at this location.	1800000188
Photo 14		O	P1	H1	This shows the top of the pile.	1800000185
Photo 15		O	P1	H1	This shows the top of the pile.	1800000186
Photo 16		O	S1	D1	This shows the state of the deck.	1800000183
Photo 17		O	P2	P2	This shows the underside of the bridge at this location.	1800000189
Photo 18		O	P3	COR1	This shows the crack in the corbel.	1800000190
Photo 19		O	S1	D1	This shows the state of the deck.	1800000184
Photo 2		O	AP1	AP	This shows the location of the end of the bridge.	1800000173
Photo 20		O	S4	W	This shows the debra in the creek.	1800000192
Photo 21		O	S4	W	This shows the debra in the creek.	1800000191
Photo 22		O	A2	P1	This shows the undereside of the bridge at this location.	1400000274
Photo 3		O	S1	K1	This shows the state of the kerb.	1800000177
Photo 4		O	S1	K1	This shows the state of the kerb.	1800000178
Photo 5		O	S1	WS	This shows the state of the DWS.	1800000175
Photo 6		O	S1	WS	This shows the state of the DWS.	1800000176

Level 2 Inspection Report - Photos & Sketches Record	B2/6	Sheet 2 Of 10

Structure Id 70108 Name Dalrymple Creek
Inspection Date 24-MAY-2004 Inspection Level 2 ✓ Level 3 Underwater

Film/Exposure Number	Sketch No	Location			Description * Deck Surface (full width and alignment) * Side View (waterway, spans, piers, etc) * Underside (deck and pier construction) * Deficient Component and Major Defects * Undefined Elements	Id
		Modification	Group	Component		
Photo 7		O	AP2	AP	This shows the end of the bridge.	1800000179
Photo 8		O	AP1	GR1	This shows the timber guardrail.	1800000174
Photo 9		O	S3	W	This shows the side of the bridge.	1800000181

Level 2 Inspection Report - Photos & Sketches Record

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Sheet 3 Of 10

Structure Id 70108 Name Dalrymple Creek

Inspection Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Pictures

Id 1400000274 Date 24-MAY-2004

Film / Exposure Number: Photo 22 Sketch No:

Description: This shows the undereside of the bridge at this location.

Mod	Category	Number	Comp Code	Comp No
O	A	2	P	1

Id 1800000172 Date 24-MAY-2004

Film / Exposure Number: Photo 1 Sketch No:

Description: This shows the alignment over the bridge.

Mod	Category	Number	Comp Code	Comp No
O	AP	1	AP	

Id 1800000173 Date 24-MAY-2004

Film / Exposure Number: Photo 2 Sketch No:

Description: This shows the location of the end of the bridge.

Mod	Category	Number	Comp Code	Comp No
O	AP	1	AP	

Level 2 Inspection Report - Photos & Sketches Record

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Sheet 4 Of 10

Structure Id 70108 Name Dalrymple Creek

Inspection Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Pictures

Id 1800000174 Date 24-MAY-2004

Film / Exposure Number: Photo 6 Sketch No:

Description: This shows the timber guardrail.

Mod	Category	Number	Comp Code	Comp No
O	AF	1	GR	1

Id 1800000175 Date 24-MAY-2004

Film / Exposure Number: Photo 5 Sketch No:

Description: This shows the state of the DWS.

Mod	Category	Number	Comp Code	Comp No
O	S	1	WS	

Id 1800000176 Date 24-MAY-2004

Film / Exposure Number: Photo 6 Sketch No:

Description: This shows the state of the DWS.

Mod	Category	Number	Comp Code	Comp No
O	S	1	WS	

Level 2 Inspection Report - Photos & Sketches Record

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Sheet 5 Of 10

Structure Id 70108 Name Dalrymple Creek

Inspection Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Pictures

Id 1800000177 Date 24-MAY-2004

Film / Exposure Number: Photo 3 Sketch No:

Description: This shows the state of the kerb.

Mod	Category	Number	Comp Code	Comp No
O	S	1	K	1

Id 1800000178 Date 24-MAY-2004

Film / Exposure Number: Photo 4 Sketch No:

Description: This shows the state of the kerb.

Mod	Category	Number	Comp Code	Comp No
O	S	1	K	1

Id 1800000179 Date 24-MAY-2004

Film / Exposure Number: Photo 7 Sketch No:

Description: This shows the end of the bridge.

Mod	Category	Number	Comp Code	Comp No
O	AP	2	AP	

Level 2 Inspection Report - Photos & Sketches Record

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Structure Id 70108 Name Dalrymple Creek

Inspection Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Pictures

Id 1800000180 Date 24-MAY-2004

Film / Exposure Number: Photo 10 Sketch No:

Description: This shows the under side of the bridge at this location.

Mod	Category	Number	Comp Code	Comp No
O	A	1	ABS	

Id 1800000181 Date 24-MAY-2004

Film / Exposure Number: Photo 9 Sketch No:

Description: This shows the side of the bridge.

Mod	Category	Number	Comp Code	Comp No
O	S	3	W	

Id 1800000182 Date 24-MAY-2004

Film / Exposure Number: Photo 11 Sketch No:

Description: This shows the state of the deck.

Mod	Category	Number	Comp Code	Comp No
O	S	1	D	1

Level 2 Inspection Report - Photos & Sketches Record

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Structure Id 70108 Name Dalrymple Creek

Inspection Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

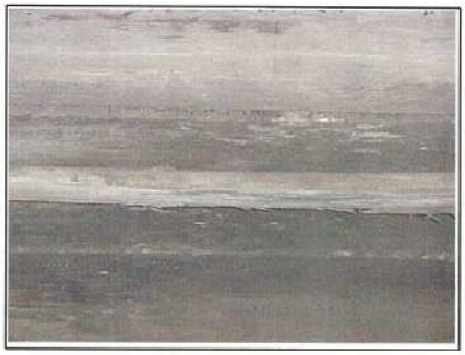
Pictures

Id 1800000183 Date 24-MAY-2004

Film / Exposure Number: Photo 16 Sketch No:

Description: This shows the state of the deck.

Mod	Category	Number	Comp Code	Comp No
O	S	1	D	1



Id 1800000184 Date 24-MAY-2004

Film / Exposure Number: Photo 19 Sketch No:

Description: This shows the state of the deck.

Mod	Category	Number	Comp Code	Comp No
O	S	1	D	1

Id 1800000185 Date 24-MAY-2004

Film / Exposure Number: Photo 14 Sketch No:

Description: This shows the top of the pile.

Mod	Category	Number	Comp Code	Comp No
O	P	1	H	1

Level 2 Inspection Report - Photos & Sketches Record

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Structure Id 70108 Name Dalrymple Creek

Inspection Date 24-MAY-2004 Inspection Level 2 ✓ Level 3 ☐ Underwater ☐

Pictures

Id 1800000186 Date 24-MAY-2004

Film / Exposure Number: Photo 15 Sketch No:

Description: This shows the top of the pile.

Mod	Category	Number	Comp Code	Comp No
O	P	1	H	1

Id 1800000187 Date 24-MAY-2004

Film / Exposure Number: Photo 12 Sketch No:

Description: This shows the state of the corbel.

Mod	Category	Number	Comp Code	Comp No
O	P	1	COR	5

Id 1800000188 Date 24-MAY-2004

Film / Exposure Number: Photo 13 Sketch No:

Description: This shows the underside of the bridge at this location.

Mod	Category	Number	Comp Code	Comp No
O	P	1	P	1

Level 2 Inspection Report - Photos & Sketches Record	B2/6	Sheet 9 Of 10

Structure Id 70108 Name Dalrymple Creek
Inspection Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Pictures

Id 1800000189 Date 24-MAY-2004
Film / Exposure Number: Photo 17 Sketch No:
Description: This shows the underside of the bridge at this location.

Mod	Category	Number	Comp Code	Comp No
O	P	2	P	2

Id 1800000190 Date 24-MAY-2004
Film / Exposure Number: Photo 18 Sketch No:
Description: This shows the crack in the corbel.

Mod	Category	Number	Comp Code	Comp No
O	P	3	COR	1

Id 1800000191 Date 24-MAY-2004
Film / Exposure Number: Photo 21 Sketch No:
Description: This shows the debra in the creek.

Mod	Category	Number	Comp Code	Comp No
O	S	4	W	

Level 2 Inspection Report - Photos & Sketches Record	B2/6	Sheet 10 Of 10

Structure Id 70108 Name Dalrymple Creek

Inspection Date 24-MAY-2004 Inspection Level 2 [✓] Level 3 [ ] Underwater [ ]

Pictures

Id 1800000192 Date 24-MAY-2004

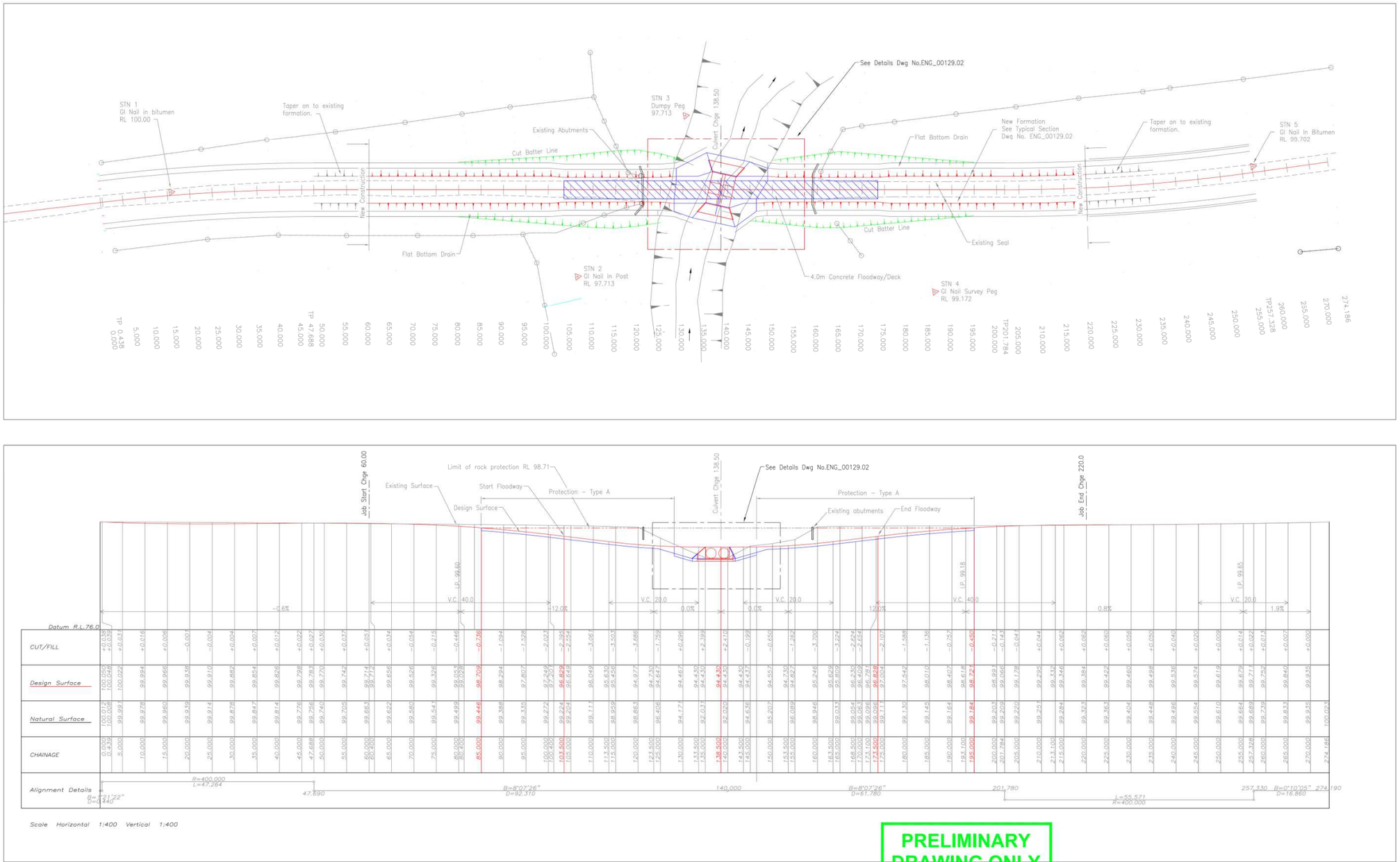
Film / Exposure Number: Photo 20

Sketch No:

Description: This shows the debra in the creek.

Mod	Category	Number	Comp Code	Comp No
O	S	4	W	

APPENDIX D – LAYOUT AND LONG SECTION LOW FLOW FLOODWAY KITAL ROAD



PRELIMINARY DRAWING ONLY
NOT FOR CONSTRUCTION

REVISIONS.	DATE	KITAL RD – TIMBER BRIDGE REPLACEMENT TWIN 2100Ø PIPE CULVERT LONG SECTION								
A Original	6/4/10	Southern Downs REGIONAL COUNCIL	Designed	HT	Approved		Date		No 1 of 4 Plans	
			Drawn	HT	Checked		Scale	1 : 400	Plan No.	ENG_00129.01

APPENDIX E – ESTIMATE FOR LOW FLOW FLOODWAY

Activity No		Unit	Amount	Quantity	Rate $	Amount $
801	**Site Establishment**					
	Setup signage, site container and hold pre start meeting					
	Labour					
	Forman + Ute	/hr	8.06	2	$ 48.20	$ 388.49
	Seconded supervisor will assist with the construction of the concrete deck and pipe installation					
	Ganger + Ute	/hr	8.06	1	$ 40.01	$ 322.48
	Labour	/hr	8.06	2	$ 27.58	$ 444.59
	Plant					
	Excavator + Operator	/hr		1	$ 128.00	$ -
	Truck 12t	/hr		2	$ 86.00	
	Prime mover and Low Loader + Operator	/hr	8.06	2	144.9	$ 2,335.78
	Materials					
	Security Fencing	/day	50		50	$ 2,500.00
	Site container	/day	50		$ 50.00	$ 2,500.00
	Toilet	/day	50		$ 50.00	$ 2,500.00
					Sub Total Cost Site set up & pack up	**$ 10,991.34**
803	**Survey/Setup & Design**					
	Locate sevices, peg out control line and establish cut area					2
	Labour					
	Forman + Ute	/hr	16.12	2	$ 48.20	$ 1,553.97
	Ganger + Ute	/hr	16.12	1	$ 40.01	$ 644.96
	Labour	/hr	16.12	2	$ 27.58	$ 889.18
	Materials					
	Survey Pegs & Paint	item			$200	$200
					Sub Total Cost Set out	**$ 3,288.11**
822	**Demolition of Existing Bridge**					
	(to be complete 1 week before start of works)					
	Quotes for the demolition of the extisting bridge where called December 2008.					5
	Ironbark Demolition Pty Ltd **(Cheaperst option)**	item			$11,750	$11,750
	Burk Industries Pty Ltd	item			$12,800	
					Sub Total Cost Demolition of Existing Bridge	**$11,750**
	LOWFLOW FLOODWAY					
820	**Remove & Stock Pile Existing Top Soil - Unit rate of $12.5 per m3**					
	Top 100mm of top soil shall be removed from the earthworks site and Stock piled					
	Topsoil shall be respred over excavation site after bulk earthworks is complete					
	300m^3 of to soil to be removed					
	Labour					2
	Forman + Ute	/hr	16.12	1	$ 48.20	$ 776.98
	Ganger + Ute	/hr		1	$ 40.01	$ -
	Labour	/hr		2	$ 27.58	$ -
	Plant					
	Excavator + Operator	/hr	16.12	1	$ 128.00	$ 2,063.36
	Truck 12t	/hr	16.12	1	$ 86.00	$ 1,386.32
						$ -
					Sub Total Cost Remove & Stock Pile Existing Top Soil	**$ 4,226.66**

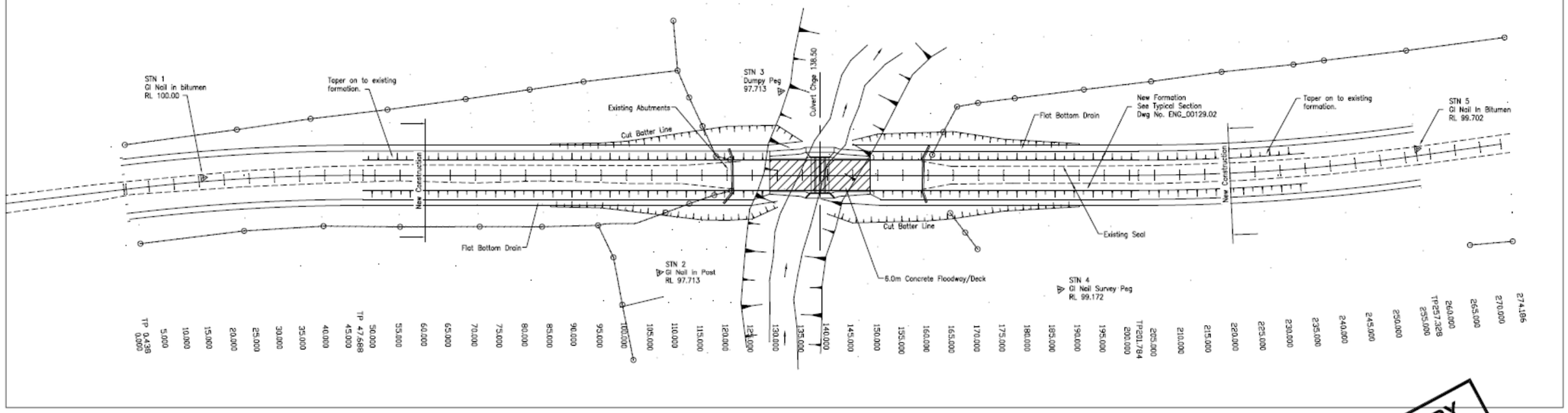
805	**Install Erosion & Sediment Control**						
	Silt socks shall be installed on all exposed soil						
	All stockpiles shall be protectd by silt fencing						
	Erosion protection shall be inspected daily						
	Labour						4
	Forman + Ute	/hr		1	$ 48.20	$	-
						$	-
	Ganger + Ute	/hr	32.24	1	$ 40.01	$	1,289.92
						$	-
	Labour	/hr	32.24	2	$ 27.58	$	1,778.36
	Plant						
	Mini Excavator + Operator contractor	/hr	16.12	1	$ 80.00	$	1,289.60
	Materials						
	Silt Fencing	item			$ 200.00	$	200.00
						$	-
	Silt Sock	/m		50	$ 10.00	$	500.00
					Sub Total Cost Install Erosion & Sediment Control	**$**	**5,057.88**
820	**Excavation of Approaches & Floodway - Unit rate of $12 per m3**						
	(Material to be stock piled onsite or given away to surrounding property owners)						
	Total cut 3525m3						
	Use two12t trucks						
	Load time/truck 16min						
	30 loads per day per tuck						
	240m3 per truck per day						
	Unit rate of $12 per m^3						
	Labour						15
	Forman + Ute	/hr	120.9	1	$ 48.20	$	5,827.38
	Ganger + Ute	/hr	120.9	1	$ 40.01	$	4,837.21
	Labour	/hr	120.9	2	$ 27.58	$	6,668.84
	Plant						
	Excavator + Operator	/hr	120.9	1	$ 128.00	$	15,475.20
						$	-
	Body Truck 12t	/hr	120.9	2	$ 86.00	$	20,794.80
	Loader + operator (Maintain stock pile)	/hr	32.24	1	$ 101.40		
	Materials						
					Sub Total Cost Excavation of Approaches	**$**	**53,603.43**
810	**Diversion of Flow & Coffer Dam**						
	(install small coffer dam upstream)						
	Pump must be fited with suction protector						
	Labour						1
	Forman + Ute	/hr	8.06	1	$ 48.20	$	388.49
	Ganger + Ute	/hr	8.06	1	$ 40.01	$	322.48
	Labour	/hr	8.06	2	$ 27.58	$	444.59
	Plant						
	Excavator + Operator	/hr	8.06	1	$ 128.00	$	1,031.68
						$	-
	Materials					$	-
						$	-
	Pump & Hoses (May require pump to dewater constrtion area 6inch)	item	50		$ 150.00	$	7,500.00
					Sub Total Cost Diversion of Flow	**$**	**9,687.24**

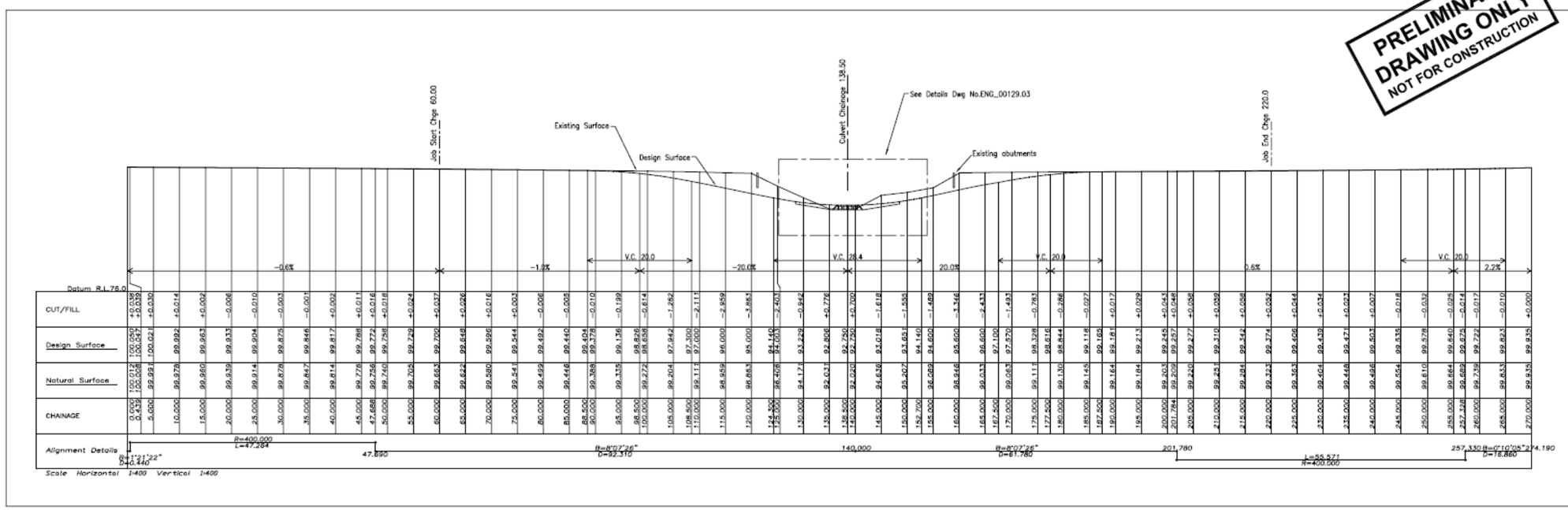
812	**Supply Lay & Install Twin 2100 Pipes**						
	Labour						4
	Forman + Ute	/hr	32.24	2	$ 48.20	$	3,107.94
	Ganger + Ute	/hr	32.24	1	$ 40.01	$	1,289.92
	Labour	/hr	32.24	3	$ 27.58	$	2,667.54
	Plant						
	12 Truck & dog + Operator	/hr	32.24	2	$ 137.02	$	8,835.05
	Excavator + Operator	/hr	32.24	1	$ 128.00	$	4,126.72
	WackerPac	/hr	32.24	2	$ 10.00	$	644.80
	CRANE	hr	12	1	$ 321.00	$	3,853.00
	Materials						
	Crusher Dust (bedding)	/t		25	$ 12.00	$	300.00
	2100 x 2.44 Flush class 2 (thick wall)	/m		14.64	$ 744.00	$	10,892.16
	2100 Headwalls class 2 (1:2 Embankment twin cell)	each		2	$ 7,960.00	$	15,920.00
	Stabilized back fill	/t		50	$ 20.00	$	1,000.00
					Sub Total Cost Supply Lay & Install Twin 2100 Pipes	$	52,637.13
820	**Place & Compact fill**						
	Total fill requred 326m^3						
	Fill shall be compacted in 300mm layers						
	Labour						3
	Forman + Ute	/hr	24.18	2	$ 48.20	$	2,330.95
						$	-
	Ganger + Ute	/hr	24.18	1	$ 40.01	$	967.44
						$	-
	Labour	/hr	24.18	3	$ 27.58	$	2,000.65
	Plant						
	Excavator + Operator	/hr	24.18	1	$ 128.00	$	3,095.04
	12 Truck & dog + Operator	/hr	24.18	2	$ 137.02	$	6,626.29
	WackerPac	/hr	24.18	2	$ 10.00	$	483.60
	Water cart + Operator	/hr	24.18	1	$ 32.24	$	779.56
	Roller (Pad foot) + Operator	/hr	24.18	1	$ 88.89	$	2,149.36
	Materials						
					Sub Total Cost Place & Compact fill	$	18,432.90
830	**Supply & Construction of Concert Deck 56m3 @ $372/m3**						
	Labour						4
	Forman + Ute	/hr	32.24	2	$ 48.20	$	3,107.94
	Ganger + Ute	/hr	32.24	2	$ 40.01	$	2,579.84
	Labour	/hr	32.24	3	$ 27.58	$	2,667.54
	Plant						
	Concrete Pump	/hr	16.12	1	$ 200.00	$	3,224.00
	Materials						
	Concrete	/m3		27	$ 270.00	$	7,290.00
	Mesh	/sheet		12	$ 150.00	$	1,800.00
	Formwork	/m		66	$ 10.00	$	660.00
					Sub Total Cost Supply & Construction of Concert Deck	$	21,329.32
810	**Supply & Construct Concrete batters**						
	Labour						2
	Forman + Ute	/hr	16.12	2	$ 48.20	$	1,553.97
						$	-
	Ganger + Ute	/hr	16.12	2	$ 40.01	$	1,289.92
						$	-
	Labour	/hr	16.12	3	$ 27.58	$	1,333.77
	Plant						
	Concrete Pump	/hr	16.12	1	$ 170.00	$	2,740.40
	Materials						
	Concrete	/m3		15	$ 207.00	$	3,105.00
	Mesh	/sheet		14	$ 150.80	$	2,111.20
	Shot Crete Pump	/hr	8.06	1	$ 250.00	$	2,015.00
					Sub Total Cost Supply & Construct Concrete batters	$	14,149.26

810	**Construct Concrete cut off Wall**						
	Labour						2
	Forman + Ute	/hr	16.12	2	$ 48.20	$	1,553.97
	Ganger + Ute	/hr	16.12	2	$ 40.01	$	1,289.92
	Labour	/hr	16.12	3	$ 27.58	$	1,333.77
	Plant						
	Concrete Pump	/hr	16.12	1	$ 170.00	$	2,740.40
	Materials						
	Concrete	/m3		9	$ 207.00	$	1,863.00
	Mesh	/sheet		2	$ 150.80	$	301.60
					Sub Total Cost Construct Concrete cut off Wall	**$**	**9,082.66**
805	**Supply & install rock erosion protection**						
	Labour						3
	Forman + Ute	/hr	24.18	2	$ 48.20	$	2,330.95
						$	-
	Ganger + Ute	/hr	24.18	1	$ 40.01	$	967.44
						$	-
	Labour	/hr	24.18	3	$ 27.58	$	2,000.65
	Plant						
	12 Truck & dog + Operator	/hr	24.18	2	$ 137.02	$	6,626.29
	Excavator + Operator	/hr	24.18	1	$ 128.00	$	3,095.04
	Materials						
	Grass Seed	each		10	$ 15.00	$	150.00
	Rock	/m3		50	30	$	1,500.00
	Concrete	/m3		50	$ 207.00	$	10,350.00
					Sub Total Cost Supply & install rock erosion protection	**$**	**27,020.37**
	APPROACH ROADWOKS						
830	**Formation of approaches**						
	Labour						2
	Forman + Ute	/hr	16.12	1	$ 48.20	$	776.98
						$	-
	Ganger + Ute	/hr	16.12	1	$ 40.01	$	644.96
						$	-
	Labour	/hr	16.12	2	$ 27.58	$	889.18
	Plant						
	Grader + Operator	/hr	16.12	1	$ 123.81	$	1,995.82
	Roller (Multi) + Operator	/hr	16.12	0.5	$ 95.39	$	768.84
	Roller (pad foot) + Operator (18t< if possible)	/hr	16.12	0.5	$ 88.89	$	716.45
	Water cart + Operator	/hr	16.12	1	$ 32.24	$	519.71
	12t Truck & dog + Operator (5 trucks, 1 days two loads each) **$11/ton**	/hr	4.03	5	$ 137.02	$	2,760.95
	Materials						
	Type 2.1 (150 x 6m wide box out)	/t		250	$ 12.00	$	3,000.00
					Sub Total Cost Formation of approaches	**$**	**12,072.90**
840	**Seal of approaches 360m2 @ $18.40/m2**						
	Labour						1
	Forman + Ute	/hr	8.06	1	$ 48.20	$	388.49
						$	-
	Ganger + Ute	/hr	8.06	1	$ 40.01	$	322.48
						$	-
	Labour	/hr	8.06	2	$ 27.58	$	444.59
	Plant						
	12t Truck	/hr	8.06	1	$ 137.02	$	1,104.38
	Roller (Multi) + Operator	/hr	16.12	0.5	$ 95.39	$	768.84
	Materials $8/m2						
	Bitumen	/L		1575	$ 1.90	$	2,992.50
	10mm	/t		18	$ 17.00	$	306.00
	14mm	/t		18	$ 17.00	$	306.00
					Sub Total Cost Seal of approaches	**$**	**6,633.29**

830	**Table drain protection**						
	Labour						1
	Forman + Ute	/hr	8.06	1	$ 48.20	$	388.49
						$	-
	Ganger + Ute	/hr	8.06	1	$ 40.01	$	322.48
						$	-
	Labour	/hr	8.06	2	$ 27.58	$	444.59
	Plant						
	Materials						
	Grass Seed	kg		10	$ 15.00	$	150.00
					Sub Total Cost Table drain protection	$	1,305.56
851	**Install signage & reinstate property fencing**						
	Labour						1
	Forman + Ute	/hr	8.06	1	$ 48.20	$	388.49
						$	-
	Ganger + Ute	/hr	8.06	1	$ 40.01	$	322.48
						$	-
	Labour	/hr	8.06	2	$ 27.58	$	444.59
	Materials						
	Fencing	item			$ 2,000.00	$	2,000.00
	Signs	item			$ 1,500.00	$	1,500.00
					Sub Total Install Guide Posts & Install signage	$	4,655.56
					Sub Total GST ex	$	265,923.62
	CONTINGENCES						
852	**Contingencies**						
	Contingencies 20%				$ 0.20	$	53,184.72
					Sub Total	$	319,108.34
	GST 10%	item			0.1	$	31,910.83
					Total Cost of Job In Contingencies & GST	$	351,019.17

APPENDIX E - LAYOUT AND LONG SECTION LOW LEVEL FLOODWAY KITAL ROAD





	REVISIONS.	DATE
A	Original	14/9/10
B	Re-Issue (Minor Alterations)	6/10/10

Southern Downs REGIONAL COUNCIL

KITAL RD – TIMBER BRIDGE REPLACEMENT
LOW FLOW PIPE CULVERTS & FLOODWAY
LONG SECTION

Designed	HT	Approved		Date		No 1 of 4 Plans		
Drawn	HT	Checked		Scale	1:400	A1	Plan No.	ENG_00129.01

APPENDIX G – ESTIMATE LOW LEVEL CROSSING

Activity No		Unit	Amount	Quantity	Rate $	Amount $
	Site Establishment					1
	Setup signage, site container and hold pre start meeting					
	Labour					
	Forman + Ute	/hr		1	$ 48.20	$ -
	Seconded supervisor will assist with the construction of the concrete deck and pipe installation					
	Ganger + Ute	/hr		1	$ 40.01	$ -
	Labour	/hr		2	$ 27.58	$ -
	Plant					
	Excavator + Operator	/hr		1	$ 128.00	$ -
	Truck 12t	/hr		2	$ 86.00	
	Prime mover and Low Loader + Operator	/hr		2	144.9	$ 2,335.78
	Materials					
	Security Fencing	/day	20		50	$ 1,000.00
	Site container	/day	20		$ 50.00	$ 1,000.00
	Toilet	/day	20		$ 50.00	$ 1,000.00
					Sub Total Cost Site set up & pack up	**$ 5,335.78**
	Survey/Setup & Design					
	Locate services, peg out control line and establish cut area					1
	Labour					
	Forman + Ute	/hr	4.03	1	$ 48.20	$ 194.25
	Ganger + Ute	/hr	4.03	1	$ 40.01	$ 161.24
	Labour	/hr	4.03	2	$ 27.58	$ 222.29
	Materials					
	Survey Pegs & Paint	item			$100	$100
					Sub Total Cost Set out	**$ 677.78**
	Demolition of Existing Bridge					
	(to be complete 1 week before start of works)					
	Quotes for the demolition of the existing bridge where called December 2008.					5
	Ironbark Demolition Pty Ltd **(Cheapest option) confirmed with Ironbark quote**	item			$11,750	$11,750
	Burk Industries Pty Ltd	item			$12,800	
					Sub Total Cost Demolition of Existing Bridge	**$11,750**
	Low-level FLOODWAY					
	Remove & Stock Pile Existing Top Soil - Unit rate of $12.5 per m3					
	Top 100mm of top soil shall be removed from the earthworks site and Stock piled Topsoil shall be respread over excavation site after bulk earthworks is complete					
	Labour					2
	Forman + Ute	/hr		1	$ 48.20	$ -
	Ganger + Ute	/hr		1	$ 40.01	$ -
	Labour	/hr		2	$ 27.58	$ -
	Plant					
	Excavator + Operator	/hr	4.03	1	$ 128.00	$ 515.84
	Truck 12t	/hr	4.03	1	$ 86.00	$ 346.58
						$ -
					Sub Total Cost Remove & Stock Pile Existing Top Soil	**$ 862.42**

Install Erosion & Sediment Control						
Silt socks shall be installed on all exposed soil						
All stockpiles shall be protected by silt fencing						
Erosion protection shall be inspected daily						
Labour						1
Forman + Ute	/hr		1	$ 48.20	$	-
					$	-
Ganger + Ute	/hr	8.06	1	$ 40.01	$	322.48
					$	-
Labour	/hr	8.06	2	$ 27.58	$	444.59
Plant						
Mini Excavator + Operator contractor	/hr	8.06	1	$ 80.00	$	644.80
Materials						
Silt Fencing	item			$ 100.00	$	100.00
					$	-
Silt Sock	/m		20	$ 10.00	$	200.00
				Sub Total Cost Install Erosion & Sediment Control	$	1,711.87

Excavation of Approaches & Floodway - Unit rate of $16.2 per m3						
(Material to be delivered to Allora dump)						
1850/m3						
Use four 12t truck & dogs						
Load time/truck 30min						
8 loads per day per tuck						
120m3 per truck per day						
Unit rate of $16.20 per m^3						
Labour						5
Forman + Ute	/hr	40	1	$ 48.20	$	1,928.00
Ganger + Ute	/hr	40	1	$ 40.01	$	1,600.40
Labour	/hr	40	2	$ 27.58	$	2,206.40
Plant						
Backhoe + operator	/hr	40		$ 78.09	$	3,123.60
Excavator + Operator	/hr	40	1	$ 128.00	$	5,120.00
					$	-
Grader + Operator	/hr	40	1	$ 123.81	$	4,952.40
Body Truck 12t & dog	/hr	32	4	$ 86.00	$	11,008.00
Materials						
				Sub Total Cost Excavation of Approaches	$	29,938.80

Diversion of Flow & Coffer Dam						
(install small coffer dam upstream)						
Pump must be fitted with suction protector						
Labour						1
Forman + Ute	/hr	0	1	$ 48.20	$	-
Ganger + Ute	/hr	8.06	1	$ 40.01	$	322.48
Labour	/hr	8.06	2	$ 27.58	$	444.59
Plant						
Excavator + Operator	/hr	8.06	1	$ 128.00	$	1,031.68
					$	-
Materials					$	-
					$	-
Pump & Hoses (May require pump to dewater construction area 6inch)	item	20		$ 150.00	$	3,000.00
				Sub Total Cost Diversion of Flow	$	4,798.75

Installation of 600rcp & u/s& d/s concrete apron & cement treated fill in floor of creek						
Labour						4
Forman + Ute	/hr	40	1	$	48.20	$ 1,928.00
						$ -
Ganger + Ute	/hr	40	1	$	40.01	$ 1,600.40
						$ -
Labour	/hr	80	2	$	27.58	$ 4,412.80
Plant						
12 Truck & dog + Operator	/hr	24	1	$	137.02	$ 3,288.48
Excavator		40	1	$	128.00	$ 5,120.00
Backhoe + operator	/hr	40		$	78.09	$ 3,120.00
Roller	hr	8	1	$	89.00	$ 712.00
Materials						
600RCP	m	2.4	4	$	200.00	$ 1,920.00
Rock protection u/s & d/s & creek floor other than under pipes	/m3		40		30	$ 1,200.00
Cement treated gravel fill & backfill around pipes	/m3		36		80	$ 2,880.00
lean mix in floor of creek under pipe	m3		4.2		250	$ 1,050.00
Concrete for- floodway slab, apron & protection works	/m3		15	$	450.00	$ 6,750.00
Sub Total Cost Supply & install rock erosion protection						**$ 33,981.68**

Supply & install rock erosion protection u/s& d/s of floodway & table drains						
Labour						1
Forman + Ute	/hr	16	1	$	48.20	$ 771.20
						$ -
Ganger + Ute	/hr	16	1	$	40.01	$ 640.16
						$ -
Labour	/hr	16	2	$	27.58	$ 882.56
Plant						
12 Truck & dog + Operator	/hr	16	2	$	137.02	$ 4,384.64
Backhoe + operator	/hr	16	1	$	78.09	$ 1,248.00
Materials						
Rock	/m3		110		30	$ 3,300.00
Concrete	/m3		10	$	250.00	$ 2,500.00
Sub Total Cost Supply & install rock erosion protection						**$ 13,726.56**

Formation of approaches $24/m2						
Labour						3days
Forman + Ute	/hr	24	1	$	48.20	$ 1,156.80
						$ -
Ganger + Ute	/hr	24	1	$	40.01	$ 960.24
						$ -
Labour	/hr	24	2	$	27.58	$ 1,323.84
Plant						
Grader + Operator	/hr	24	1	$	123.81	$ 2,971.44
12t Truck + Dog	/hr	16	2	$	99.90	$ 3,196.80
Roller (Multi) + Operator	/hr	24	1	$	95.39	$ 2,289.36
Materials						
Type 2.1 (90m x 7x .150) each approach pugged & cement treated	/t	250		$	13.00	$ 3,250.00
Sub Total Cost Seal of approaches						**$ 15,148.48**

Bitumen Seal of approaches $11.56/m2					
Labour					1
Forman + Ute	/hr	8.06	1	$ 48.20	$ 388.49
					$ -
Ganger + Ute	/hr	8.06	1	$ 40.01	$ 322.48
					$ -
Labour	/hr	8.06	2	$ 27.58	$ 444.59
Plant					
12t Truck + Dog	/hr	8.06	1	$ 99.90	$ 805.19
Roller (Multi) + Operator	/hr	8.06	0.5	$ 95.39	$ 384.42
Materials					
Bitumen seal 90x7m @ 3.6l/m^2	/L	2268		$ 1.90	$ 4,309.20
10mm	/t	10		$ 27.60	$ 276.00
14mm	/t	13		$ 27.60	$ 358.80
				Sub Total Cost Seal of approaches	**$ 7,289.18**
Install signage & reinstate property fencing					
Labour					1
Forman + Ute	/hr	8.06	1	$ 48.20	$ 388.49
					$ -
Ganger + Ute	/hr	8.06	1	$ 40.01	$ 322.48
					$ -
Labour	/hr	8.06	2	$ 27.58	$ 444.59
Materials					
Fencing	item			$ 2,000.00	$ 2,000.00
Signs	item			$ 1,500.00	$ 1,500.00
				Sub Total Install Guide Posts & Install signage	**$ 4,655.56**
				Sub Total GST ex	$ 129,876.86

CONTINGENCES

Contingencies /Maintenance					
Contingencies 20%				$ 0.20	$ 25,975.37
				Sub Total	$ 155,852.23
GST 10%	item			0.1	$ 15,585.22
				Total Cost of Job In Contingencies & GST	$ 171,437.46

APPENDIX H

Capital Expenditure	Ongoing Annual	Budget year		Forecast year															
Project name	Main	2011		2012		2013		2014		2015		2016		2017		2018		2019		2020	
Roads & Drainage		Total Cost	Subsidy/ Trade in	Total Cost	Subsidy/ Trade in	Total Cost	Subsidy/ Trade in	Total Cost	Subsidy/ Trade in	Total Cost	Subsidy/ Trade in	Total Cost	Subsidy/ Trade in	Total Cost	Subsidy/ Trade in	Total Cost	Subsidy/ Trade in	Total Cost	Subsidy/ Trade in	Total Cost	Subsidy/ Trade in
Roads Asset Maintenance																					
Reseals		1,450,000		1,450,000		1,400,000		1,400,000		1,400,000		1,400,000		1,400,000		1,400,000		1,400,000		1,400,000	
Gravel Resheeting		750,000		750,000		750,000		750,000		750,000		750,000		750,000		750,000		750,000		750,000	
Bridges Special Maintenance		90,000		100,000		100,000		100,000		100,000		100,000		100,000		100,000		100,000		100,000	
Kerb and Channel replacement		25,000		25,000		25,000		25,000		25,000		25,000		25,000		25,000		25,000		25,000	
Upgrade Existing Unconstructed Accesses		15,000		15,000		15,000		15,000		15,000		15,000		15,000		15,000		15,000		15,000	
Council Roadworks Projects																					
Activity St reconstruction stage 2 (Warwick)		170,000																			
Allowance for costs associated with rectifying roads off realignment and easements etc.		0																			
Andreatta Lane (Pozieres) upgrade from gravel std to bitumen std						130,000															
Anemone St reconstruction Stage 1 (Killarney)		180,000																			
Anemone St reconstruction Stage 2 (Killarney)				200,000																	
Bakers Rd Floodway construction (Mt Colliery)				80,000																	
Canningvale Rd widen bitumen seal (Warwick)		150,000																			
Charlie Gully Rd extend bitumen seal (Upper freestone)						100,000															
Fitzroy St (Albion to Canning) rehabilitate and replace K&C (Warwick)		350,000																			
Fitzroy St (Stanley Av to rail line) widen and K&C (Warwick)						100,000															
Gibbs Lne upgrade to bitumen sealed std (Ballandean)		100,000																			
Glen Aplin Sts bitumen seal (Glen Aplin)		80,000																			
Glengallan/Ogilvie Rd stormwater		100,000																			
Glenlyon/Warroo St Upgrade (Wallangarra)		100,000																			
Glenvale Rd improvements (sealing high mtc areas) (Leslie Dam)				100,000																	
Harslett Rd (Amiens) widen bitumen seal						100,000															
Inverleigh Rd eastern end realignment and intersection improvements (Rosenthal Hts)								100,000													
Kingsleigh Rd extend bitumen seal (Rosenthal Heights)																					
Lyndhurst Lane Bridge Replacement and approaches (Rosenthal Heights)						1,000,000															
Mapes Rd rehabilitate and widen				150,000																	
Marino Rd Widening (Broadwater)		170,000																			
Massey Boney Mountain Rd widen and rehabilitate to Aerodrome (Massey)				200,000																	
Mt Colliery Village Bitumen sealing (Mt Colliery)		80,000																			
Mt Tully Rd Safety Improvements				100,000																	
Neville Ln / Eukey Rd Intersection improvement (Storm King)				200,000																	
Osbaldeston Rd widen gravel and floodway construction (Sugarloaf)		200,000																			
Pradella Rd western end and Scott Camps Rd southern end upgrade gravel rd to bitumen standard				200,000																	
Pratten George St roundabout (Warwick)								170,000													
Railway St K&C replacement (Stanthorpe)		50,000																			
Spring Creek Rd Widen Floodway (Amiens)				70,000																	
Springdale Rd Safety Improvements				100,000																	
Sundown Rd (Currs to Bents) reconstruct and widen bitumen seal (Ballandean)		80,000																			
Teale Rd widening (Thulimbah)		180,000																			
Tummaville Rd Bridge Replacement timber bridge with culverts (Leyburn)		250,000																			
Unallocated Council Roadworks				350,000		570,000		1,900,000		2,200,000		2,200,000		2,200,000		2,200,000		2,200,000		2,200,000	
Upper Wheatvale Rd rehab and widen (East of Hendon Deuchar Rd) (Deuchar)				300,000																	
Village St bitumen sealing				50,000																	
Roads to Recovery																					
Assumed that the Roads to Recovery program will continue at similar levels as previous										1,150,000	1,150,000	1,150,000	1,150,000	1,150,000	1,150,000	1,150,000	1,150,000	1,150,000	1,150,000	1,150,000	1,150,000
Donnellys Castle Re rehabilitate and widen northern End				150,000	150,000	150,000	150,000														
Doyles Rd (northern end) rehabilitate (Spring Creek Allora)		250,000	250,000																		
Elks Lane Floodway (Greenlands)		100,000	100,000																		
Glen Rd/Willi St Intersection Improvements (Warwick)		130,000	130,000																		
Goomburra Rd rehabilitate and widen (Gladfield)				200,000	200,000	200,000	200,000														
Hermitage-Emuvale Rd rehabilitate (Hermitage)				200,000	200,000	200,000	200,000														