Naracoorte Township

Stormwater Management for new Development

Naracoorte Lucindale Council

September 2011

Ref No. 2010.0282RA1B

Tonkin CONSULTING

a better approach

Document History and Status

Rev	Description	Author	Reviewed	Approved	Date
A	Draft for comment	TAK	TPT	KSS	29 July 2011
B	Final	TAK	TPT	KSS	22 September 2011

Contents

Tables

Figures

1 Introduction

Tonkin Consulting has undertaken a review of the Naracoorte drainage network and previous studies of the various catchments within Naracoorte to provide advice on how to manage stormwater as part of new development within the Township. As part of this project we have also reviewed the previous studies to confirm they have allowed for the current expected amount of infill development and that they are consistent with current land zoning.

There are 12 catchments that have been identified within Naracoorte and two areas that have been zoned as deferred urban. A number of stormwater management strategies for these catchments are possible and depend partly on the characteristics of each individual catchment. Rather than applying prescriptive requirements for all new development, this report has outlined the strategies that should be considered for development within each of the catchments based on the catchment characteristics.

The focus of the study has been to investigate strategies to manage stormwater generation from infill development, which over the long term will have the largest impact on stormwater runoff within Naracoorte. However, a number of the strategies could equally be applied at a land division scale.

A review of the previous studies in relation to infill and current zoning is provided in Section 2. A description of the various stormwater management strategies is outlined in Section 3 which also includes a matrix outlining what strategies could be applied to each catchment while the capital works priorities are outlined in Section 4 with an overall summary provided in Section 5.

2 Review of Existing Studies

2.1 Infill Potential

The previous studies have allowed for a relatively high runoff coefficient for commercial and industrial areas. However the runoff coefficients used for residential areas are considered to be too low for the likely long term development of the area. As a result it is likely that as part of any detailed design phase, in which it is recommended that flows are reassessed using a higher coefficient, that the actual pipe sizes may be larger than those documented in the reports.

A summary of the main coefficients used is shown in Table 2.1 for the Stage 2 report (Caves Road, City Centre and Gum Avenue catchments) and Table 2.2 for the Stage 3 report (remaining areas). This is compared against an estimate of current runoff coefficients and of future coefficients following significant infill development.

The modelling has assumed that development will encompass the full extent of the zoned area and therefore allows for development of currently vacant or sparsely developed areas such as the industrial zoned land north of Deviation Road or within the southern residential portions of the Township east of Gordon Street. Therefore existing runoff coefficients are lower than what was used in the modelling in some areas.

The main increase in future runoff is likely to be when older residential areas become more heavily developed. This increase will be due to the following factors:

- Large single blocks being split into a number of smaller blocks
- Larger dwellings replacing an existing smaller dwelling
- Extensions added to existing dwellings
- A much higher percentage of connection of roof drainage systems to the kerb and gutter (a large proportion of gutters are currently not connected to the kerb and gutter and typically spill into garden or road side verge areas).

Table 2.1: Stage 2 Report Runoff Coefficients Summary

Land Type	Estimated current runoff coefficient	Runoff Coefficient Used	Potential runoff coefficient following significant infill development
Residential	0.2 (old areas) / 0.35 (newer areas)	0.20 (old areas) / 0.35 (newer areas)	0.40-0.45 (dependent on allotment sizes)
Commercial	0.7 (town centre)	0.7 (town centre)	0.8

Table 2.2: Stage 3 Report Runoff Coefficient Summary

Land Type	Estimated current runoff coefficient	Runoff Coefficient Used	Potential runoff coefficient following significant infill development
Residential	0.15-0.18 (old areas) / 0.27 (newer areas)	0.18 (old areas) / 0.27 (newer areas)	0.40-0.45 (dependent on allotment sizes)
Commercial	0.5-0.65	0.5-0.65	0.5-0.8
Industrial	0.30-0.55 (large amounts of vacant land)	0.55	0.7

2.2 Zoning Changes

The current land zonings have been compared to the information used for the catchment modelling. It has been assessed that there have been no significant changes to land zoning with the Study Area.

3 Stormwater Management Strategies

3.1 Introduction

This section provides a brief overview of the potential stormwater management strategies that could be applied to development within Naracoorte. In some instances multiple strategies could be applied to a single development.

3.2 On-site Detention

This strategy requires detention of stormwater on each site such that post-development peak flow rates typically don't exceed a certain threshold, such as predevelopment flow rates or the peak flow produced by a predetermined impervious site coverage (e.g. 25%). On a domestic scale this typically requires the installation of rain tanks with a large air space that temporarily holds water and then drains out slowly via an orifice. These systems are typically unpopular (as the owner derives no benefit from the large, relatively expensive detention tank) and are potentially hard to monitor by Council and can be prone to tampering such that the detention tank is converted into a permanent water storage tank. Computations to determine the amount of detention required can also be costly for small scale developments.

For larger scale developments the detention system would typically be in the form of a basin with a controlled discharge rate. This basin reduces the amount of available useful space within the development. However the basin can form part of a passive reserve or open space.

Detention will not reduce the volume of water leaving a development and would not be well suited to catchments that rely on infiltration at the downstream end of the catchment.

3.3 On-site Retention

Retention has the benefit of reducing the total volume of water that leaves a catchment. It can also be incorporated into a detention facility so that it can also reduce the rate of discharge from a site. The two main forms of retention that could be applied in Naracoorte are rainwater tanks and infiltration systems.

3.3.1 Rainwater Tanks

Large rainwater tanks, plumbed into the house/building, can provide a moderate level of on-site retention. They are also able to provide some form of detention as they are not always full at the start of large rainfall events and have the benefit of reducing mains water demand. However they are typically only able to intercept roof runoff and so paved areas will still freely drain from the site.

3.3.2 Infiltration

Infiltration would be well suited to the sandy areas of the Township. This can be implemented through soakage trenches or basins. The sandy areas of the Township could be mapped and data from this mapping incorporated into Council's GIS to allow an easy assessment to be made on the suitability of the site for soakage systems. Infiltration systems have the potential to intercept all impervious areas from a site. Modelling is typically required to determine the size of the system, which could be costly for small scale developments and would require geotechnical testing to determine infiltration rates.

A number of areas of the Township have wide road verge areas adjacent to large blocks. It may be an option to provide infiltration systems within these large verge areas as opposed to requiring all new development to drain directly to the kerb and gutter. This could make a significant difference to the impact of infill development in some areas as outlined in Section 2.1.

3.4 Capital Upgrades – Infrastructure Levy

Council has already commissioned the detailed design of some portions of the underground drainage network and has plans to upgrade of a number of other drains. Capital upgrades could potentially reduce or eliminate the requirement for on-site management of stormwater within the catchment that drains to the upgraded drainage system, provided it allows for the future development potential of the catchment.

In lieu of developers having to construct on-site measures (such as basins, tanks, soakage trenches etc.), Council could require that developers contribute towards a stormwater levy. The amount of the levy payable would depend on the size and nature of the development and would assist Council in funding capital works. However, it is likely that Council will have to spend most of the money up front and would only be reimbursed over time as development proceeds. The levy could potentially cover all new development within the Township regardless of the site's location.

3.5 Maximum Site Coverage

Limiting the maximum allowable site coverage of a development can reduce the increase in runoff from future development. However this can typically only be used to control the footprint of the dwelling/building. It is more difficult to control the amount of paved/sealed area within a development. Large amounts of paved and sealed areas could still potentially result in a high proportion of impervious area thereby still producing a significant increase in runoff from the site.

3.6 Minimum Allotment Sizes

Placing a restriction on the minimum allotment size will assist in reducing the increase in runoff from future development as the pervious proportion of development will be kept relatively high if the minimum block size is relatively large.

3.7 Minimum Floor Levels

3.7.1 Adjacent Naracoorte Creek and Adjacent to Trapped Low Spots

Flood mapping has been undertaken along Naracoorte Creek and a number of trapped low spots (where there is no overland flood flow path) have been identified throughout the Township. Elevated floor levels for development adjacent to these areas should be imposed so as to ensure they are protected from flooding in the 100-year ARI flood event. The location of trapped low spots could be digitised such that they are identified on Council's GIS system to ensure this information is readably accessible when development assessments are made.

3.7.2 Other Areas

Elsewhere in the Township the road network should have the ability to act as a safe overland flood flow path in extreme rainfall events. This can only occur if floor levels of dwellings are set above the adjacent top of kerb levels. Therefore, where practical, all floor levels for dwellings/buildings should be set to a minimum of 200mm above adjacent top of kerb levels. In some areas higher floor levels may be required if significant flood flow paths are known to pass through the road network, particularly in areas of shallow longitudinal grade.

3.8 Summary of options suitable for each catchment

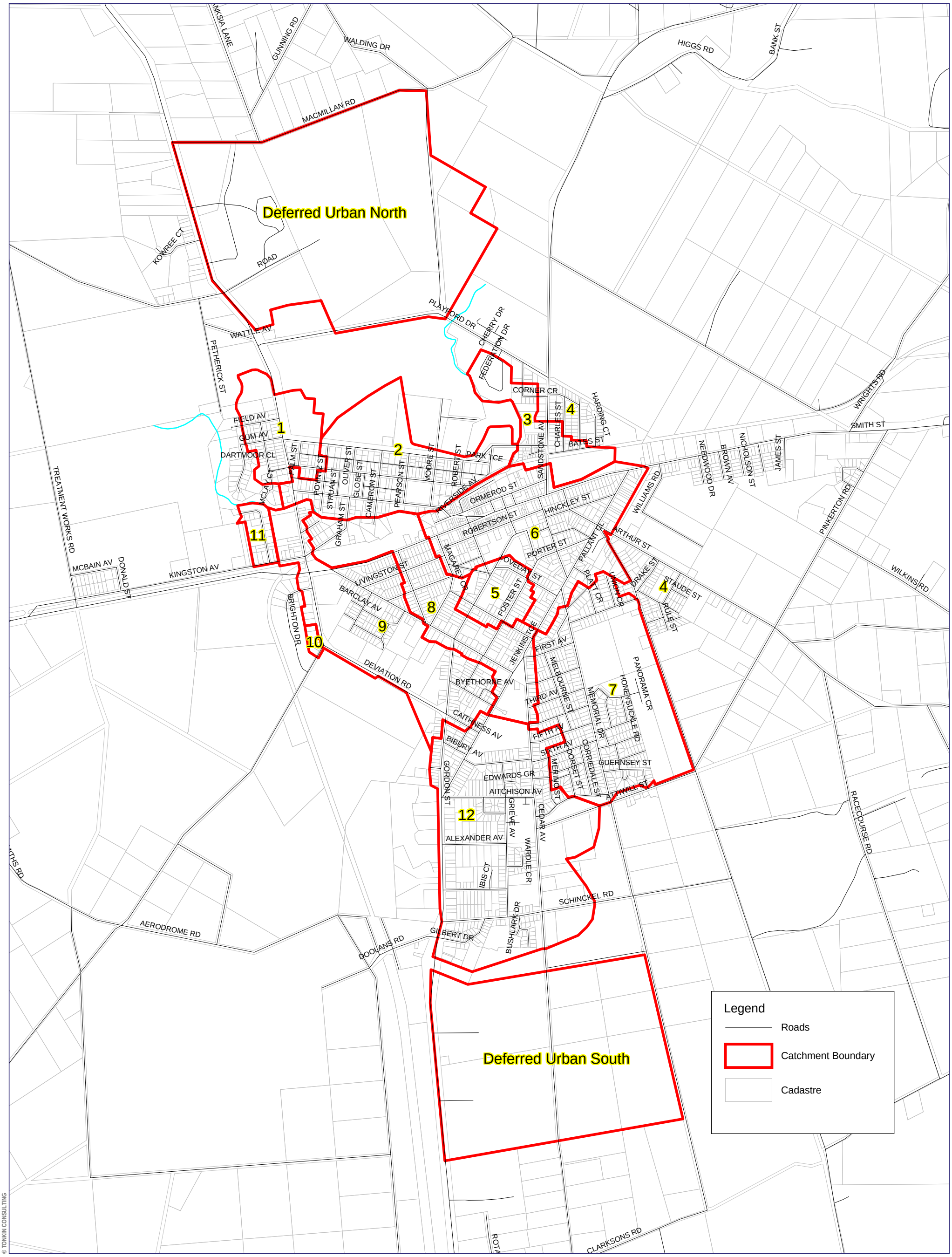
Table 3.1 provides a summary of the management options that would be suitable for each of the catchments along with some brief comments about the key catchment characteristics. The location of each catchment is shown in Figure 3.1 as derived from available topographical information and subsequent field inspections.

Table 3.1: Summary of Options suitable for each catchment

Catchment	Name	Comments	On-site Detention	Large rainwater tanks	Infiltration trenches / basins	Capital Upgrades / works Required	Maximum site coverage	Minimum allotment sizes	Floor level controls at low spots or adjacent flood prone land	Floor levels set up above adjacent top of kerb level
1	Field Ave /Gum Ave	Relies on pumps. Recent upgrades. No overland flood flow path to discharge point.							x	x
2	Cameron St / Freeling St	Poor drainage standard. Catchment contains trapped low spots. Drains to creek. Sandy in parts	x		x	x	x	x	x	x
3	Northern River, including Bates St	Reasonable standard for existing drains. Overland flood flow path downstream of Sandstone Ave.	x				x	x		x
4	Caves Road	Reasonable standard. Overland flood flow path exists to outfall drain					x	x		x
5	TAFE	No outlet to catchment. Relies on soakage and requires upgrade to pits and pipes at the low spot		x	x	x	x	x	x	x
6	Town Centre	Some trapped low spots. High value area. Proposal to duplicate drains. High existing runoff coefficient. Therefore lower increase in future runoff.				x			x	x

Catchment	Name	Comments	On-site Detention	Large rainwater tanks	Infiltration trenches / basins	Capital Upgrades / works Required	Maximum site coverage	Minimum allotment sizes	Floor level controls at low spots or adjacent flood prone land	Floor levels set up above adjacent top of kerb level
7	Gare Swamp	Existing detention storage adequate to manage 100-yr ARI event with 2L/s discharge. Possible basin required to manage southern end of catchment. Sandy soils in parts.		x	x	x			x	x
8	McCoy St and Butler Terrace	Design completed in 1999 but not constructed. Need more inlet pits. Expensive amount of works required and would need to be staged. Reasonable overland flood flow paths available.	x			x	x	x		x
9	Deviation Road	Potential upgrade to drainage system along Deviation Road. Large potential increase in runoff due to development within catchment. Existing road side drains poorly formed. Large allotment sizes in industrial area.	x	x		x	x		x	x
10	Brighton Drive Industrial	No upgrades needed. Large basin to mange runoff. Extra flow may spill into basin from new drain along Deviation Road		x						x
11	Wheeler Court	Overland flood flow path existing to creek. Limited measures required.								x

Catchment	Name	Comments	On-site Detention	Large rainwater tanks	Infiltration trenches / basins	Capital Upgrades / works Required	Maximum site coverage	Minimum allotment sizes	Floor level controls at low spots or adjacent flood prone land	Floor levels set up above adjacent top of kerb level
12	Cedar Ave, Grieve Ave, Schinckel Rd	Relatively steep catchments. Sandy soils in parts. Overland flow path available to west without flooding properties. Some basins located on private property. Poor surface drainage capacity. Sparsely developed. Large increase in runoff likely due to development.	x		x	x	x	x		x
-	Deferred Urban North	Large increase in runoff. Ensure adequate drainage infrastructure will be in place and that road network will provide an overland flood flow path for major rainfall events. Relatively sandy soils with good drainage.			x	x	x	x		x
	Deferred Urban South	Large increase in runoff. Ensure adequate drainage infrastructure will be in place and that road network will provide an overland flood flow path for major rainfall events. Sandy soils in area with good drainage.			x	x	x	x		x



Tonkin CONSULTING
www.tonkin.com.au
a better approach

*

Scale: 1:20,000

Job Number:	2010.0282
Filename:	catchment plan.wor
Revision:	A
Date:	18/07/2011
Drawn:	TAK
Spatial Approval:	TKD
Technical Approval:	TAK

Data Acknowledgement:
Cadastre supplied by PBBI Australia Pty Ltd

Naracoorte Lucindale Council

NARACOORTE CATCHMENT BOUNDARIES

Figure 3.1

4 Capital Works Priorities

Based on the previous reports, works already undertaken and discussions with Council the current works priorities are as follows.

4.1 Priority 1: Town Centre

The design of the upgrade to the town centre drainage system has commenced. The proposed scheme will be relatively significant and would need to be constructed over a number of stages. It will help to reduce flooding at a number of trapped low spots and provide an improved level of flood protection to the high value commercial centre of Naracoorte.

4.2 Priority 2: Cameron Street / Freeling Street

The existing main drain within this catchment is under capacity with flooding regularly occurring at the trapped low spots within the catchment. The proposed drainage upgrade discharging into Naracoorte Creek will reduce the flood risk in the area.

4.3 Priority 3: Cedar Avenue, Grieve Avenue, Schinckel Road.

New drainage systems are required to manage the discharge from this area before it spills onto Gordon Street. The surface flow capacity of Gordon Street is very low in parts due to flat grade and limited cross fall resulting in regular inundation of the road.

4.4 Priority 4: McCoy Street and Butler Terrace

The drain for this system was designed in 1999 but has not been constructed. The drain will provide a significant upgrade to the existing system. The works are relatively extensive and would need to be staged over an extended period.

4.5 Priority 5: Deviation Road

Two concept options have been developed for drainage along Deviation Road. The drain will assist in providing an improved drainage system to an area where there is the potential for a large increase in runoff due to new industrial and commercial development. The drain will provide a significant upgrade to the existing system. The works are relatively extensive and would need to be staged over a few years.

4.6 Priority 6: TAFE area

The low spot within the TAFE catchment regularly experiences ponding across the road. Additional inlets and a larger soakage system are required to manage the problem.

4.7 Priority 7: Caves Road

The Caves Road drain is throttled by a small diameter drain which causes upstream surface flooding. There is the potential for these areas to be developed in the future which would require management of the high flood risk in the area. This could potentially be done by removing the existing restriction within the Caves Road drain caused by the small diameter pipe in conjunction with a large detention facility within the Racecourse as outlined as the preferred option within the Caves Road Drainage Study (Caves Road Drainage Study, Tonkin Consulting, Ref 98.0087).

4.8 Potential for Stormwater Management Authority Subsidy Money

Capital works within upstream catchments larger than 40 hectares can be eligible for subsidy funding from the Stormwater Management Authority provided the works are incorporated into a Stormwater Management Plan. Of the works outlined above, the works associated with Priorities 1 (Town Centre) and 3 (Cedar Avenue) would be eligible for funding (only for the works

downstream of the 40 hectare boundary) and all of the works associated with Priority 7 (Caves Road).

5 Summary

5.1 Stormwater Management Strategies

The various stormwater management strategies outlined above have provided guidance to the potential development controls that should be considered for each new development based on its location within the 12 catchment areas of the Township. The report has suggested some additional GIS related work to ensure that the appropriate strategies are implemented for each development proposal. Each development proposal will still need individual inspection to ensure the application of the appropriate strategies.

5.2 Planned Capital Works

The report has prioritised planned capital works outlined within previous drainage studies that will potentially form the Council's drainage capital works for a number of years to come. The review of the existing modelling has indicated that detailed design works may require that some pipe sizes be increased based on higher runoff from future levels of the development within the Township. Some works may be potentially eligible for subsidy funding from the Stormwater Management Authority. The opportunity for implementing a stormwater infrastructure levy for new development in lieu of on-site controls could potentially be an option to assist Council in the funding of future works provided the works allow for ultimate development conditions.