



**COOTAMUNDRA-  
GUNDAGAI** REGIONAL  
COUNCIL

Cootamundra Gundagai Regional Council

# **Priority Infrastructure Project: Stormwater Priority Assessment Report**

DRAFT Version 1.1

April 2018



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## Executive Summary

Council has set aside \$1 Million from the NSW Government's Stronger Communities Fund, to ensure the ongoing improvement and upgrades to stormwater systems in the Council area.

The purpose of this report is to identify possible stormwater management projects using a risk based approach, and to propose a priority list for the expenditure. The report focusses on potential stormwater improvements for the urban drainage systems within the townships of Cootamundra and Gundagai (including South Gundagai). The risk based approach is documented as **Appendix A**. The full risk assessment is documented in **Appendix B**.

A list of recommended high priority projects is included at the end of this Executive Summary. This includes those projects assessed with a priority of 1 or 2 from the full list (Refer Table 2 for the full list), and is not in priority order. Whilst some smaller projects can be undertaken readily, the more complex projects will require survey and design input using a suitably qualified engineering consultant, and a tendering process may be necessary in order to procure a construction contractor. **Any project description and cost information shown in this report is indicative only, and is subject to detail project scoping, design and cost estimation.**

**Mainstream flooding from the major watercourses in each of the townships is outside the scope of this report.** Projects associated with mainstream flooding are listed in the risk management assessment for completeness. It is recommended that Council apply for the grants available under the NSW Government's Floodplain Management program to update flood studies and prepare Floodplain Risk Management Plans for Cootamundra and Stockinbingal, and allocate an appropriate one-third contribution. The grant program normally requires a one-third contribution from Councils.

**DRAFT** Recommendations for expenditure of the \$1 Million are listed below:

1. That \$100,000 be allocated as a one-third contribution towards Floodplain Risk Management Plans for Cootamundra and Stockinbingal and that grant applications be prepared under the NSW Government's Floodplain Management program.
2. That \$100,000 be allocated towards a program of inspection and drain cleaning in Cootamundra and Gundagai, with priority given to the following locations:
  - South St and Isaac St South, Gundagai
  - Nashs Lane and Muttama Road, Cootamundra
3. That \$150,000 be allocated towards projects that can be constructed without design plans, including:

- Adam Street and McGowan Street, Cootamundra – Construct a small levee or grassed earth bank on the road reserve along fence line to separate mainstream flood waters from local water
  - Corner of Eagle and Luke St, South Gundagai - Construct kerb and gutter to divert run off down Luke St
  - Continue the construction of concrete “v” drain and grassed channel sides at various locations throughout Cootamundra.
4. That \$150,000 be allocated towards survey, investigation and design of the following projects:
- Tor St, Gundagai. East side road drainage between Nurse Murray St and Jack Moses Avenue
  - Open stormwater drain between Middle and South St, South Gundagai (Concrete "v" drain with selective improvements to channel sides and inlet/outlet to structures)
  - Southee Circle, Cootamundra. CCTV inspection of pipes. Analyse stormwater capacity and overland flow paths. Design improvements to minimise flooding risk.
  - Sheehan Dr, Gundagai between Nurse Murray St and Jack Moses Avenue- design of roadside drainage including pipes, pits, kerb and gutter
  - Drain on private property between Tor St & O'Hagan St, Gundagai - Design a piped drainage system and overland flow path through private properties
  - Drain on private property at 48 Mount St South Gundagai - Design a piped drainage system and overland flow path through private property
5. That the remaining \$500,000 be allocated towards construction of the projects listed in priority order in Recommendation 4, which are subject to design work and costing. The expected funding shortfall is to be considered in conjunction with competing priorities in future budgets.
6. That all unfunded stormwater projects be listed in the Stormwater Asset Management Plan and that the expected funding shortfall be considered in conjunction with competing priorities in future budgets

Table 1 – DRAFT High Priority Stormwater Improvement Project List

Ref	Town	Location	Preferred Action	Project Planning Requirements	Cost Range
C5	Cootamundra	Adam Street x McGowan Street	Consider installing small levee or grassed earth bank along fence line to separate mainstream flood waters from local water	Minor construction without design	\$20,000 to \$150,000

Ref	Town	Location	Preferred Action	Project Planning Requirements	Cost Range
G1	Gundagai	Tor St. East side road drainage between Nurse Murray St and Jack Moses Avenue	Design and construct roadside drainage including pipes, pits, kerb and gutter	Design required by consultant, then construction under contract	\$150,000 to \$500,000
G7	South Gundagai	Corner of Eagle and Luke St	Construct kerb and gutter to divert run off down Luke St	Minor construction without design	\$20,000 to \$150,000
G9	South Gundagai	Open stormwater drain between Middle and South St	Concrete "v" drain with selective improvements to channel sides and inlet/outlet to structures	Design required by consultant, then construction under contract	\$150,000 to \$500,000
G11	South Gundagai	Isaac St	Inspection and cleaning of drain	Maintenance project	\$0 to \$20,000
G12	South Gundagai	48 Mount St	Design and construct piped drainage through private property with easement	Design required by consultant, then construction under contract	\$20,000 to \$150,000
C1	Cootamundra	Nash's Lane x Muttama Road	Vegetation maintenance and desilting	Maintenance project	\$0 to \$20,000
C2	Cootamundra	Florance Street near Hume Street	Consider installing concrete "V" invert and reshape grassed channel	Minor construction without design	\$20,000 to \$150,000
C3	Cootamundra	Wills Street near White Street	Consider installing concrete "V" invert and reshape grassed channel including spur line into Mary Angove Cres	Minor construction without design	\$20,000 to \$150,000
C4	Cootamundra	Berthong Street	Consider installing concrete "V" invert and reshape grassed channel	Minor construction without design	\$20,000 to \$150,000
C6	Cootamundra	Boundary Road x Matilda Ave	Consider installing concrete "V" invert and reshape grassed channel	Minor construction without design	\$20,000 to \$150,000
C12	Cootamundra	Parker St Bridge	Structural Assessment of Bridge to withstand flood events	Design required by consultant, then construction under contract	\$0 to \$20,000
C13	Cootamundra	Southee Circle	CCTV inspection of pipes. Analyse stormwater capacity and overland flow paths. Design and construct improvements.	Design required by consultant, then construction under contract	\$150,000 to \$500,000

Ref	Town	Location	Preferred Action	Project Planning Requirements	Cost Range
G3	Gundagai	Sheehan Dr	Design and construct roadside drainage including pipes, pits, kerb and gutter	Design required by consultant, then construction under contract	\$20,000 to \$150,000
G5	Gundagai	Drain on private property between Tor St & O'Hagan St	Design and construct piped drainage system and overland flow path through private properties	Design required by consultant, then construction under contract	\$150,000 to \$500,000

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# 1 Introduction

## 1.1 Purpose of Report

Council has set aside \$1 Million from the NSW Government's Stronger Communities Fund, to ensure ongoing improvement and upgrades to the stormwater systems in the Council area.

The purpose of this report is to identify possible stormwater management projects using a risk based approach, and to propose a priority list for the expenditure.

The risk management approach is adapted from the National Asset Management (NAMS) risk management templates. An outcome of this process is this stormwater priority assessment report. **Appendix A** describes the risk management process and **Appendix B** includes the risk management template. This template will also be a direct input to Council's future stormwater asset management plan.

**Section 2** of this report provides a brief summary of the current conditions of the assets across the Council area. **Section 3** describes the high priority projects arising from the risk assessment process, and **Section 4** provides recommendations for expenditure of the \$1 Million.

## 1.1 Acknowledgements

The risk assessment has been developed using templates from NAMS.PLUS. Acknowledgement is offered to the Council staff who participated in the short workshop and inspection at Cootamundra on 14 November 2017, and at Gundagai on 22 December 2017.

## 1.2 Disclaimer

This document has been prepared for a particular purpose, using information made available by the client in accordance with the client's instructions. Users of this document should note the assumptions and approximations used. Any use of the document outside of the stated purpose is at the user's risk.

Any project description and cost information shown in this report is indicative only, and is subject to detail project scoping, design and cost estimation.

## 2 Stormwater Overview

### 2.1 Overview of main watercourses

In Cootamundra, almost all stormwater drains to Muttama Creek. In Gundagai, stormwater drains off the Gundagai urban area to Morleys and Jones Creek, which are tributaries to the Murrumbidgee River. South Gundagai drains directly to the river. In Stockinbingal, stormwater is impacted by the proximity to the Bland and Dudauman Creeks.

This report focusses on stormwater improvements for the urban drainage systems that drain to the main watercourses. **Mainstream flooding from the major watercourses in each of the townships is outside the scope of this report.** The report notes the issues associated with mainstream flooding and recommends that Council apply for grants to update flood studies and to prepare floodplain risk management plans for Cootamundra and Stockinbingal.

Information on mainstream flooding can be found in the following documents:

- Cootamundra Local Flood Plan - A Sub-Plan of the Cootamundra Local Disaster Plan - June 2007
- Cootamundra Flood Study
- Gundagai Floodplain Risk Management Study, 2014

### 2.2 Overview of Cootamundra

Cootamundra was heavily impacted by a flood event on September 23, 2016. During this flood event, three houses suffered water-over-floor flooding, and flood levels were close to the forecasted one in hundred year flood levels. Whilst the majority of flood issues related to mainstream flooding associated with Muttama Creek, and are outside the scope of this report, there are benefits that would be gained from improvements to the urban drainage systems that drain to Muttama Creek. Figure 1 shows the location of stormwater priorities across Cootamundra.

There are several sub-catchments that drain to Muttama Creek, which drain the Cootamundra urban area. The stormwater infrastructure in these sub catchments largely consists of:

- Open earth roadside drains
- Improved open drains (concrete inverts)
- Piped drainage

Figures 2, 3, & 4 show examples of this infrastructure.

Figure 1 – Location of Stormwater Priorities in Cootamundra

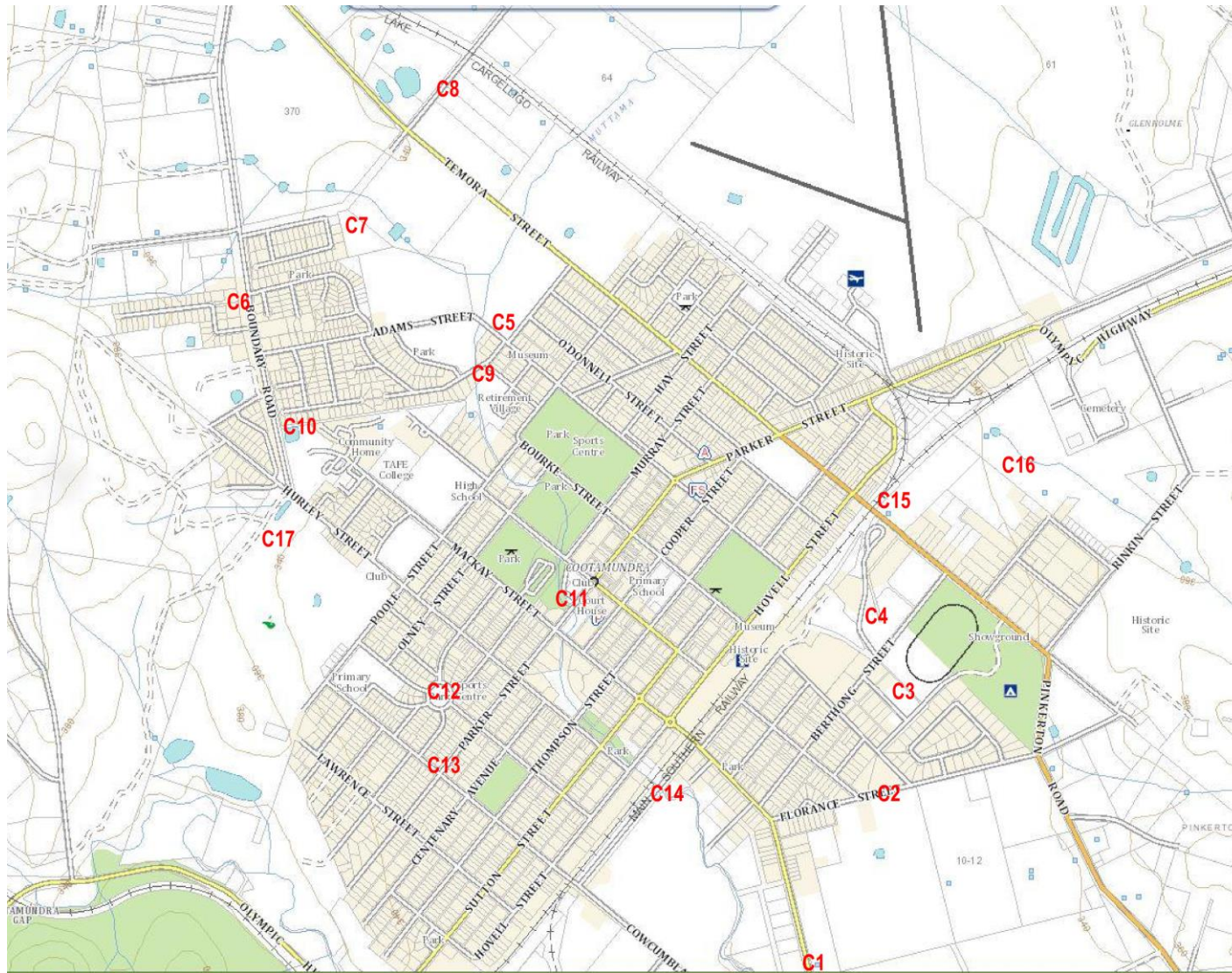


Figure 2 – Improved open drainage upstream of Florance St Cootamundra (C2)



Figure 3 – Pipe Crossing – Pinkerton Street, Cootamundra (C15)



Figure 4 – Open roadside drains – Adams Street north of McGowan Street, Cootamundra (C5)



Cootamundra has significant development potential. These potential development areas all drain to existing urban drainage, which has very limited capacity. **Careful master planning of new release areas is essential to ensure that downstream flooding is not intensified.** It is important that design of new stormwater systems have a neutral or beneficial impact on existing downstream drainage.

## 2.3 Overview of Gundagai

The topography of Gundagai consists of numerous hillsides draining to flat floodplain areas. The hillsides generate fast-flowing stormwater runoff that causes stormwater nuisance to residential properties on and below the hillslopes. The stormwater infrastructure in Gundagai largely consists of:

- Open earth drains
- Piped drainage through built-up areas

In several locations throughout Gundagai and South Gundagai, roadside drainage is inadequate to convey stormwater flows, and private property, including a number of outbuildings, is impacted. In South Gundagai, there are large open drains located in private property that have heavy maintenance requirements and do not provide an adequate level of service to surrounding residents.

Figure 5 shows the location of stormwater priorities across Gundagai, while Figures 6 – 11 shows examples of this infrastructure.

Figure 5 – Location of stormwater priorities in Gundagai

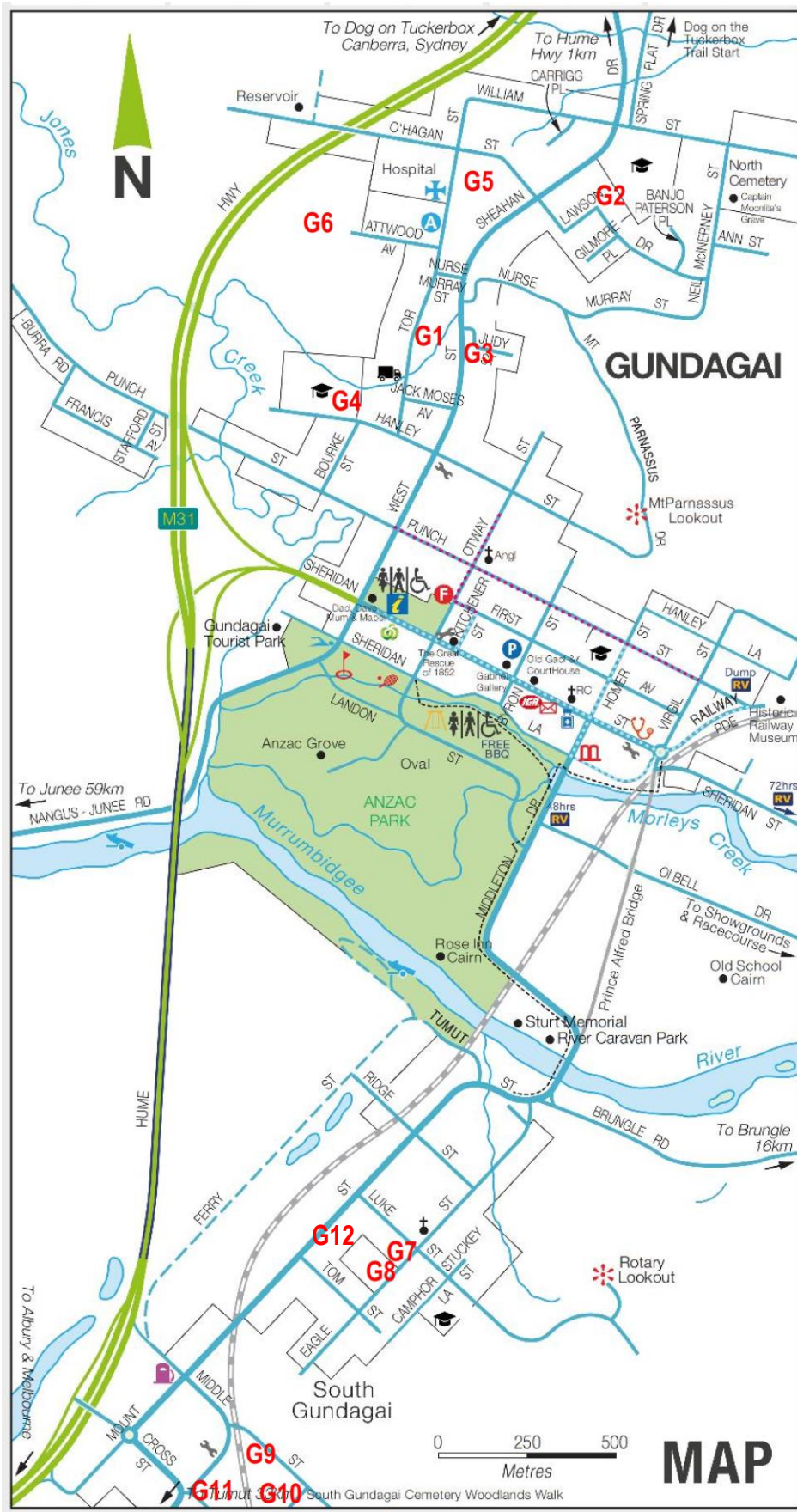


Figure 6 – Inadequate roadside drainage. Tor St Gundagai (G1)



Figure 7 – Stormwater drainage through private property between Tor St and O'Hagan St, Gundagai (G5)



Figure 8 – Runoff into private property. Corner Luke St and Eagle St, South Gundagai (G7)



Figure 9 – Open drains through private property. Middle St South Gundagai (G9)





Figure 10 – Open drains at South St and Isaac St South Gundagai (G11)



Figure 11 – Open Drain at rear of 48 Mouny Street Gundagai (G12)



### **3 Stormwater Management Priorities**

Section 3.1 lists the assessed priority order of the stormwater improvement projects. Several projects are illustrated in Section 3.2. The full Risk Assessment is contained in Appendix B.

Whilst some smaller projects can be undertaken readily, the more complex projects will require survey and design input using a suitably qualified engineering consultant, and a tendering process may be necessary in order to procure a construction contractor.

Section 3.3 discusses the issues associated with mainstream flooding and recommends that Council apply for grants to update flood studies and to prepare floodplain risk management plans for Cootamundra and Stockinbingal.

### 3.1 Priority List of Stormwater Improvement Projects

Table 2 – Priority List of Stormwater Improvement Projects

Ref	Town	Location	What can happen?	Possible cause	Risk rating	Preferred Action	Project Planning Requirements	Cost Range	Recommended Priority
G5	Cootamundra	Adam Street x McGowan Street	Flow from upstream rural catchment entering urban streets with potential to flood dwellings	Overland flow from creek entering urban areas	Very High	Consider installing small levee or grassed earth bank along fence line to separate mainstream flood waters from local water	Minor construction without design	\$20,000 to \$150,000	1
G1	Gundagai	Tor St. East side road drainage between Nurse Murray St and Jack Moses Avenue	Run off from Tor St can enter private property and cause nuisance flooding	Inadequate roadside drainage	High	Design and construct roadside drainage including pipes, pits, kerb and gutter	Design required by consultant, then construction under contract	\$150,000 to \$500,000	1
G7	South Gundagai	Corner of Eagle and Luke St	Storm water run-off from road can enter private property and flood garage	Stormwater run-off flowing down Luke St	High	Construct kerb and gutter to divert run off down Luke St	Minor construction without design	\$20,000 to \$150,000	1
G9	South Gundagai	Open stormwater drain between Middle and South St	Erosion and flooding of private property	Open earth drain	High	Concrete "v" drain with selective improvements to channel sides and inlet/outlet to structures	Design required by consultant, then construction under contract	\$150,000 to \$500,000	1

Ref	Town	Location	What can happen?	Possible cause	Risk rating	Preferred Action	Project Planning Requirements	Cost Range	Recommended Priority
G11	South Gundagai	Isaac St	Flooding of private property and out buildings	Pipe culvert under road too small and heavily vegetated stormwater drains cannot convey stormwater runoff	High	Inspection and cleaning of drain	Maintenance project	\$0 to \$20,000	1
G12	South Gundagai	48 Mount St	Private Property	Runoff from public reserve concentrated in private property	High	Design and construct piped drainage through private property with easement	Design required by consultant, then construction under contract	\$20,000 to \$150,000	1
C1	Cootamundra	Nash's Lane x Muttama Road	Flow of upstream water is obstructed	Vegetation Growth and Siltation	Medium	Vegetation maintenance and desilting	Maintenance project	\$0 to \$20,000	2
C2	Cootamundra	Florance Street near Hume Street	Flow of upstream water is obstructed	Vegetation Growth and Siltation	Medium	Consider installing concrete "V" invert and reshape grassed channel	Minor construction without design	\$20,000 to \$150,000	2
C3	Cootamundra	Wills Street near White Street	Flow of upstream water is obstructed	Vegetation Growth and Siltation	Medium	Consider installing concrete "V" invert and reshape grassed channel including spur line into Mary Angove Cres	Minor construction without design	\$20,000 to \$150,000	2

Ref	Town	Location	What can happen?	Possible cause	Risk rating	Preferred Action	Project Planning Requirements	Cost Range	Recommended Priority
C4	Cootamundra	Berthong Street	Flow of upstream water is obstructed	Siltation	Medium	Consider installing concrete "V" invert and reshape grassed channel	Minor construction without design	\$20,000 to \$150,000	2
C6	Cootamundra	Boundary Road x Matilda Ave	Erosion, pedestrian hazard	Siltation, erosion	Medium	Consider installing concrete "V" invert and reshape grassed channel	Minor construction without design	\$20,000 to \$150,000	2
C12	Cootamundra	Parker St Bridge	Structural Failure	Crack in bridge	Medium	Structural Assessment of Bridge to withstand flood events	Design required by consultant, then construction under contract	\$0 to \$20,000	2
C13	Cootamundra	Southee Circle	Significant overland flow due to poor piped drainage and no defined overland flow path	Inadequate pipe drainage and inlets	High	CCTV inspection of pipes. Analyse stormwater capacity and overland flow paths. Design and construct improvements.	Design required by consultant, then construction under contract	\$150,000 to \$500,000	2
G3	Gundagai	Sheehan Dr	Roadside Drainage is inadequate. Overtopping can flow into private property	Inadequate roadside drainage	Medium	Design and construct roadside drainage including pipes, pits, kerb and gutter	Design required by consultant, then construction under contract	\$20,000 to \$150,000	2

Ref	Town	Location	What can happen?	Possible cause	Risk rating	Preferred Action	Project Planning Requirements	Cost Range	Recommended Priority
G5	Gundagai	Drain on private property between Tor St & O'Hagan St	Storm Water flows cause flooding of private property	No formal drainage system	Medium	Design and construct piped drainage system and overland flow path through private properties	Design required by consultant, then construction under contract	\$150,000 to \$500,000	2
C7	Cootamundra	Harold Conkey Ave	Erosion, pedestrian hazard	Siltation, erosion	Medium	Consider installing concrete "V" invert and reshape grassed channel. Investigate off line detention basin in reserve	Minor construction without design	\$20,000 to \$150,000	3
C10	Cootamundra	Boundary Road near hospital	Roadside Drainage	Siltation, erosion	Medium	Consider installing concrete "V" invert and reshape grassed channel	Minor construction without design	\$20,000 to \$150,000	3
C15	Cootamundra	Railway Culvert	Blockage can obstruct flow	Blockage can obstruct flow	Medium	Inspection program to reduce risk of blockage	Maintenance project	\$0 to \$20,000	3
C16	Cootamundra	Pinkerton Rd	Small pipes under railway with limited capacity cause backup	Inadequate pipe capacity under railway with flat gradients	Medium	Review Pipe Capacity and investigate options for augmentation	Design required by consultant, then construction under contract	\$150,000 to \$500,000	3
C17	Cootamundra	Future Development area west of Rinkin Street	Increased flooding downstream	Impacts of urbanisation can increase runoff	High	Release area master planning	Future Release Area Master Planning	Subject to future Release Area Master Planning	3

Ref	Town	Location	What can happen?	Possible cause	Risk rating	Preferred Action	Project Planning Requirements	Cost Range	Recommended Priority
C18	Cootamundra	Future Development area south-west of Hurley Street	Increased flooding downstream	Impacts of urbanisation can increase runoff	High	Release area master planning	Future Release Area Master Planning	Subject to future Release Area Master Planning	3
G4	Gundagai	Hanley St	Open drain heavily vegetated, storm water cannot flow	Vegetation Growth and Siltation	Medium	Regular drain cleaning and inspection	Maintenance project	\$0 to \$20,000	3
G8	South Gundagai	Eagle St	Water not draining from road	Roadside vegetation prevent run off from road pavement	Medium	Maintenance of roadside vegetation	Maintenance project	\$0 to \$20,000	3
G10	South Gundagai	South St	Flooding of private property	Flooding when capacity of open drain exceeded. Open drains heavily blocked by vegetation	Medium	Inspection and cleaning of drain	Maintenance project	\$0 to \$20,000	3
C8	Cootamundra	West Jindalee Road	Overland flow from creek	Rural area with flat topography and minimal stormwater drainage infrastructure	Medium	Rural area. Low priority	Design required by consultant, then construction under contract	\$20,000 to \$150,000	4

Ref	Town	Location	What can happen?	Possible cause	Risk rating	Preferred Action	Project Planning Requirements	Cost Range	Recommended Priority
C14	Cootamundra	Cowcumber St	Water over road	No piped drainage at intersections	Medium	Investigation of piped drainage improvements to reduce road hazard	Design required by consultant, then construction under contract	\$150,000 to \$500,000	4
G2	Gundagai	Lawson Drive	Overland flows from low-point in road that cannot be conveyed by pipe drainage system, may flow through private properties	Stormwater flows exceeding the capacity of pipe drainage system	Low	Regular inspections and pipe cleaning	Design required by consultant, then construction under contract	\$150,000 to \$500,000	4
G6	Gundagai	Drain on private property downstream of hospital - Attwood Ave	Erosion of drains on rural property	Run off from hospital	Low	Inspection	Maintenance project	\$0 to \$20,000	5



### 3.2 Examples of High Priority Stormwater Improvement Projects

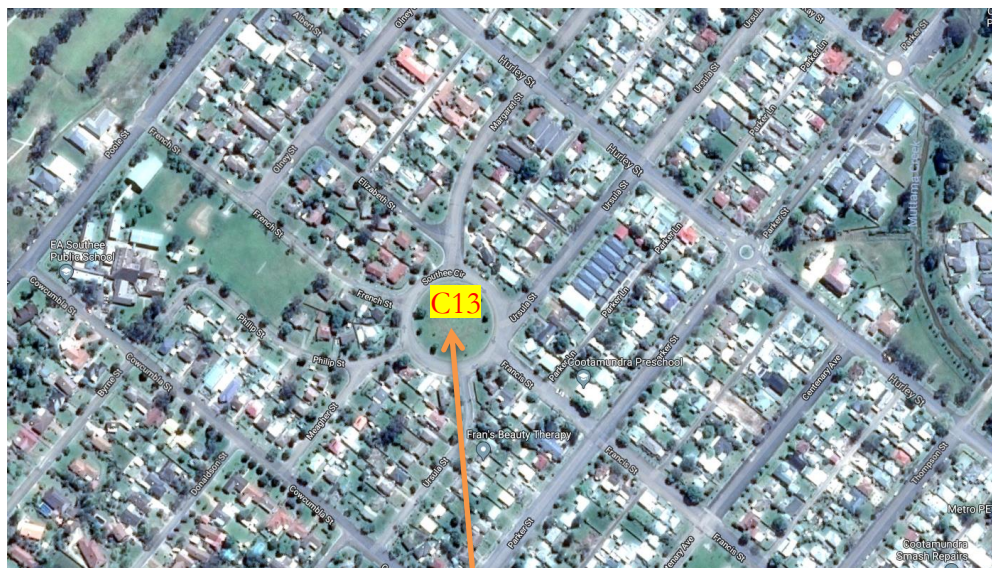
Imagery from Google Maps

Figure 12 – McGowan Street and Adams St Cootamundra – Separation of creek flows from urban runoff (C5)



Consider installing small levee or grassed earth bank along fence line to separate mainstream flood waters from local water

Figure 13 – Southee Circuit subcatchment – Investigate piped drainage and overland flow path (C13)



Investigate pipe and inlet capacity - CCTV inspection recommended. Analyse stormwater capacity and overland flow paths. Design required for improvements. Consider construction of improvements once scope of works and cost is known

Figure 14 – Stormwater Priorities in Gundagai – Tor St, Sheehan Drive (G1, G2, G3, G4)



Consider the design and construction of improvements to roadside drainage

Consider the design and construction of pipe drainage and overland flow path through private property

Figure 15 – Stormwater Priorities in South Gundagai (G9, G10, G11)



Consider the design and construction of a concrete “v” drain with selective improvements to channel sides



Inspection and drain cleaning is recommended

### 3.3 Mainstream Flooding

The scope and costs of floodplain mitigation works is outside the scope of this report. General risks associated with mainstream flooding are listed in the risk management assessment for completeness. The current status of floodplain management at Council are is listed below.

Table 3 – Mainstream Flooding – Status of information

Town	Watercourses	Source of information	Recommendation
Cootamundra	Muttama Creek	<ul style="list-style-type: none"> <li>Cootamundra Local Flood Plan - A Sub-Plan of the Cootamundra Local Disaster Plan -June 2007</li> <li>Cootamundra Flood Study</li> </ul>	Apply for Grant Funding to prepare an updated Flood Study and a Floodplain Risk Management Plan
Stockinbingal	Bland and Dudauman Creeks	<ul style="list-style-type: none"> <li>Cootamundra Local Flood Plan - A Sub-Plan of the Cootamundra Local Disaster Plan -June 2007</li> <li>Cootamundra Flood Study</li> </ul>	Apply for Grant Funding to prepare an updated Flood Study and a Floodplain Risk Management Plan
Gundagai	Murrumbidgee River	<ul style="list-style-type: none"> <li>Gundagai Flood Study and Floodplain Risk Management Plan</li> </ul>	Current

It is recommended that Council apply for the grants available under the NSW Government’s Floodplain Management program to update flood studies and to prepare Floodplain Risk Management Plans for Cootamundra and Stockinbingal.

The Grant Program is normally based on a one-third contribution from each of the Federal, State, and Local governments. Accordingly, it is recommended that an amount of \$100,000 be allocated as Council’s contribution towards this grant program.

Information on the Floodplain Management Program is available at:

<http://www.environment.nsw.gov.au/coasts/Floodgrants.htm>

## 4 Recommendations

DRAFT Recommendations for expenditure of the \$1 Million are listed below:

1. That \$100,000 be allocated as a one-third contribution towards Floodplain Risk Management Plans for Cootamundra and Stockinbingal and that grant applications be prepared under the NSW Government's Floodplain Management program.
2. That \$100,000 be allocated towards a program of inspection and drain cleaning in Cootamundra and Gundagai, with priority given to the following locations:
  - South St and Isaac St South, Gundagai
  - Nashs Lane and Muttama Road, Cootamundra
3. That \$150,000 be allocated towards projects that can be constructed without design plans, including:
  - Adam Street and McGowan Street, Cootamundra – Construct a small levee or grassed earth bank on the road reserve along fence line to separate mainstream flood waters from local water
  - Corner of Eagle and Luke St, South Gundagai - Construct kerb and gutter to divert run off down Luke St
  - Continue the construction of concrete “v” drain and grassed channel sides at various locations throughout Cootamundra.
4. That \$150,000 be allocated towards survey, investigation and design of the following projects:
  - Tor St, Gundagai. East side road drainage between Nurse Murray St and Jack Moses Avenue
  - Open stormwater drain between Middle and South St, South Gundagai (Concrete "v" drain with selective improvements to channel sides and inlet/outlet to structures)
  - Southee Circle, Cootamundra. CCTV inspection of pipes. Analyse stormwater capacity and overland flow paths. Design improvements to minimise flooding risk.
  - Sheehan Dr, Gundagai between Nurse Murray St and Jack Moses Avenue- design of roadside drainage including pipes, pits, kerb and gutter
  - Drain on private property between Tor St & O'Hagan St, Gundagai - Design a piped drainage system and overland flow path through private properties
  - Drain on private property at 48 Mount St South Gundagai - Design a piped drainage system and overland flow path through private property
5. That the remaining \$500,000 be allocated towards construction of the projects listed in priority order in Recommendation 4, which are subject to design work and costing. The

expected funding shortfall is to be considered in conjunction with competing priorities in future budgets.

6. That all unfunded stormwater projects be listed in the Stormwater Asset Management Plan and that the expected funding shortfall be considered in conjunction with competing priorities in future budgets

## 5 References

Cootamundra Local Flood Plan - A Sub-Plan of the Cootamundra Local Disaster Plan  
June 2007

IPWEA, 2011, International Infrastructure Management Manual, 2011, Institute of Public Works Engineering Australasia, Sydney, , [www.ipwea.org/iimm](http://www.ipwea.org/iimm)

ISO, 2009, ISO 31000:2009, Risk management – Principles and guidelines, Standards Australia, Sydney.

Standards Australia, 2004, AS/NZS 4360:2004, Australian/New Zealand Standard, Risk Management, Sydney (superseded by ISO 3100:2009).

Standards Australia, 2004, HB 436:2004, Risk Management Guidelines, Companion to AS/NZS 4360:2004, Sydney.

Gundagai Floodplain Risk Management Study, 2014

Cootamundra Flood Study, 1988

## Appendix A Risk Management Framework

### A-1 Objectives

The objectives of the risk assessment are:

- to identify risks to the stormwater assets that may impact of the delivery of services from infrastructure
- to select credible risks for detailed analysis,
- to analyse and evaluate risks in accordance with ISO 31000:2009,
- to prioritise risks,
- to identify risks requiring treatment by management action,
- to develop risk treatment plans identifying the tasks required to manage the risks and the resources required.

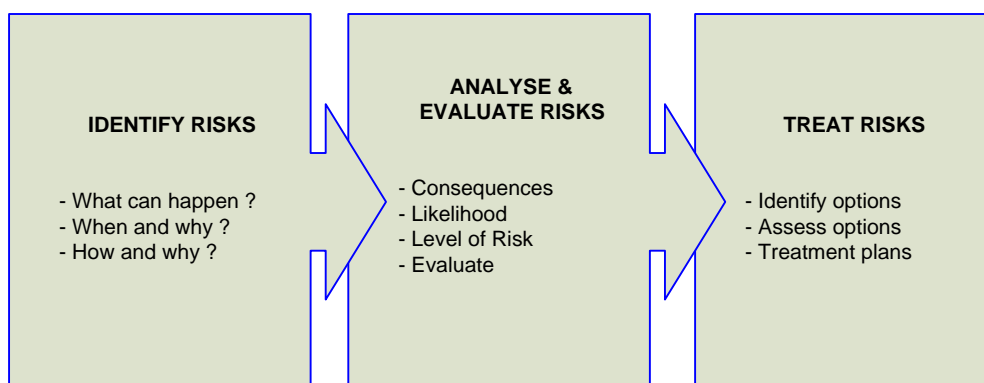
### A-2 Core Infrastructure Risk Management

This core risk management plan has been designed to be read as a supporting document to the infrastructure and asset management plan. It has been prepared using the fundamentals of International Standard ISO 31000:2009 Risk Management – Principles and Guidelines.

### A-3 Risk Management Process

The risk management process used in this project is shown in Figure 16 below. It is an analysis and problem solving technique designed to provide a logical process for the selection of treatment plans and management actions to protect the community against unacceptable risks. The process is based on the fundamentals of International Standard ISO 31000:2009.

Figure 16 - Risk Management Process – Abridged. *Source: Adapted from ISO 31000:2009, Figure 1, p vii*



### A-4 Risk Identification

Potential risks associated with providing services from infrastructure were identified at meetings of the council’s internal stakeholders responsible for stormwater infrastructure management. Stakeholders were asked to identify “what can happen, where and when” to the various infrastructure items, then to identify possible “why and how can it happen” together with any existing risk management controls.



The assets at risk, what can happen, when, possible cause(s), existing controls and credibility are shown in Appendix B – Risk Register. Credible risks are subjected to risk analysis in Analysis of Risk below. Risks assessed as non-credible were not considered further and will be managed by routine procedures.

## A-5 Risk Analysis

### **General**

Credible risks which have been identified during the risk identification stage were analysed. This process takes into account the **‘likelihood’** and the **‘consequences’** of the event. The objective of the analysis is to separate the minor acceptable risks from the major risks and to provide data to assist in the assessment and management of risks.

The risk analysis process is applied to all credible risks to determine levels of risk. The process acts as a filter by applying a reasoned and consistent process. Minor risks can be eliminated from further consideration and dealt with within standard operating procedures.

The remaining risks will therefore be of such significance as to consider the development of risk treatment options and plans.

### **Likelihood**

Likelihood is a qualitative description of chance of an event occurring. The process of determining likelihood involves combining information about estimated or calculated probability, history or experience. Where possible it is based on past records, relevant experience, industry practice and experience, published literature or expert judgement.

### **Consequences**

Consequences are a qualitative description of the outcome of an event affecting objectives. The process of determining consequences involved combining information about estimated or calculated effects, history and experience.

### **Method**

The risk analysis method uses the risk rating chart shown below. This process uses a qualitative assessment of likelihood/probability and history/experience compared against a qualitative assessment of severity of consequences to derive a risk rating.

The qualitative descriptors for each assessment are shown below.

#### **Likelihood**

<b>Likelihood</b>	<b>Descriptor</b>	<b>Probability of occurrence</b>
Rare	May occur only in exceptional circumstances	More than 20 years

Likelihood	Descriptor	Probability of occurrence
Unlikely	Could occur at some time	Within 10-20 years
Possible	Might occur at some time	Within 3-5 years
Likely	Will probably occur in most circumstances	Within 2 years
Almost certain	Expected to occur in most circumstances	Within 1 year

### Consequences

Consequence	Injury	Service Interruption	Environment	Finance	Reputation
Insignificant	Nil	< 4 hrs	Nil	< \$20k	Nil
Minor	First Aid	Up to 1 day	Minor short term	\$20k - \$100k	Minor media
Moderate	Medical treatment	1 day – 1 week	Wide short term	\$100k - \$500k	Moderate media
Major	Disability	1 week – 1 month	Wide long term	\$500k - \$1M	High media
Catastrophic	Fatality	More than 1 month	Irreversible long term	> \$1M	Censure/ Inquiry

### Risk Assessment

The risk assessment process compares the likelihood of a risk event occurring against the consequences of the event occurring. In the risk rating table below, a risk event with a likelihood of 'Possible' and a consequence of 'Major' has a risk rating of 'High'. This rating is used to develop a typical risk treatment.

Risk Rating					
Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Rare	L	L	M	M	H
Unlikely	L	L	M	M	H
Possible	L	M	H	H	H
Likely	M	M	H	H	VH
Almost Certain	M	H	H	VH	VH

Ref: HB 436:2004, Risk Management Guidelines, Table 6.6, p 55.

### Indicator of Risk Treatment

The risk rating is used to determine risk treatments. Risk treatments can range from immediate corrective action (such as stop work or prevent use of the asset) for 'Very High' risks to manage by routine procedures for 'Low' risks.

An event with a 'High Risk' rating will require 'Prioritised action'. This may include actions such as reducing the likelihood of the event occurring by physical methods (limiting usage to within the asset's capacity, increasing monitoring and maintenance practices, etc), reducing consequences (limiting speed of use, preparing response plans, etc) and/or sharing the risk with others (insuring the organisation against the risk).

Risk Rating		Action Required and Timing
VH	Very High Risk	Immediate corrective action
H	High Risk	Prioritised action required
M	Medium Risk	Planned action required
L	Low Risk	Manage by routine procedures

### Analysis of Risk

The team conducted an analysis of credible risks identified in Section 3.1 using the method described above to determine a risk rating for each credible risk.

The credible risks and risk ratings are shown in **Appendix B – Risk Register**

## Appendix B Risk Register (Refer to Excel spreadsheet)

Risk No.	RISK IDENTIFICATION							RISK ANALYSIS				PREFERRED RISK TREATMENT			RECOMMENDED ACTION PLAN			
	Town	Location	Asset at Risk	What can happen?	When can it occur?	Possible cause	Existing controls	Likelihood	Consequences	Risk rating	Action required	Treatment option(s)	Residual risk	Risk treatment plan	Actions	Project Planning Requirements	Cost Range	Recommended Priority
C1	Cootamundra	Nash's Lane x Muttama Road	Creek	Flow of upstream water is obstructed	Within 1 year	Vegetation Growth and Siltation	Irregular creek clearing	Likely	Minor	Medium	Vegetation maintenance and desilting	Vegetation maintenance and desilting	Medium	Vegetation maintenance and desilting	Vegetation maintenance and desilting	Maintenance project	\$0 to \$20,000	2
C2	Cootamundra	Florance Street near Hume Street	Drainage Channel	Flow of upstream water is obstructed	Within 1 year	Vegetation Growth and Siltation	Irregular drain maintenance	Likely	Minor	Medium	Vegetation maintenance and desilting	Add concrete "V"	Low	Add concrete "V"	Consider installing concrete "V" invert and reshape grassed channel	Minor construction without design	\$20,000 to \$150,000	2
C3	Cootamundra	Wills Street near White Street	Drainage Channel	Flow of upstream water is obstructed	Within 1 year	Vegetation Growth and Siltation	Irregular drain maintenance	Likely	Minor	Medium	Vegetation maintenance and desilting	Continue concrete "V" on White Street side	Low	Continue concrete "V" on White Street side	Consider installing concrete "V" invert and reshape grassed channel	Minor construction without design	\$20,000 to \$150,000	2
C4	Cootamundra	Berthong Street	Silo's		Within 1 year	Siltation	Irregular drain maintenance	Likely	Minor	Medium	Vegetation maintenance and desilting	Clean drain	Low	Clean drain	Consider installing concrete "V" invert and reshape grassed channel	Minor construction without design	\$20,000 to \$150,000	2
C5	Cootamundra	Adam Street x McGowan Street	Roads, Dwellings	Flow from upstream rural catchment entering urban streets with potential to flood dwellings	Within 10 years	Overland flow from creek entering urban areas	Nil	Almost Certain	Major	Very High	Separation of creek flows from local flows	Construct levee. Interim solution of grassed earth bank along fence line to divert flooding away from Cutler Ave. Trying to separate flood water from local water	Medium	Construct levee. Interim solution of grassed earth bank along fence line to divert flooding away from Cutler Ave. Trying to separate flood water from local water	Consider installing small levee or grassed earth bank along fence line to separate mainstream flood waters from local water	Minor construction without design	\$20,000 to \$150,000	1
C6	Cootamundra	Boundary Road x Matilda Ave	Roadside drainage	Erosion, pedestrian hazard	Within 2-3 years	Siltation, erosion	Irregular drain maintenance	Likely	Minor	Medium	Improve roadside drainage	Add concrete inverts to drainage	Low	Add concrete inverts to drainage	Consider installing concrete "V" invert and reshape grassed channel	Minor construction without design	\$20,000 to \$150,000	2
C7	Cootamundra	Harold Conkey Ave	Roadside drainage	Erosion, pedestrian hazard	Within 2-3 years	Siltation, erosion	Irregular drain maintenance	Likely	Minor	Medium	Improve roadside drainage	Possible off-line detention dam	Low	Possible off-line detention dam	Consider installing concrete "V" invert and reshape grassed channel. Investigate off line detention basin in reserve	Minor construction without design	\$20,000 to \$150,000	3
C8	Cootamundra	West Jindalee Road	Roads, Dwellings	Overland flow from creek	Within 10 years	Rural area with flat topography and minimal stormwater drainage infrastructure	Irregular drain maintenance	Likely	Minor	Medium	Improve roadside drainage	Houses are very low to ground with minimal drainage	Low	Houses are very low to ground with minimal drainage	Rural area. Low priority	Design required by consultant, then construction under contract	\$20,000 to \$150,000	4
C9	Cootamundra	Cutler Ave	Homes	Overflow from creek	Within 10 years	Suggest more info.	Mainstream flooding	Possible	Moderate	High	Mainstream flooding				Apply for funding to update flood study and to prepare floodplain risk management plan	One-third funding allocation to match possible two-thirds grant	\$20,000 to \$150,000	5
C10	Cootamundra	Boundary Road near hospital	Roadside drainage	Roadside Drainage	Within 1 year	Will overland flow cause flooding to private property/over road/both?		Possible	Minor	Medium	Improve roadside drainage	Keep drains. Hospital has own dam with excess water flowing to town storm water	Low		Consider installing concrete "V" invert and reshape grassed channel	Minor construction without design	\$20,000 to \$150,000	3
C11	Cootamundra	Poole St x Bourke Street	Homes	Overflow from creek	Within 1 year	Cause: "Rural area with limited run-off capacity"	Mainstream flooding	Possible	Moderate	High	Mainstream flooding	Floodplain Risk Management Study, development controls	Medium	Floodplain Risk Management Study	Apply for funding to update flood study and to prepare floodplain risk management plan	One-third funding allocation to match possible two-thirds grant	\$20,000 to \$150,000	5
C12	Cootamundra	Parker St Bridge	Bridge	Structural Failure	Within 20 years	Crack in bridge	Monitoring	Unlikely	Major	Medium	Planned action required	Structural Assessment of Bridge to withstand flood events	Low	Structural Assessment of Bridge to withstand flood events	Structural Assessment of Bridge to withstand flood events	Design required by consultant, then construction under contract	\$0 to \$20,000	2

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Risk No.	Town	Location	RISK IDENTIFICATION					RISK ANALYSIS				PREFERRED RISK TREATMENT			RECOMMENDED ACTION PLAN			
			Asset at Risk	What can happen?	When can it occur?	Possible cause	Existing controls	Likelihood	Consequences	Risk rating	Action required	Treatment option(s)	Residual risk	Risk treatment plan	Actions	Project Planning Requirements	Cost Range	Recommended Priority
C13	Cootamundra	Southee Circle	Dwellings, roads	Significant overland flow due to poor piped drainage and no defined overland flow path	Within 1 year	Inadequate pipe drainage and inlets	Nil	Possible	Moderate	High	Prioritised action required	Review pipes with additional capacity required. Southee circle is old swamp area. High water table. 750/900 inlet pipes. No run off point. Golf course outlet to French St drains through Southee circle	Low	CCTV inspection of pipes. Analyse stormwater capacity and overland flow paths	CCTV inspection of pipes. Analyse stormwater capacity and overland flow paths. Design and construct improvements.	Design required by consultant, then construction under contract	\$150,000 to \$500,000	2
C14	Cootamundra	Cowcumber St	Roads	Water over road	Within 1 year	No piped drainage at intersections	Nil	Likely	Minor	Medium	Planned action required	Low priority	Low	Low priority	Investigation of piped drainage improvements to reduce road hazard	Design required by consultant, then construction under contract	\$150,000 to \$500,000	4
C15	Cootamundra	Railway Culvert	Creek crossing	Blockage can obstruct flow	Within 10 years	Blockage can obstruct flow	Monitoring	Unlikely	Major	Medium	Planned action required	Clean up near creek crossing	Low	Inspect	Inspection program to reduce risk of blockage	Maintenance project	\$0 to \$20,000	3
C16	Cootamundra	Pinkerton Rd	Pipes under railway crossing	Small pipes under railway with limited capacity cause backup	Within 5 years	Inadequate pipe capacity under railway with flat gradients	Monitoring	Likely	Minor	Medium	Planned action required	Review pipe system capacity	Medium	Design analysis	Review Pipe Capacity and investigate options for augmentation	Design required by consultant, then construction under contract	\$150,000 to \$500,000	3
C17	Cootamundra	Future Development area west of Rinkin Street	Impacts of urbanisation can increase runoff	Increased flooding downstream	Within 10 years	Impacts of urbanisation can increase runoff	Planned development	Possible	Moderate	High	Prioritised action required	Stormwater detention structures to ensure that impacts of urban runoff are no greater than current rural land use	Medium	Release area master planning	Release area master planning	Future Release Area Master Planning	> \$1,000,000	3
C18	Cootamundra	Future Development area south-west of Hurley Street	Impacts of urbanisation can increase runoff	Increased flooding downstream	Within 10 years	Impacts of urbanisation can increase runoff	Planned development	Possible	Moderate	High	Prioritised action required	Stormwater detention structures to ensure that impacts of urban runoff are no greater than current rural land use	Medium	Release area master planning	Release area master planning	Future Release Area Master Planning	> \$1,000,000	3
C19	Cootamundra	Mainstream Flooding from Muttama Creek	Buildings, Roads	Flooding	Within 10 years	Mainstream Flooding	Maintenance of creek corridor	Likely	Major	High	Prioritised Action Required	Floodplain Risk Management Study, development controls	Medium	Subject to Floodplain Risk Management Study	Apply for funding to update flood study and to prepare floodplain risk management plan	One-third funding allocation to match possible two-thirds grant	\$20,000 to \$150,000	5
G1	Gundagai	Tor St	Private property	Run off from Tor St can enter private property and cause nuisance flooding	Within 1 year	Inadequate roadside drainage	Footpath diversion banks	Almost Certain	Moderate	High	Prioritised action required	Construct roadside drainage	Low	Design and construct roadside drainage including pipes, pits, kerb and gutter	Design and construct roadside drainage including pipes, pits, kerb and gutter	Design required by consultant, then construction under contract	\$150,000 to \$500,000	1
G2	Gundagai	Lawson Drive	Residences	Overland flows from low-point in road that cannot be conveyed by pipe drainage system, may flow through private properties	Within 10 years	Stormwater flows exceeding the capacity of pipe drainage system	Footpath	Unlikely	Minor	Low	Manage by routine procedures	Option of upgrading pipe drainage system expensive for low risk	Low	Regular inspections and pipe cleaning	Regular inspections and pipe cleaning	Design required by consultant, then construction under contract	\$150,000 to \$500,000	4
G3	Gundagai	Sheehan Dr	Road, private property	Roadside Drainage is inadequate. Overtopping can flow into private property	Within 2-3 years	Inadequate roadside drainage	Roadside drains and pipe crossings	Likely	Minor	Medium	Planned action required	Construct roadside drainage	Low	Design and construct roadside drainage including pipes, pits, kerb and gutter	Design and construct roadside drainage including pipes, pits, kerb and gutter	Design required by consultant, then construction under contract	\$20,000 to \$150,000	2

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RISK IDENTIFICATION								RISK ANALYSIS				PREFERRED RISK TREATMENT			RECOMMENDED ACTION PLAN			
Risk No.	Town	Location	Asset at Risk	What can happen?	When can it occur?	Possible cause	Existing controls	Likelihood	Consequences	Risk rating	Action required	Treatment option(s)	Residual risk	Risk treatment plan	Actions	Project Planning Requirements	Cost Range	Recommended Priority
G4	Gundagai	Hanley St	Road, private property	Open drain heavily vegetated, storm water cannot flow	Within 2-3 years	Vegetation Growth and Siltation	Irregular drain maintenance	Likely	Minor	Medium	Planned action required	Clean drain	Low	Regular drain cleaning and inspection	Regular drain cleaning and inspection	Maintenance project	\$0 to \$20,000	3
G5	Gundagai	Drain on private property between Tor St & O'Hagan St	Private property and outbuildings	Storm Water flows cause flooding of private property	Within 2-3 years	No formal drainage system	Minor catchment diversions completed at the time hospital works undertaken	Likely	Minor	Medium	Planned action required	Design and construct piped drainage system and overland flow path through private properties	Low	Design and construct piped drainage system and overland flow path through private properties	Design and construct piped drainage system and overland flow path through private properties	Design required by consultant, then construction under contract	\$150,000 to \$500,000	2
G6	Gundagai	Drain on private property downstream of hospital - Altwood Ave	Rural paddocks	Erosion of drains on rural property	Within 2-3 years	Run off from hospital	Nil	Possible	Insignificant	Low	Manage by routine procedures	Inspection	Low	Inspection	Inspection	Maintenance project	\$0 to \$20,000	5
G7	South Gundagai	Corner of Eagle and Luke St	Private garage	Storm water run off from road can enter private property and flood garage	Within 2-3 years	Stormwater run off flowing down Luke St	Nil	Likely	Moderate	High	Prioritised action required	Construct kerb and gutter to divert run off down Luke St	Low	Construct kerb and gutter to divert run off down Luke St	Construct kerb and gutter to divert run off down Luke St	Minor construction without design	\$20,000 to \$150,000	1
G8	South Gundagai	Eagle St	Council park	Water not draining from road	Within 2-3 years	Roadside vegetation prevent run off from road pavement	Nil	Likely	Insignificant	Medium	Planned action required	Maintenance of roadside vegetation	Low	Maintenance of roadside vegetation	Maintenance of roadside vegetation	Maintenance project	\$0 to \$20,000	3
G9	South Gundagai	Open stormwater drain between Middle and South St	Private property	Erosion and flooding of private property	Within 5 years	Open earth drain	Irregular drain maintenance	Possible	Moderate	High	Prioritised action required	Preferred option is to pipe the open channel however this is very expensive. Alternative treatments include concrete "v" drain with selective improvements to channel sides	Low	Concrete "v" drain with selective improvements to channel sides	Concrete "v" drain with selective improvements to channel sides and inlet/outlet to structures	Design required by consultant, then construction under contract	\$150,000 to \$500,000	1
G10	South Gundagai	South St	Private property	Flooding of private property	Within 2-3 years	Flooding when capacity of open drain exceeded. Open drains heavily blocked by vegetation	Irregular drain maintenance	Possible	Minor	Medium	Planned action required	Inspection and cleaning of drain	Low	Inspection and cleaning of drain	Inspection and cleaning of drain	Maintenance project	\$0 to \$20,000	3
G11	South Gundagai	Isaac St	Private property	Flooding of private property and out buildings	Within 2-3 years	Pipe culvert under road too small and heavily vegetated stormwater drains cannot convey stormwater runoff	Irregular drain maintenance	Possible	Moderate	High	Prioritised action required	Inspection and cleaning of roadside drainage. Possible cut-off drain near Gocup Road to divert some of the catchment away from private property	Low	Inspection and cleaning of drain	Inspection and cleaning of drain	Maintenance project	\$0 to \$20,000	1
S1	Stockinbingal	Mainstream Flooding from Bland and Dudauman Creeks	Properties, roads	Flooding	Within 20 years	Floodplain	Flood mitigation works constructed 1988	Unlikely	Minor	Low	Manage by routine procedures	Floodplain Risk Management Study, development controls	Medium	Floodplain Risk Management Study	Subject to Floodplain Risk Management Plan. Development controls in place for future development	One-third funding allocation to match possible two-thirds grant	\$20,000 to \$150,000	5
G12	Gundagai	Mainstream Flooding from Murrumbidgee River	Buildings, Roads, Open Space	Flooding	Within 10 years	Mainstream Flooding	Mainstream flooding	Likely	Major	High	Prioritised Action Required	Floodplain Risk Management Study, development controls	Medium	Subject to Floodplain Risk Management Study	Risks of Mainstream Flooding documented in Gundagai Floodplain Risk Management Plan			5