
**NARROMINE SHIRE COUNCIL
ORDINARY MEETING BUSINESS PAPER – 10 JULY 2019
REPORTS TO COUNCIL – INFRASTRUCTURE AND ENGINEERING SERVICES**

1. WORKS REPORT

Author	Director Infrastructure and Engineering Services
Responsible Officer	Director Infrastructure and Engineering Services
Link to Strategic Plans	CSP – 4.3.4 Ensure Council's property assets are monitored and well managed

Executive Summary

This report provides information regarding works undertaken for the given period in regards to both operational and capital works.

Report

The Works Report (**Attachment No. 1**) for the period 8 June 2019 to 5 July 2019 is presented to Council for their information.

Financial Implications

Council has provision for these services in its 18/19 Operational Budget.

Legal and Regulatory Compliance

Local Government Act 1993
Roads Act 1993

Risk Management Issues

Nil

Internal/External Consultation

Nil

Attachments

Works Report

RECOMMENDATION

That the information be noted.

2. NARROMINE LEVEE AND FLOOD RISK MANAGEMENT PLAN

Author	Director Infrastructure and Engineering Services
Responsible Officer	Director Infrastructure & Engineering Services
Link to Strategic Plans	CSP – 3.1.2 Resolve issues surrounding the flood levee and impacts on residential development

Executive Summary

The purpose of this report is to provide an update on the Narromine Levee and Flood Risk Management Plan

Report

Council has received financial support from the State Floodplain Management program, managed by the Office of Environment and Heritage (OEH), to undertake and review a flood investigation of Narromine. The primary objective of the New South Wales (NSW) Government's Flood Prone Land Policy is to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property, and to reduce private and public losses resulting from floods, utilising ecologically positive methods wherever possible. The previous Flood Risk Management Plan was conducted in 2009 and requires a review. The Flood Management Committee at its April 2019 meeting recommended: "**Cr Davies/Tony Barlow that Option Ha be the recommended alignment for the proposed levee to minimise impacts (such as potential flooding and aesthetic) for residents along Warren Road, subject to further engineering advice regarding Webb Siding.**"

Accordingly, the Flood Risk Management project will review the existing flood risk management study and plan, to enable an understanding of the impacts and changes in flood behaviour due to physical alteration of catchment characteristics such as construction of flood mitigation works or extensive new development in the catchment. It also involves reviewing existing recommended management measures as well as testing and investigating practical, feasible and economic management measures to treat existing, future and residual risk. The revised floodplain risk management study will provide a basis for informing the development of a new floodplain risk management plan.

Feasible options to manage the flood risk in Narromine will be reviewed and a plan developed, incorporating risk management options deemed appropriate for the town.

In brief, the project will consider the options / impacts of:

- A breakout flow through a set of railroad culverts approximately 2 km upstream of Narromine (flow through Webbs Siding Rd to Backwater Cowal) including a costing (engineers estimate) for a culvert/bridge at that location to ensure that the breakout flow occurs in the flood event that reduces the flood heights in town. This was excluded from the previous flood study.

2. NARROMINE LEVEE AND FLOOD RISK MANAGEMENT PLAN (Cont'd)

- The impact of the new railway line (Inland Rail) which is planned to cross the highway and Macquarie River in the vicinity of Webbs Siding. Please note that the alignment of this railway line has not been confirmed yet and a railway corridor can be provided during the initial stages of this project. It is anticipated that an alignment will be announced towards mid to late 2019. This was excluded from the previous flood study.
- Provide advice on land-use planning.

Previous studies and levee alignments and impacts will be considered in the development of the Flood Risk Management Plan.

Financial Implications

Council received a grant totalling \$92,571.43 with a funding ratio of 6:1. Council's contribution has been budgeted for in the 19/20 financial year.

The updated Flood Risk Management Plan will be used to review previous selected Levee alignments and impacts. The updated plan will be used for funding applications. A cost estimate will be developed for options identified.

Legal and Regulatory Compliance

Local Government Act 1993

The Floodplain Development Manual (NSW Government 2005)

Australian Institute of Disaster Resilience Handbook 7: Managing the floodplain: best practice in flood risk management in Australia (AIDR Handbook 7) (AIDR 2017).

Risk Management Issues

Inclusion of potential breakout flow near Webbs Siding to the Backwater Cowal has been included.

Potential impacts of the new railway line (Inland Rail) have been included.

A review of current levee alignments has been included.

Internal/External Consultation

External consultation with relevant stakeholders will be conducted as part of the Narromine Flood Risk Management Plan study.

Attachments

Nil

RECOMMENDATION

That the information be noted.

NARROMINE SHIRE COUNCIL
ORDINARY MEETING BUSINESS PAPER – 10 JULY 2019
REPORTS TO COUNCIL – INFRASTRUCTURE AND ENGINEERING SERVICES

3. TRANGIE DRAINAGE STRATEGY

Author	Director Infrastructure & Engineering Services
Responsible Officer	Director Infrastructure & Engineering Services
Link to Strategic Plans	CSP – 4.3.4 Ensure Council's property assets are monitored and well managed

Executive Summary

The purpose of this report is to present feedback from public exhibition and seek Council's endorsement to adopt the Trangie Urban Stormwater Management Plan.

Report

At Council's Ordinary Meeting on the 10th April 2019, it was resolved that the draft Trangie Urban Stormwater Management Plan be adopted and placed on public exhibition for a period of 28 days. (Resolution 2019/081)

The draft Trangie Urban Stormwater Management Plan (**Attachment No. 2**) was placed on Council's website and Facebook, as well as hard copies distributed to 4 locations within the Shire for public viewing. Submissions closed on 22 May 2019.

No submissions were received.

Financial Implications

The Trangie Urban Stormwater Management Plan will be used to develop future capital works and improvements programs, for stormwater systems in Trangie

Legal and Regulatory Compliance

Local Government Act 1993
Roads Act 1993
Protection of the Environment Operations Act, 1997

Risk Management Issues

Improved stormwater management and environmental controls.

Internal/External Consultation

Consultation has been undertaken with the Trangie Community/ Stakeholders. Further consultation may be required during implementation of stormwater treatment controls.

Attachments

Trangie Urban Stormwater Management Plan

3. TRANGIE DRAINAGE STRATEGY (Cont'd)

RECOMMENDATION

That Council adopt the Trangie Urban Stormwater Management Plan.

4. EXHIBITION DRAFT SECTION 7.11 HEAVY VEHICLE CONTRIBUTIONS PLAN 2019 – HEAVY VEHICLES

Author	Executive Manager Planning
Responsible Officer	Executive Manager Planning
Link to Strategic Plans	CSP - 4.4.1 Our road network is safe, well maintained and appropriately funded DP - 3.6.1 Ensure local and regional roads are safe and well-constructed and maintained

Executive Summary

The purpose of this report is to seek approval to place the Draft Narromine Shire Council Section 7.11 Contributions Plan 2019 – Heavy Vehicles on public exhibition for a period of 28 days.

Report

Background

The current Narromine Shire Section 94A Development Contributions Plan was prepared under Section 94A of the *Environmental Planning and Assessment Act 1979* and allows Council to impose a fixed development consent levy on a development to contribute to the costs of providing local infrastructure.

The contributions imposed under this Plan are based on the estimated costs of carrying out a development and do not reflect the costs of maintaining Council roads that are directly attributable to heavy vehicle generating development such as quarries and mines.

Council is already experiencing high volumes of heavy vehicles for extractive mining in the LGA. Most of these products are used within our shire and are also exported. It is expected that extractive mining practices and subsequent traffic will increase over time due to increased development in Dubbo and due to Inland Rail.

In recognition of the potential increase in heavy vehicle generating developments that may occur in the Narromine Local Government Area (LGA) in the near future and the potential impact on Council roads, Hunter Strategy Consultants were engaged to prepare the attached Draft Narromine Shire Council Section 7.11 Contributions Plan 2019 – Heavy Vehicles (**See Attachment No. 3**).

4. EXHIBITION DRAFT SECTION 7.11 HEAVY VEHICLE CONTRIBUTIONS PLAN 2019 – HEAVY VEHICLES (Cont'd)

A heavy vehicle contributions plan provides transparency and certainty to developers when they are making business decisions and removes the costs and time taken for Council to negotiate separate planning agreements for each development application.

Discussion

It is proposed that the *Draft Narromine Shire 7.11 Contributions Plan 2019 – Heavy Vehicle* will apply to the entire LGA and will include heavy vehicle generating developments that produce over 5,000m³ of solid material annually or with an annual approved total haulage of 7,500 tonnes of material.

The Plan will not apply to developments located on industrial or business zoned lands or to developments undertaken by or on behalf of Council unless undertaken for a business enterprise.

The methodology used to determine the proposed contribution is based on the average annualised road maintenance costs, the distance and type of road used and the type of vehicle involved.

It is considered that this approach presents an equitable means of calculating the contribution as it provides a direct link between the type of road used and the size of the vehicle used in an operation. Given the costs associated with the administration and management of the Plan, it allows for a levy of 1% of the value of the contribution to fund Plan management and administration.

This approach is the same as the approach adopted by other regional Councils including Parkes, Cowra, Molong, Armidale, Wagga Wagga, Bathurst, and Upper Hunter.

The Plan also makes provision for applicants to dedicate land, undertake works in kind or to provide a material public benefit in lieu of the heavy vehicle haulage contribution, but only where Council deems that it is appropriate.

Financial Implications

There are no financial implications as a result of exhibiting the draft 7.11 Contributions Plan 2019 – Heavy Vehicles. However, the adoption of the Plan will have a positive financial impact as it will provide Council with the ability to fund road maintenance costs incurred as a direct result of the operation of heavy vehicle generating developments, rather than seeking an alternative funding method.

Legal and Regulatory Compliance

- *Environmental Planning & Assessment Act 1979*
- *Environmental Planning & Assessment Regulation 2000*
- *Department of Planning & Environment Practice Notes 2005*

4. EXHIBITION DRAFT SECTION 7.11 HEAVY VEHICLE CONTRIBUTIONS PLAN 2019 – HEAVY VEHICLES (Cont'd)

- Ministerial Directions (Local Infrastructure Contributions)

Risk Management Issues

If Council does not adopt a contributions plan it will need to fund road maintenance required as a result of heavy vehicle generating developments from another source.

There is a lack of transparency associated with relying on only voluntary planning agreements to fund road maintenance as they are negotiated on a case by case basis.

Consultation

The draft Plan is suitable for public consultation and wider community comment. In accordance with the Clause 26 of the *Environmental Planning and Assessment Regulations 2000*, the draft Plan will be exhibited publicly for 28 days, with Council providing public notice in the local newspaper.

Following exhibition, any submissions made to Council on the draft Plan will be reported to Council for consideration including any recommended amendments in response to the submissions.

Attachments

Attachment 1 – Draft Narromine Shire Council 7.11 Contributions Plan 2019 – Heavy Vehicles.

As this matter relates to planning decision made in the exercise of a function of Council under the EPA Act, and relates to a development contribution plan under that Act, ***a division is required to be called on the motion.***

RECOMMENDATION

1. That the Draft Narromine Shire Council 7.11 Contributions Plan 2019 – Heavy Vehicles be publicly exhibited for a period of 28 days.

André Pretorius
Director Infrastructure and Engineering Services

	MONTHLY WORKS REPORT Friday, 5 July 2019	Infrastructure and Engineering Services Narromine Shire Council Tel: 02 6889 9999 Fax: 02 6889 9998 mail@narromine.nsw.gov.au
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Road and Park users are to proceed with caution at all work sites and observe work signs to ensure safety.
 Speed zones are enforceable with possible short delays.
 For all enquiries, please contact Council's Infrastructure and Engineering Services Department on 6889 9999.

URBAN ROADS – Narromine, Trangie, Tomingley	
Various Streets (Narromine)	<u>Maintenance:</u> <ul style="list-style-type: none"> Routine Maintenance Program such as patching, sign installation and sweeping, etc. <u>Capital:</u> <ul style="list-style-type: none"> Jones Circuit – Tree removal, new road construction and drainage
Various Streets (Trangie)	<u>Maintenance:</u> <ul style="list-style-type: none"> Routine Maintenance Program such as patching and sweeping, etc.
Various Streets (Tomingley)	<u>Maintenance:</u> <ul style="list-style-type: none"> Routine Maintenance Program
UNSEALED ROADS NETWORK	
Various Unsealed Roads	<u>Maintenance: Map No. 1</u> Maintenance Grading in progress or completed; <ul style="list-style-type: none"> Gainsborough Road Dappo Road – spot grade Newhaven Road Backwater Road Elmore Road Belmont Road Dandaloo Road <u>Capital: Map No. 2</u> Resheeting in progress or completed; <ul style="list-style-type: none"> Tantitha Road
SEALED ROADS NETWORK	
Various Sealed Roads	<u>Capital:</u> <ul style="list-style-type: none"> Trangie Collie Road – Completed 2km rehab
SWIMMING POOLS	
Narromine Pool	<ul style="list-style-type: none"> Landscaping works at entrance of pool and fencing has been completed.
Trangie Pool	<ul style="list-style-type: none"> Rebuild of pump shed progressing and amenities upgrade and fencing has been completed.
PARKS AND OPEN SPACE NETWORK CBD Gardens, Parks, Ovals, Villages	
Narromine CBD	<ul style="list-style-type: none"> General maintenance and mowing. Current water restrictions and cooler weather are limiting turf growth. Garden beds have been upgraded with new plants. Signage has been ordered for the Glenn McGrath cricket nets.
Narromine Parks and Reserves	<ul style="list-style-type: none"> General maintenance, mowing and weed control.

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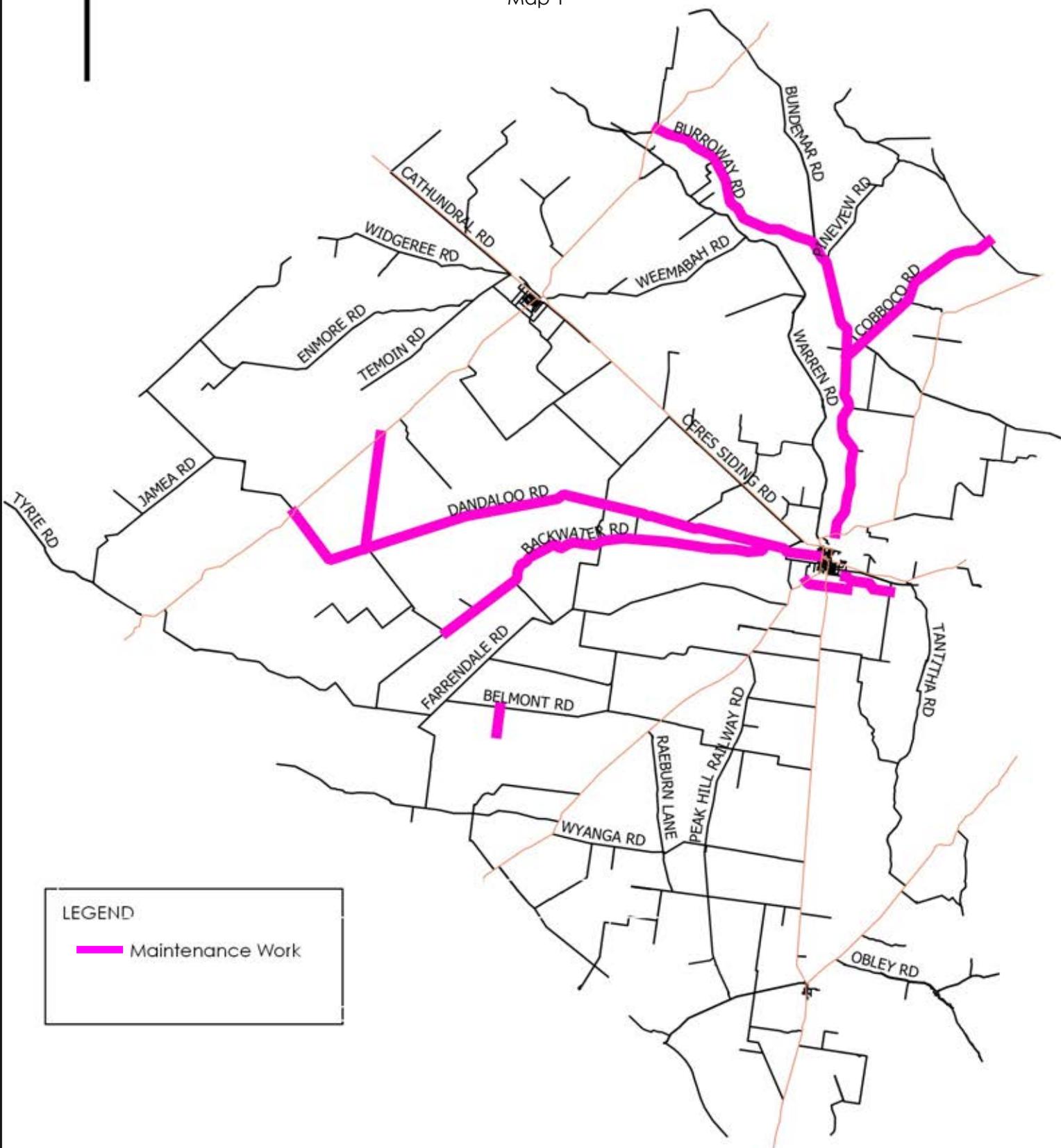
PARKS AND OPEN SPACE NETWORK CBD Gardens, Parks, Ovals, Villages Cont.	
Narromine Parks and Reserves	<ul style="list-style-type: none"> • Signage installation is complete
Narromine Sports Grounds	<ul style="list-style-type: none"> • General maintenance and mowing. Current water restrictions and cooler weather are limiting turf growth. • Payten Oval irrigation project internal complete, external continuing. • Dundas Oval irrigation project completed. • Old scoreboard at Cale Oval has been removed. • Vandalism occurred at Noel Powell Ovals and has been rectified.
Narromine Streets	<ul style="list-style-type: none"> • Main Street landscaping upgrade continues.
Trangie CBD	<ul style="list-style-type: none"> • General maintenance and weed control ongoing.
Trangie Parks	<ul style="list-style-type: none"> • General maintenance and mowing.
Trangie Sports Grounds	<ul style="list-style-type: none"> • Burns Oval now open. • Winter season sports continuing.
Trangie Streets	<ul style="list-style-type: none"> • General maintenance. Street sweeping weekly on Tuesday's. Vegetation mowing has commenced.
Tomingley Village	<ul style="list-style-type: none"> • Contractor is responsible for vegetation control.
AERODROME	
Narromine Aerodrome	<ul style="list-style-type: none"> • Tree trimming, slashing and weed control continue.
BUILDING MAINTENANCE	
All Buildings	<ul style="list-style-type: none"> • General maintenance as required.
Vandalism	<ul style="list-style-type: none"> • Vandalism at Council facilities still continues.
Narromine Medical Centre	<ul style="list-style-type: none"> • General maintenance as required.
Council Administration Buildings	<ul style="list-style-type: none"> • Hot water services replaced at Burns Oval and finance building.
PUBLIC CONVENIENCES	
Rotary Park (Narromine) Public Toilets	<ul style="list-style-type: none"> • Burraway toilets upgrade has been completed.
Burraway Street Public Toilets (adjacent to Pool)	
Argonauts Park (Trangie) Public Toilets (Goan Waterhole)	<ul style="list-style-type: none"> • Toilet facilities cleaned every Tuesday, Thursday and Saturday.
Dandaloo Street Trangie (adjacent to Bakery)	<ul style="list-style-type: none"> • Toilet facilities cleaned every Monday, Wednesday and Friday.
Narromine and Trangie Truck Wash	<ul style="list-style-type: none"> • Waiting for outcome of land acquisition process for the Trangie Truck wash.
Wetlands	<ul style="list-style-type: none"> • Wetland project continues progressing with preliminary designs being received. • Toilet block secured and cleaned daily.

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CEMETERIES	
Narromine Cemetery	<ul style="list-style-type: none"> • General maintenance, mowing and weed spraying. • Topping up of graves that have shown signs of subsiding. • Irrigation renewal in progress. A pump has been installed. • Preparation of rose garden beds for relocation of roses from Main Street is complete.
Trangie Cemetery	<ul style="list-style-type: none"> • General maintenance, mowing and weed spraying. • Ongoing topping up of graves that showed signs of subsiding.
WATER AND SEWER	
Tomingley	<ul style="list-style-type: none"> • Continued regular system maintenance at water treatment plant. Staff are carrying out final quarter meter reading
Trangie	<ul style="list-style-type: none"> • Staff have continued reticulation system maintenance. • Staff have commenced works to lay new sections of water main either side of the Mitchell Highway to rectify issues around leaking services in the laneway adjacent Trangie Mini Mart. These mains will remove some dead ends from the system to improve water quality in these areas. Earlier plans to underbore the Highway at this site have been abandoned due to space constraints. • Meter reading Contractors have completed final quarter reads
Narromine	<ul style="list-style-type: none"> • Level 3 water restrictions continue in Narromine in accordance with the odds and evens scheme, and will continue as required. Water restriction cautions continue to be issued where warranted. • Staff have completed mains and service rationalisation and rehabilitation in Culling, Manildra and Nymagee Street's. These works included new water services to the Junior Rugby League ground and Noel Powel Oval. Remaining works include removal of redundant valves and hydrants and patching of roadways when this is complete. Regular Drinking Water Quality sampling and analysis continues. Sewer pump station maintenance is ongoing. • Meter reading Contractors have completed the final quarter read.



Map 1



NARROMINE SHIRE COUNCIL

Maintenance Works Program 2018-2019 - June

Notes - roads that are highlighted have had work undertaken on them and are not specific sections



TRANGIE STORMWATER MANAGEMENT PLAN

May 2019

Project No.2107

Document Verification

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Document title	Report		Project number 2107			
Description						
Client Contact						
	Name	Signature	Issue:	Date		
Prepared by	RX/ KLL		B	7.5.2019		
Checked by	RK					
Issued by	RK					
Filename	Trangie Stromwater Management Plan					
Document History						
	Issue A		Issue B		Issue C	
Issue to:	Date	No. Copies	Date	No. Copies	Date	No. Copies
Tanjeeb Huq	21.09.2018	PDF				
Jordan Richardson			7.5.2019	PDF		

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OVERVIEW

Narromine Shire Council is committed to improving the water quality and environmental values for the township of Trangie through an integrated catchment management approach. Narromine Shire Council issued a brief for the Stormwater Management Plan for Trangie in April 2018 and Storm Consulting (Storm) was awarded the project.

In response, Storm commenced plan preparation in accordance with the Managing Urban Stormwater Council Handbook prepared by EPA in 1997 which have the following key components:

- A Detailed Action Plan which identifies and prioritise specific cost-effective solutions, assigns responsibilities for actions that is applicable to Council's needs and program;
- An Implementation Strategy which defines the management framework for ongoing co-ordination between stormwater managers;
- A detailed investment program which involves the identification of funding sources to implement priority actions;
- An Evaluation and Monitoring Program which determines performance indicators for the actions and identifies appropriate monitoring to measure the success of the Stormwater Management Plan.

The Stormwater Management Plan and implementation strategy proposed for Trangie takes into account environmental considerations, feedback from the local community, drainage efficiency, and cost effectiveness of the proposed options. A monitoring program is also proposed as part of the Plan.

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APPENDICES

APPENDIX A

Photographic Record of Stormwater Issues in Trangie

APPENDIX B

Community Involvement and Education

APPENDIX C

Structural Assessment and Education Options

1.0 INTRODUCTION

The NSW Environmental Protection Authority (EPA) has previously issued a notice under Section 12 of the Protection of the Environment Administration Act 1991 to all NSW councils, requiring each council to develop a Stormwater Management Plan. This Stormwater Management Plan is the outcome of that EPA direction. In April 2018, Narromine Shire Council issued a brief for preparation of the Stormwater Management Plan for Trangie and the project was awarded to Storm Consulting (Storm).

This Plan is prepared in accordance with the Managing Urban Stormwater Council Handbook prepared by the EPA in 1997. The focus of this report is to provide strategies to improve stormwater quality while minimising any potential impact on the environment.

A site inspection was undertaken in May 2018 by Storm staff. In addition to Trangie, the township of Narromine was also inspected during the site visit. This was to assess the stormwater strategies in place at Narromine and to ensure that there would be some consistencies in the strategies adopted between the two townships.

Community consultation was undertaken with the Trangie Aboriginal Local Council as well as residents in the area. Community and stakeholder input obtained from the Narromine Stormwater Management Plan (Hunter Water 2000) was also incorporated as part of the data for Trangie.

1.1. Objective of Stormwater Management Plan (SMP)

The main objective of the Stormwater Management Plan is to improve the overall performance of the Trangie stormwater system by:

- Improving existing drainage infrastructure, such as creating road kerb and gutters and provision of an underground drainage system for the road network;
- Providing treatment measures to mitigate existing creek bank/bed erosion issues;
- Improving creek environmental values through creek rehabilitation and naturalisation works;
- Increasing community awareness, education, and ownership of stormwater assets; and
- Implementing cost-effective stormwater treatment measures.

1.2. Framework and Scope of the SMP

This SMP has been prepared according to the Managing Urban Stormwater Council Handbook prepared by EPA in 1997. The aim of this plan is to improve the management of stormwater within the Trangie urban catchment by:

- Describes the catchment

- Identifies existing catchment conditions
- Establishes the values of the catchment
- States appropriate management objectives
- Identifies management issues
- Evaluates potential management practices
- Contains plan implementation strategies for Narromine Shire Council
- Presents a performance monitoring program
- Establishes stormwater management objectives for new developments
- Describes a mechanism for reporting on the implementation of the plan

1.3. Community Consultation and Data Collection

One-on-one interviews and workshop sessions with community members and government agency representatives have previously been conducted for Narromine (Hunter Water, Oct 2000). Catchment values and stormwater management objectives established from those sessions have been incorporated as part of this study for Trangie.

Additional community consultation has been conducted by Storm with the following stakeholders:

- Trangie Action Group
- Trangie Local Aboriginal Land Council
- The comments of the above stakeholders have been taken into consideration of the long-term and short-term objective development.

1.4. Stormwater Catchment Values

Stormwater values were developed during one-to-one stakeholder consultations. These values were incorporated into the stakeholder briefing document. The ranking of values was established during the workshops using a combination of individual assessment and consensus gathering. Each participant was given a total of 100 points to allocate to the stormwater values. The facilitators added all points from all stakeholders present to produce the Stormwater Catchment Values, as shown in Table 1-1.

For example, the combined stakeholders of Narromine, Trangie and Tomingley considered good water quality (regulation of supply) to be most important, with protection of community health and safety (from flooding) ranking second. The ranking of water quality as the highest is usual for stormwater values, since water quality can be linked to most other values. The lowest rank values included increased opportunity for recreation and protection of the catchment for tourism.

The ranking of the values will enable Council to establish an 'order of priority' when considering management options for the Stormwater Management Plan. This process is ongoing, and values will change over time. Therefore, the process of development and implementing a Stormwater Management Plan needs to be consultative and dynamic.

Table 1-1: Stormwater Catchment Values

Value	Score
Water quality (regulation of supply)	165
Health and Safety (i.e., flooding)	150
Aesthetics	110
Habitat restoration (i.e. the wetlands)	98
Community awareness	95
Visual amenity	90
Property and asset protection	85
Economic value of stormwater management	75
Natural habitat	65
Reduction of maintenance/cost frequency	60
Stormwater reuse	52
Tourism	30
Recreation	25

1.5. Stormwater Management Objectives

Objectives were developed to assist in achieving the catchment values. A considerable amount of time was spent reviewing objectives at the workshop session (Table 1-2). These objectives are discussed in detail in Section 4.0 of this report.

The objectives are linked to the key values, in order to demonstrate how each objective will help to address stormwater values. These are broken down into short-term objectives, which provide a means to achieving stormwater values in the short-term, and to support longer-term objectives. These may also be called sub-objectives and play an important part in the initial stage of stormwater management in terms of working towards long term objectives. Over time, the short-term objectives will be achieved and replaced by other objectives as the need arises.

Table 1-2: Stormwater Management Objectives

Objective	Score
Optimal infrastructure, management & design	817
Improved community awareness	595
Improved water quality	365
Minimised localised flooding from stormwater	295
Minimise erosion	165
Improvement of aesthetics	110
Protection of aquatic and terrestrial habitats	98
Protection of community health and safety	98

2.0 CATCHMENT DESCRIPTION

Trangie is located in central New South Wales and is a small regional town with an estimated population of about 1200 (year 2016). Located around 220 metres above sea-level in the Macquarie Valley Irrigation Area, Trangie is on the main western railway line and on the Mitchell Highway between Narromine (35 km south east) and Nyngan (90 km north-west). The locality map of Trangie is shown in Figure 2-1.

Trangie is bounded to the north by the Macquarie River and to the south by the Back Water Cowl, a tributary of the Boggy Cowl. Although the Trangie urban catchment area is not subject to frequent flooding, ponding, water stagnation can occur during high flow events.



Figure 2-1: Locality Map of Trangie

2.1. Ecological Description

Goan waterhole is located to the north-east of Trangie and at certain times of the year can be a spectacular display of mosses and water plants and home to many birds. The townscape is dominated by the Trangie silo, which is a testimony to the importance of wheat production in Narromine Shire. There are vast cotton fields outside the town and sheep, wool, sorghum and fat lambs are also important to the area. The area is thought to have been occupied by the Wongaibon Aborigines prior to white settlement. 'Trangie' is an indigenous word said to mean 'quick'.

The town later developed on 'Weemaabah' station, established in the 1830s. The Cobb & Co. Coach service from Dubbo to Bourke passed through the area and stopped at the Swinging Gate Hotel. However, a township did not develop until the railway arrived in 1882. Dubbo to Nevertire local wool producers benefited greatly from the improved transportation.

In 1915, a 4000-ha experimental farm established in Trangie was at the forefront of technological changes which came to the district, driving the expansion of livestock and cropping industries. The Trangie Agricultural Research Centre continues to operate today.

2.2. Waterways

According to the Macquarie River Floodplain Management Plan (Narromine to Oxley Station, 2008), the Trangie urban catchment area is located within the Macquarie River catchment. For the 1990 historical flood, 25% of the Macquarie River peak flow breaks away and flows westward to join Trangie, Cowal and Beleringar/Sandy Creek, thereby providing a natural relief valve for downstream flooding.

The 1990 historical flood event produced a peak flow of 179,000 ML/day at Narromine. The annual exceedance probability (AEP) is estimated at 1.5%, which equivalent to a 1 in 65 year ARI (Average Recurrence Interval) event. On this basis, it is expected that the Trangie urban catchment area is affected by flooding from the Macquarie River for events greater than the 1 in 50 year ARI event.

Storm has undertaken a preliminary 2-dimensional flood assessment for the Trangie catchment using HECRAS-2D. Information adopted for the 2D flood study is listed below:

- LiDAR data, Dandaloo 2012 08 2kmx2km Point Cloud Metadata (Figure 2.2)
- Rainfall Intensity Frequency Duration from Bureau of Meteorology (BOM) The coverage of this dataset is over the Trangie region.
- The 1 metre Digital Elevation Model (DEM) is produced using the TIN (Triangular Irregular Network) method of averaging ground heights to formulate a regular grid. This data set contains the ground surface model in ASCII grid format derived from C3 LiDAR (Light Detection and Ranging) from an ALS50ii (Airborne Laser Scanner). Standard Airborne Laser Sensor (ALS) products are processed to ICSM standards level C3. This data has an accuracy of 0.3m (95% Confidence Interval) vertical and 0.8m (95% Confidence Interval) horizontal with a minimum point density of UNK laser return per square metre measured at nadir. For more information on the data's accuracy, please refer to the lineage provided in the data history.

The direct rainfall method was used to generate rainfall over the Trangie urban catchment area. Figure 2-3 shows the flood depth obtained over the Trangie urban catchment area during 1 in 10-year ARI and 1 in 50-year ARI. Figure 2-4 shows the flood velocities over the catchment during 1 in 10-year ARI and 1 in 50-year ARI. Both Figures 2-3 and 2-4 are for a 2-hour rainfall duration.

The results indicate that the Trangie urban catchment can be split into two sub-catchments, a northern and a southern catchment, which is divided by the topographic ridge between Harris Street and Derribong Street. The northern sub-catchment drains to the Goan waterhole, while the southern sub-catchment discharges to the farmland downstream of the Goan chain of ponds systems. It is noted that part of Trangie, particularly near the western proximity of Links Road also discharges in a westerly direction. Stormwater ponding is expected to occur throughout Trangie during a 1 in 10-year ARI event, with the flood extents continuing to increase for a 1 in 50-year ARI event.

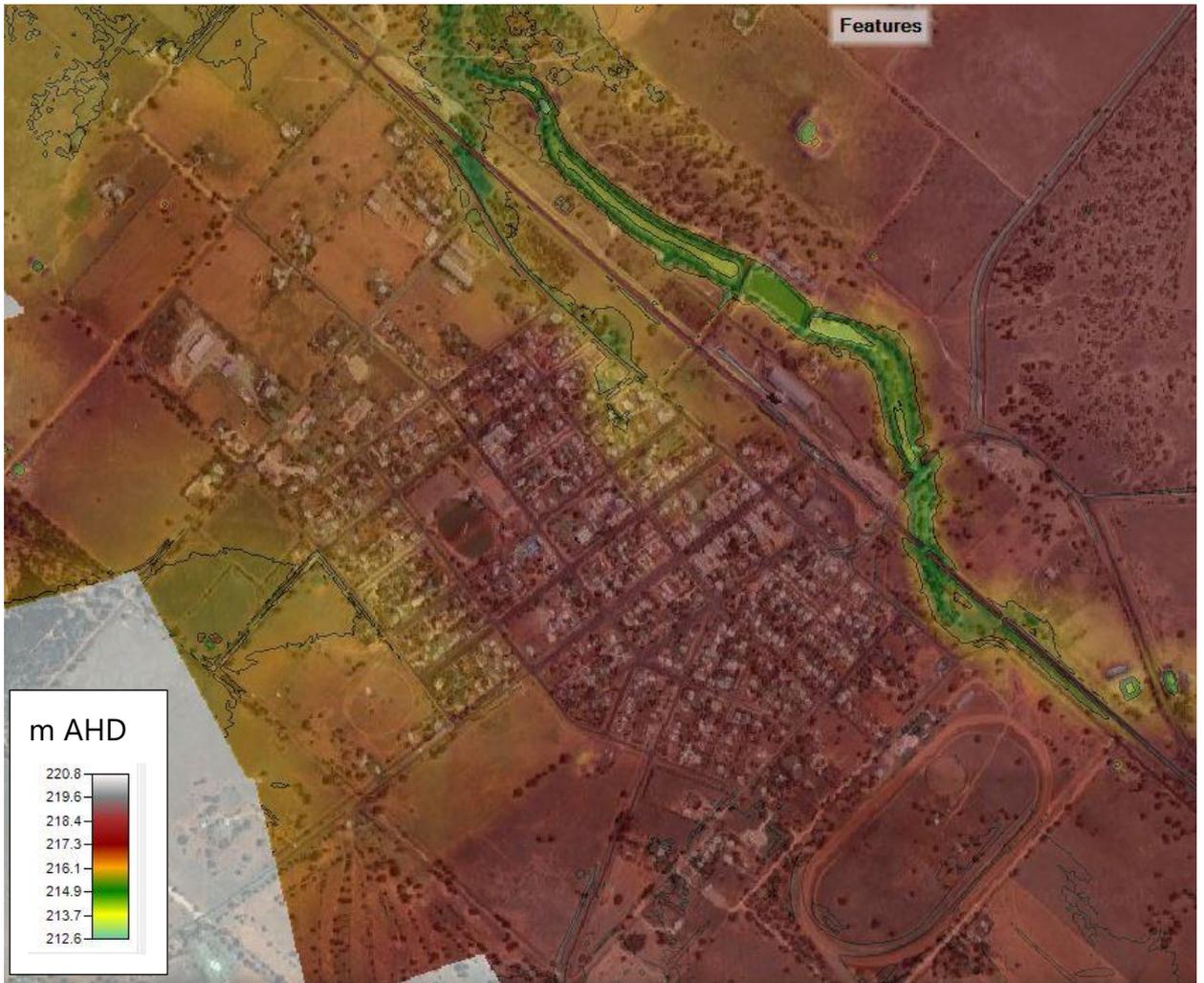


Figure 2-2: LIDAR DEM Data for Trangie Urban Catchment Area

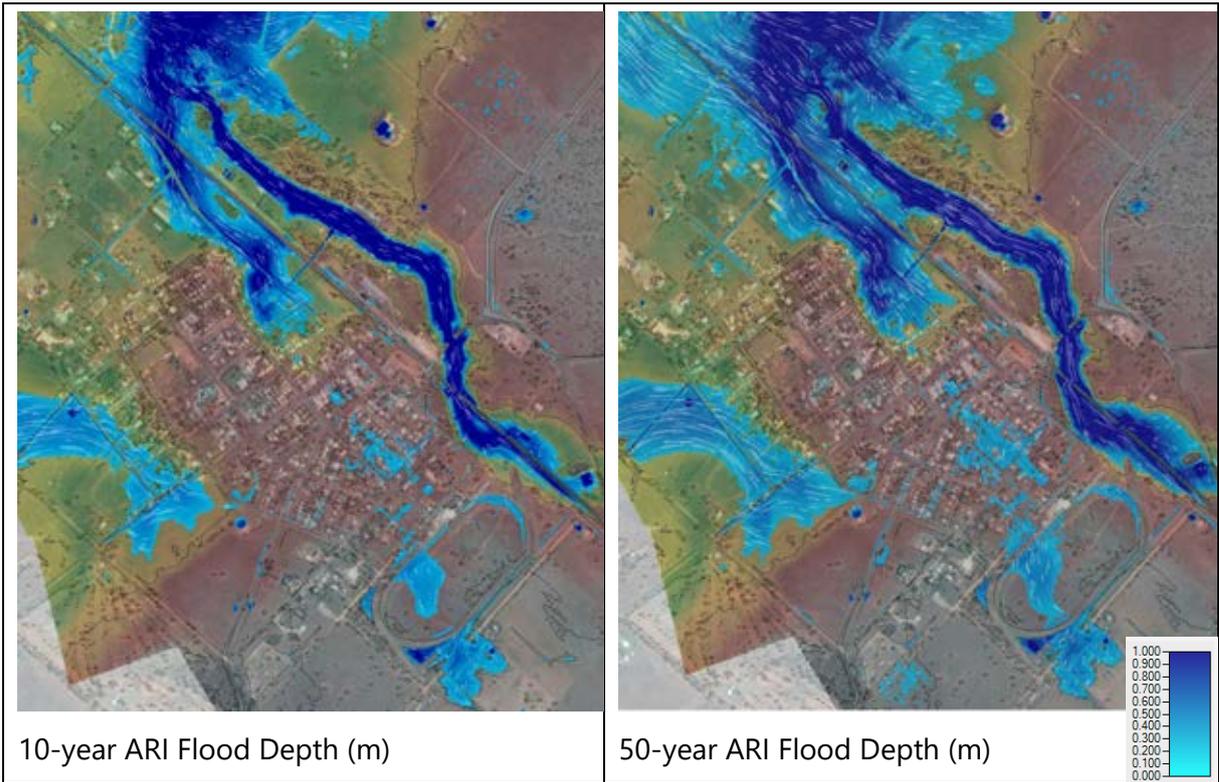


Figure 2-3: Flood Depths for 1 in 10-year and 1 in 50-year events

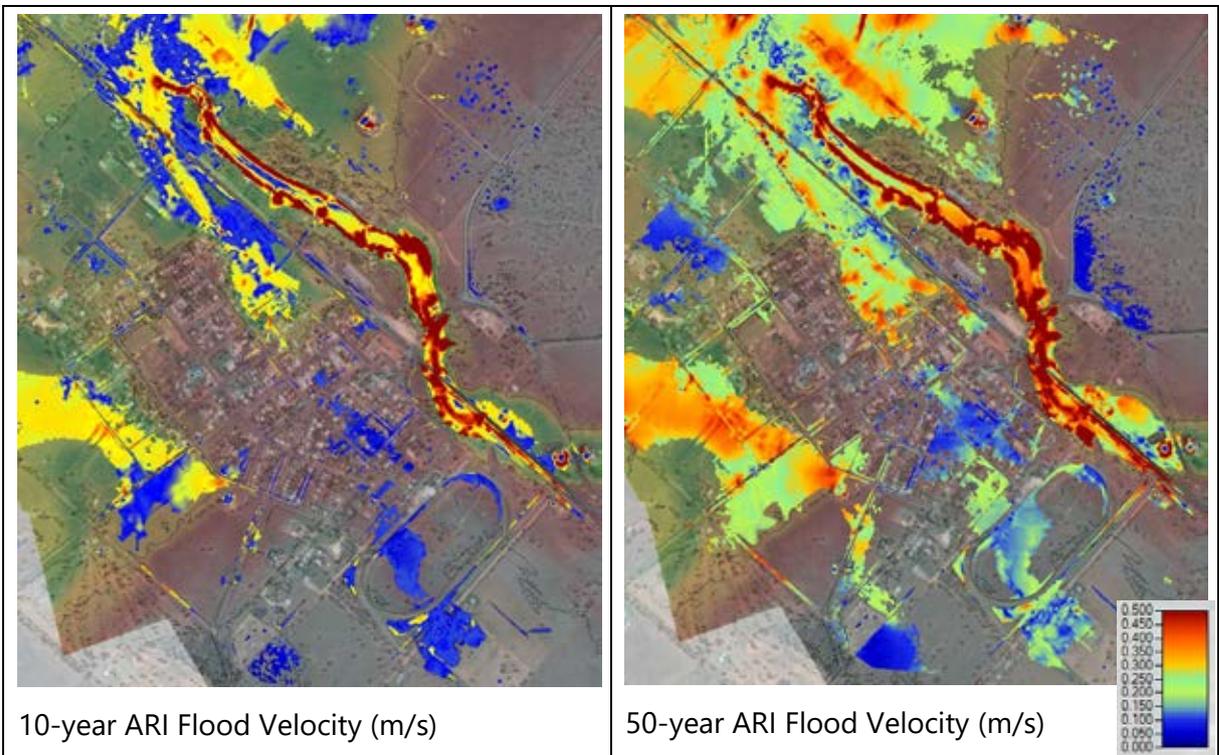


Figure 2-4: Flood Velocities for 1 in 10-year and 1 in 50-year events

2.3. Land use

Land use within the Trangie urban catchment area comprises of low density rural residential development and farm land. The residential areas transit to farm land on the outskirts of the town. Industrial activity is relatively minor and consists of warehouses, fuel depot and the small workshops.

2.4. Topography

Trangie is relatively flat and slopes gently in a north westerly direction. Elevations at the south eastern and north western sections of the town are at about RL 218.5m and RL 216m, respectively.

2.5. Geology and Soils

At many locations, the soils within Trangie are naturally acidic with typical pH values of around 4.5, although soil types vary within the Narromine Shire due to geographic land formations. The backwater Cowal area consists of soils with mainly brown and grey cracking clays, with some yellow solodics, red chromosols and non-calcic browns. The inundated areas to the south and west are mainly solodics. Soils near the Macquarie River are mostly alluvial made up of different layers and various textures. Many of the soils in the Narromine Shire are sodic and this affects their permeability.

2.6. Climate

Climate is an important factor in stormwater management. The average annual rainfall for Trangie is approximately 506 mm. Table 2.1 shows the average annual rainfall and evaporation data collected from the research station at Trangie.

Table 2-1: Average Rainfall and Average Evaporation for Trangie, NSW

Month	Average Rainfall (mm)	Average Evaporation (mm)
January	55.5	9.4
February	50.4	8.4
March	48.6	6.7
April	42.0	4.6
May	39.2	2.6
June	34.2	1.8
July	36.0	1.8
August	33.5	2.6

Month	Average Rainfall (mm)	Average Evaporation (mm)
September	32.0	3.8
October	46.0	5.7
November	43.7	7.7
December	45.2	8.2
Total	506.3	63.3

Source: Bureau of Meteorology, 2000

3.0 CATCHMENT VALUES

3.1. General Ecological Constraints

3.1.1. Database Searches

Searches of several databases were made to identify threatened species and Endangered Ecological Communities (EECs) that may potentially be found on the subject site. Databases were accessed on 10th August 2018, including the following:

- NSW Wildlife Atlas (www.bionet.nsw.gov.au/); and
- Ebird (<https://ebird.org/australia/hotspots>).

3.1.2. Threatened Species

A search of BioNet- NSW Wildlife Atlas was undertaken for records within 5km of Trangie. This yielded only 3 observations in total of 2 threatened species as shown in Figure 3-1. The species recorded are both bird species and unlikely to be disturbed by any works. These species only use urban and peri-urban areas on a temporary basis.

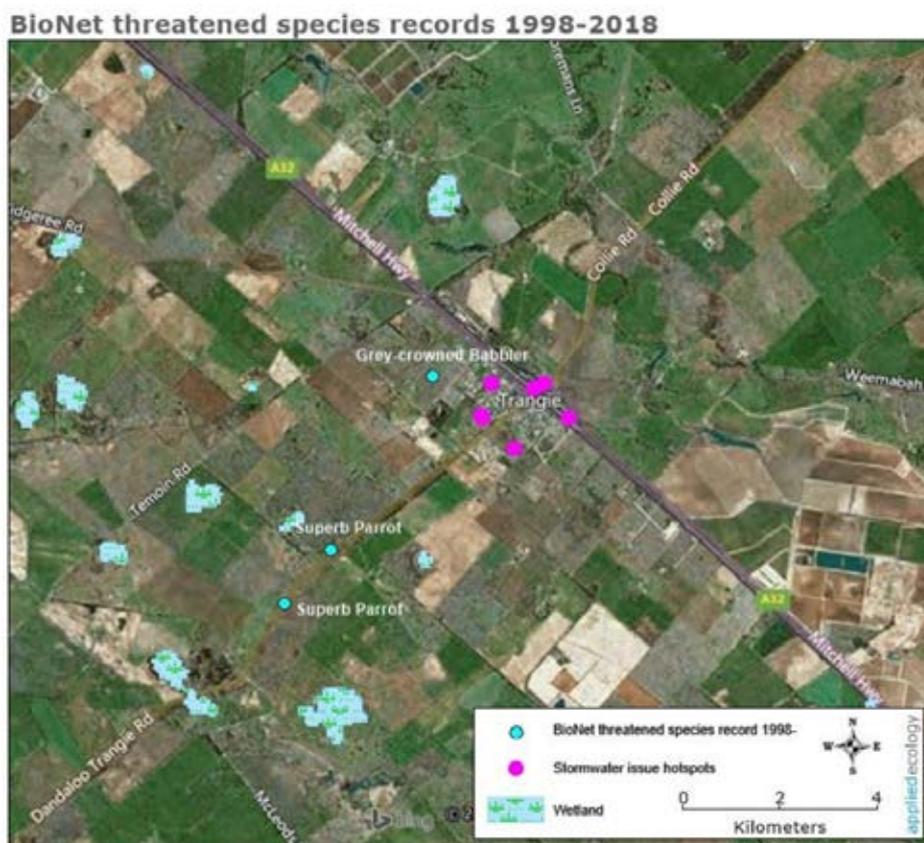


Figure 3-1: Threatened species records (BioNet 1998-2018) near Trangie

A further search was undertaken of the entire LGA. This included searches for migratory species and threatened species and included all valid records of Threatened (listed on TSC Act 1995 & Biodiversity Conservation Act 2016), Commonwealth listed, CAMBA listed, JAMBA listed or ROKAMBA listed entities in Narromine LGA recorded since 1/01/1998 until 10/8/2018. The search returned a total of 234 records of 28 species (Table 3-1).

Table 3-1: Threatened species and listed migratory species, Narromine LGA, BioNet 1998-2018

Class Name	Scientific Name	Common Name	NSW Status	Comm Status	Count
Aves	<i>Anseranas semipalmata</i>	Magpie Goose	V,P		4
Aves	<i>Stictonetta naevosa</i>	Freckled Duck	V,P		2
Aves	<i>Botaurus poiciloptilus</i>	Australasian Bittern	E1,P	E	1
Aves	<i>Circus assimilis</i>	Spotted Harrier	V,P		4
Aves	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V,P	C	1
Aves	<i>Hieraetus morphnoides</i>	Little Eagle	V,P		8
Aves	<i>Lophoictinia isura</i>	Square-tailed Kite	V,P,3		1
Aves	<i>Falco subniger</i>	Black Falcon	V,P		3
Aves	<i>Grus rubicunda</i>	Brolga	V,P		3
Aves	<i>Hydroprogne caspia</i>	Caspian Tern	P	C,J	2
Aves	<i>Polytelis swainsonii</i>	Superb Parrot	V,P,3	V	34
Aves	<i>Ninox connivens</i>	Barking Owl	V,P,3		6
Aves	<i>Tyto novaehollandiae</i>	Masked Owl	V,P,3		2
Aves	<i>Merops ornatus</i>	Rainbow Bee-eater	P	J	15
Aves	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V,P		54
Aves	<i>Chthonicola sagittata</i>	Speckled Warbler	V,P		3
Aves	<i>Grantiella picta</i>	Painted Honeyeater	V,P	V	4
Aves	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V,P		50
Aves	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V,P		3
Aves	<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V,P		6
Aves	<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V,P		1
Aves	<i>Stagonopleura guttata</i>	Diamond Firetail	V,P		1
Mammalia	<i>Phascolarctos cinereus</i>	Koala	V,P	V	1
Mammalia	<i>Petaurus norfolcensis</i>	Squirrel Glider	V,P		2
Mammalia	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V,P		1
Mammalia	<i>Chalinolobus picatus</i>	Little Pied Bat	V,P		13
Mammalia	<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V,P	V	1
Flora	<i>Tylophora linearis</i>		V,P	E	8

3.1.3. Ebird

There are 59 species records at Trangie Park and Goan Waterhole from 10 surveys. This area includes a stormwater hotspot. The majority of these species are recorded post 2016 and are listed below with approximate counts. Details of the species are shown in Table 3-2

Table 3-2: Species Record

Common Name	Count	Common Name	Count
Straw-necked Ibis	200	Eastern Rosella	2
Galah	50	Spiny-cheeked Honeyeater	2
Sulphur-crested Cockatoo	50	Striated Pardalote	2
Little Corella	40	Ground Cuckoo-shrike	2
Eurasian Coot	30	Magpie-lark	2
Fairy Martin	20	crow/raven sp.	2
Common Starling	16	Pink-eared Duck	1
Pacific Black Duc	14	Australasian Grebe	1
Australian Shelduck	10	Little Pied Cormorant	1
Noisy Miner	10	Australasian Darter	1
White-plumed Honeyeater	10	White-necked Heron	1
Black Swan	8	White-faced Heron	1
Australian Magpie	6	Black-shouldered Kite (Australian)	1
Apostlebird	6	Brown Goshawk	1
House Sparrow	5	Whistling Kite	1
Australian White Ibis	4	Laughing Kookaburra	1
Red-rumped Parrot	4	Australian Hobby	1
Grey-crowned Babbler	4	Blue-faced Honeyeater	1
Little Crow	4	Striped Honeyeater	1
Welcome Swallow	4	Grey Butcherbird	1
Yellow-billed Spoonbill	3	Pied Butcherbird	1
Black Kite	3	Black-faced Cuckooshrike	1
Masked Lapwing	3	Olive-backed Oriole	1
Yellow-throated Miner	3	Willie Wagtail	1
Australian Wood Duck	2	Little Raven	1
Grey Teal	2	White-winged Chough	1
Hardhead	2	Mistletoebird	1

Common Name	Count	Common Name	Count
Australian Pelican	2	Sacred Kingfisher	2
Rock Dove	2	Nankeen Kestrel	2
Crested Pigeon	2	Australian Ringneck	2

3.1.4. Vegetation Communities

Over-cleared Landscapes

The stormwater hotspots are all located on over-cleared landscapes (Figure 3-2).

Overcleared Landscapes - Mitchell Landscapes v31

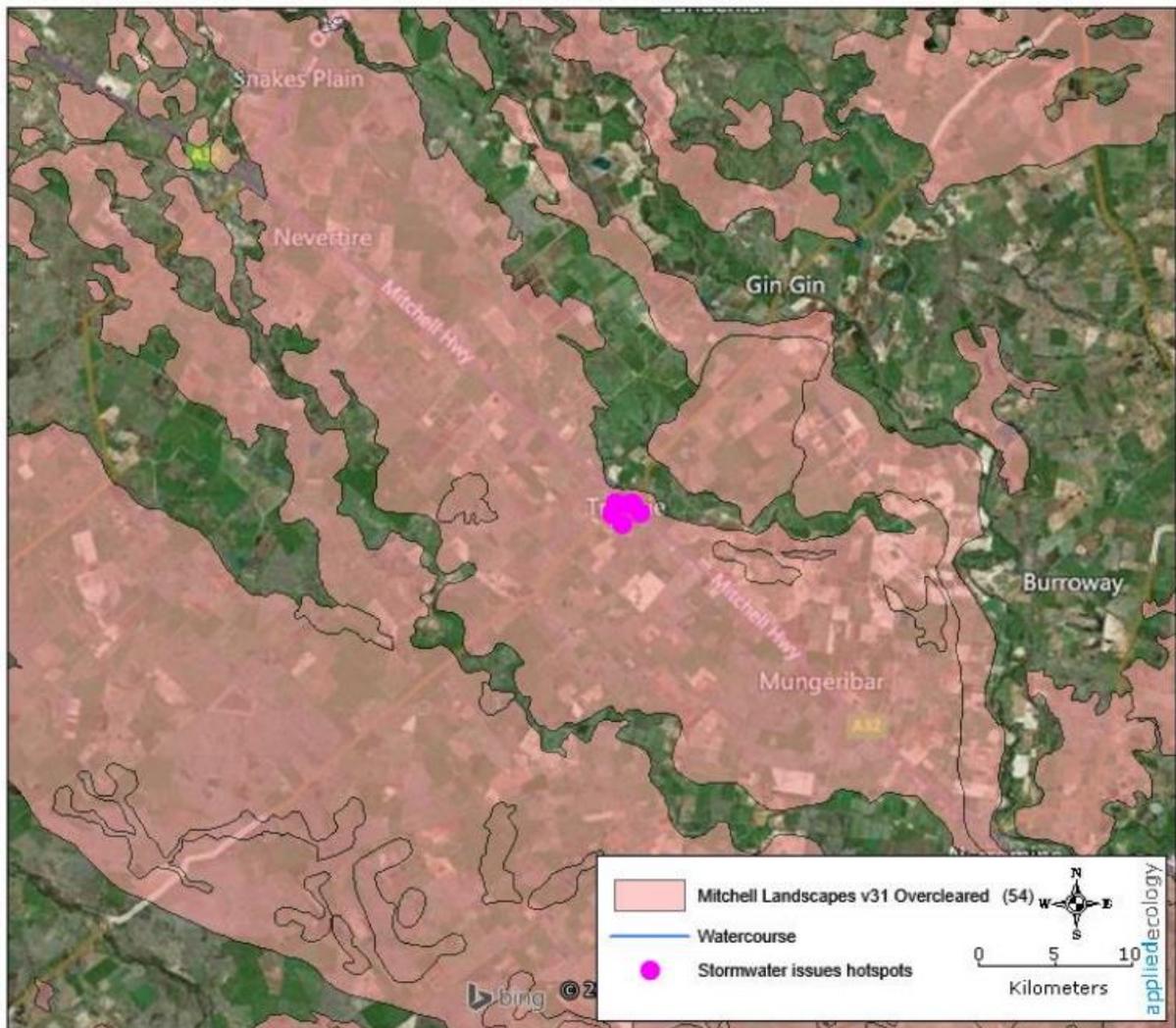


Figure 3-2: Over-cleared landscape mapping - Mitchell landscapes v31

3.1.5. Endangered Ecological Communities

Several of the stormwater hotspots identified are located near areas of remnant Endangered Ecological Communities, including Weeping Myall Woodland and Inland Grey Box Woodland (Figure 3-3).

Vegetation Communities (PCT) OEH VIS 4468

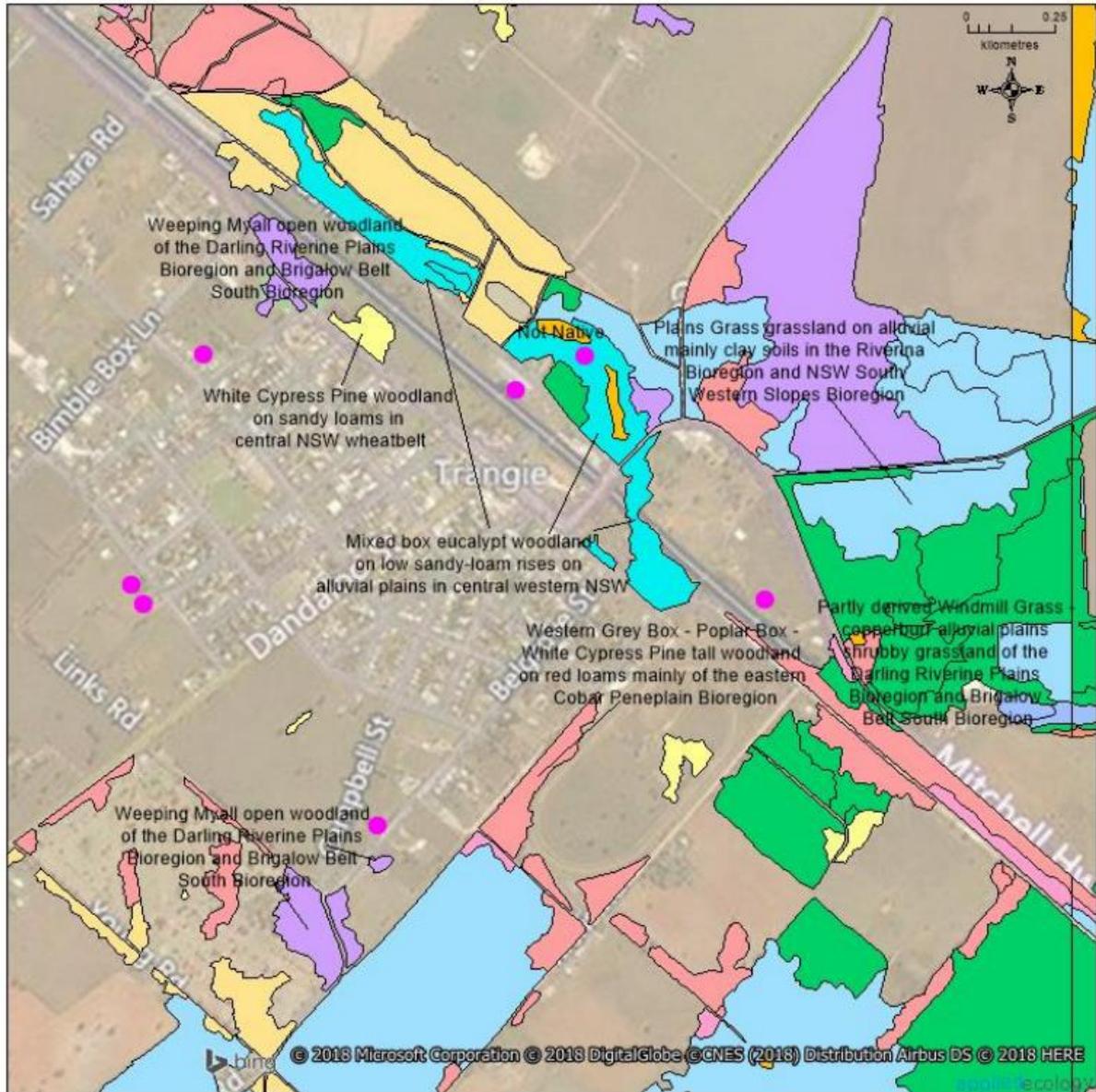


Figure 3-3: Plant Community types from Vis 4468 mapping (OEH 2017)

Based on the results of literature and database searches there are no major constraints associated with threatened species or endangered ecological communities. Goan waterhole provides a local fauna hotspot, with a concentration of records of avian fauna from this location.

Works at sites that drain to this location may have an impact on these birds. Works at several other sites have some potential to impact on an endangered ecological community. All the vegetation communities in the area are associated with over-cleared landscapes and should be considered with the precautionary principle in mind.

Stormwater hotspots were inspected on 21st July 2018 to gain a more detailed understanding of site specific constraints. The results of these surveys are provided in the following sections of this report.

3.2. Community Consultation

It should be noted that the scoring results from the previous Narromine Stormwater Management report has been included in this ranking of values as well. This means that the scores allocated include those from the stakeholders of Narromine, Trangie, Tomingley and the Trangie Local Aboriginal Land Council.

Table 3-3: Stakeholder Scoring Sheet

Stakeholder Number	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Property and asset protection	120	10	20	15	20	15	10	20	20	20	5	10	10	10	10	10
Water Quality	205	20	5	10	10	15	15	30	5	10	25	5	10	10	10	10
Health and Safety	190	5	0	5	10	10	5	5	20	10	15	10	10	10	10	10
Community awareness	135	10	20	5	8	10	5	10	20	5	0	5	5	5	5	4
Habit restoration (esp. the wetlands)	117	5	5	10	10	5	10	5	20	10	10	20	10	10	10	8
Aesthetics	148	10	10	10	0	20	5	0	0	5	10	20	5	5	5	5
Visual amenity	110	0	5	0	0	5	0	0	0	5	5	10	5	5	2	4
Tourism	46	5	0	5	10	5	20	0	5	5	5	0	5	5	5	5
Reduction of maintenance cost/frequency	80	0	0	5	0	5	0	0	0	5	5	5	10	5	1	5
Recreation	46	5	5	5	5	5	0	20	5	5	5	5	5	10	5	10
Natural habitat	95	5	5	15	10	0	20	0	0	5	5	10	5	5	5	5
Economic value of stormwater management	95	10	10	10	10	0	10	10	5	10	10	0	10	10	8	10
Stormwater reuse	123	15	15	5	7	5	0	0	0	5	0	0	10	10	10	10

The total scores for each stormwater value are listed in Table 3-4.

Table 3-4: Total Stormwater Catchment Values

Value	Total
Water Quality	205
Health and Safety	190
Aesthetics	148
Community awareness	135
Stormwater reuse	123
Property and asset protection	120
Habit restoration (esp. the wetlands)	117
Visual amenity	110
Natural habitat	95
Economic value of stormwater management	95
Reduction of maintenance cost/frequency	80
Recreation	46
Tourism	46

In summary, the stakeholders consider water quality to be the most important factor followed by health and safety, while the lowest ranked values included recreation and tourism. Council also noted the need to upgrade the local stormwater drainage system. Other values including property and asset protection, visual amenity and reduction of maintenance cost/frequency are also listed in the table.

4.0 STORMWATER MANAGEMENT OBJECTIVES

4.1. Introduction

Consultation with Council on the 30/06/18 indicated that the primary objective for stormwater management in Trangie is to improve the efficiency of the drainage system. Stormwater hotspots raised by the local community and Council have been inspected on site. A list of the long-term and short-term objectives is summarised in Table 4-1.

Table 4-1: Connection between long-term/short-term to stormwater values

Long Term (Overriding Objectives)	Short Term (Sub-objectives)	Link to Values
Improve Water Quality		
To improve and maintain water quality within ANZECC guidelines	<ul style="list-style-type: none"> • To reduce the amount of litter entering waterways, especially from the CBD. • To reduce the risk of contaminated run-off entering waterways from the CBD. • To reduce the levels of nutrients entering Trangie. • To reduce the amount of siltation in the waterhole. 	<ul style="list-style-type: none"> • Water quality • Visual amenity
Minimise Erosion		
To minimise the impact of erosion on property and the environment	<ul style="list-style-type: none"> • To enforce the correct procedure for erosion control on new development sites. • To reduce the number of unsealed road verges susceptible to erosion. • To reduce the incidence of river and stream bank erosion. 	<ul style="list-style-type: none"> • Water quality • Natural habitats • Reduction in maintenance cost/frequency

Long Term (Overriding Objectives)	Short Term (Sub-objectives)	Link to Values
	<ul style="list-style-type: none"> To reduce erosion caused by stormwater outlets into the creeks. 	
Improve Aesthetics of the Catchment		
To improve the aesthetics of the stormwater system	<ul style="list-style-type: none"> Reduce odour and algae problems due to stagnant stormwater 	<ul style="list-style-type: none"> Aesthetics Health and safety
Protection of Aquatic and Terrestrial Habitats		
To ensure that the stormwater system does not impact on aquatic and terrestrial habitats	<ul style="list-style-type: none"> Reduce sedimentation around stormwater outlets. Improve water quality, especially regarding silt and litter around stormwater outlets. Reduce weed introduction in creeks through stormwater channels 	<ul style="list-style-type: none"> Water quality Natural habitat Habitat restoration Recreation
Ensure Community Health and Safety		
To ensure that public health and safety is not compromised by the stormwater system	<ul style="list-style-type: none"> Minimise opportunities for mosquito breeding in stagnant water. Monitor and reduce the impact of septic 	<ul style="list-style-type: none"> Health and safety
Increase Community Awareness		
To improve community awareness, education and involvement in stormwater management	<ul style="list-style-type: none"> Implement public education programs to increase public awareness and ownership 	<ul style="list-style-type: none"> Stormwater reuse Community awareness
Optimal Infrastructure Planning and Management		
Ensure stormwater and other infrastructure is designed, planned and managed to reduce impacts on property, public health and the environment	<ul style="list-style-type: none"> Improve maintenance of stormwater infrastructure. Ensure that the SMP is compatible with other Management Plans. 	<ul style="list-style-type: none"> Reduction in maintenance cost/frequency Economic value of stormwater management

Long Term (Overriding Objectives)	Short Term (Sub-objectives)	Link to Values
Localised Flooding		
To ensure that stormwater does not inundate properties and roads.	<ul style="list-style-type: none"> To minimise localised flooding by improving stormwater management and maintenance. 	<ul style="list-style-type: none"> Property and asset protection.

4.2. Management Objectives

Management objectives have been developed to protect the 'high priority' catchment values of the stormwater system and its catchment. These include both 'long-term' commitments in principle (a 'vision' for the catchment) and 'short-term', quantifiable objectives to help form the basis of actions to be incorporated in the stormwater strategies. The project objectives are scored by linking to the corresponding values shown in Table 4-2. The final ranking for the stormwater objectives is shown in Table 4-3.

Table 4-2: Score for the Stormwater Objectives

Objectives	Linked values and their scores	Total Score
Improved water quality	<ul style="list-style-type: none"> Water quality (205) Aesthetics (148) Stormwater reuse (123) Recreation (46) 	522
Minimise erosion	<ul style="list-style-type: none"> Water quality (205) Habitat restoration (esp. the wetland) (117) 	322
Improvement of aesthetics	<ul style="list-style-type: none"> Aesthetics (148) 	148
Protection of aquatic and terrestrial habitats	<ul style="list-style-type: none"> Habitat restoration (esp. the wetland) (117) 	117
Protection of community health and safety	<ul style="list-style-type: none"> Health and safety (190) 	190
Improved community awareness	<ul style="list-style-type: none"> Water quality (205) Community awareness (135) Habitat restoration (esp. the wetland) (117) Visual amenity (110) Tourism (46) Natural habitat (95) Stormwater reuse (123) 	831

Objectives	Linked values and their scores	Total Score
Optimal infrastructure, management & design	<ul style="list-style-type: none"> • Water quality (205) • Health and safety (190) • Aesthetics (148) • Visual amenity (110) • Tourism (46) • Reduction of maintenance cost/frequency (80) • Economic value of stormwater management (95) • Property and asset protection (120) • Stormwater reuse (123) 	1117
Minimised localised flooding from stormwater	<ul style="list-style-type: none"> • Health and safety (190) • Reduction of maintenance cost/frequency (80) • Property and asset protection (120) 	390

Table 4-3: Ranking for Stormwater Objectives

Objectives	Score	Rank
Optimal infrastructure, management & design	1117	1
Improve community awareness	831	2
Improve water quality	522	3
Minimise localised flooding from stormwater	390	4
Minimise erosion	322	5
Protect community health and safety	190	6
Improve aesthetics	148	7
Protect aquatic and terrestrial habitats	117	8

5.0 STORMWATER MANAGEMENT ISSUES

Table 5-1 shows a list of stormwater issues and possible causes, which incorporate the results from the Trangie local community, Narromine Shire Council and the Trangie Local Aboriginal Land Council. Onsite observations obtained during the site meeting with Narromine Shire Council on the 07/06/17 were also taken into consideration. The total scores given to each identified issue are listed in Table 5-2. These issues are linked to their objectives in Table 5-3.

In Table 5-3, the potential impact and frequency of occurrence of each issue is also listed. It is noted that this information is later adopted in deriving the benefit cost index for the selected options in Section 7.

Table 5-1: Stormwater Issues and Causes for Trangie Urban Catchment Area

Issues	Causes
Water Quality	
Nutrients	<ul style="list-style-type: none"> Fertilizer runoff from gardens and farms Runoff from public toilets – stormwater infiltration Possible large nutrient store at old stockyards
Salinity	<ul style="list-style-type: none"> Nature of soil Soil strip related
Erosion	
Creek bank erosion	<ul style="list-style-type: none"> Erosion associated with the river system
Aquatic & Terrestrial Habitats	
Weeds	<ul style="list-style-type: none"> Weeds block drains Agriculture plant pests introduced through the stormwater system
Impact on habitats	<ul style="list-style-type: none"> Changed habitat conditions Accumulated rubbish after floods
Health & Safety	
Mosquito breeding	<ul style="list-style-type: none"> Stagnant water Mosquitoes in creek – kids use creek to bathe in
Community Awareness	
Lack of community awareness	Lack of awareness

Issues	Causes
Planning Issues	
Access	<ul style="list-style-type: none"> • Difficult access to drains for maintenance
Flooding	
Localised flooding due to stormwater impacts	<ul style="list-style-type: none"> • Low lying flat ground, lack of slope • Insufficient drainage capacity • Blocked underground drainage which feeds into open grassed drains, which stops the flow of stormwater. • Old infrastructure • Insufficient capacity of culverts • Insufficient pipe size

Table 5-2: Total Scores for Stormwater Issues

Linked Issues	Objectives and their scores	Total Score
Nutrients and Salinity	<ul style="list-style-type: none"> • Improve water quality (522) • Improve aesthetics (148) • Protect aquatic and terrestrial habitats (117) • Protect community health and safety (190) 	977
Creek bank erosion	<ul style="list-style-type: none"> • Improve water quality (522) • Minimise erosion (322) • Protect aquatic and terrestrial habitats (117) 	961
Weeds and Impact on habitats	<ul style="list-style-type: none"> • Improve aesthetics (148) • Protect aquatic and terrestrial habitats (117) 	265
Impact on natural species	<ul style="list-style-type: none"> • Protect aquatic and terrestrial habitats (117) 	117
Mosquito breeding	<ul style="list-style-type: none"> • Protect community health and safety (190) 	190
Insufficient feedbacks from community consultation	<ul style="list-style-type: none"> • Improve community awareness (831) 	831
Localised flooding due to flat terrain and difficult design constrains	<ul style="list-style-type: none"> • Optimal infrastructure, management & design (1117) • Minimise localised flooding from stormwater (390) • Improve aesthetic (148) 	1655
Ponding due to flat terrain	<ul style="list-style-type: none"> • Optimal infrastructure, management & design (1117) • Minimise localised flooding from stormwater (390) 	1655

Linked Issues	Objectives and their scores	Total Score
	<ul style="list-style-type: none"> Improve aesthetic (148) 	

Table 5-3: Stormwater Issue Scores (impact) for the Urban Areas of Trangie

Issue	Score	Impact	Frequency
Localised flooding due to lack of infrastructure	1655	5	2
Stagnant water due to flat terrain	1655	5	4
Nutrients and Salinity	977	3	3
Creek bank erosion	961	3	2
Insufficient feedbacks from community consultation	831	3	5
Weeds and Impact on habitats	265	2	5
Mosquito breeding	190	2	3
Impact on natural species	117	1	5

6.0 STORMWATER MANAGEMENT OPTIONS

Stormwater management options were developed in consultation with Narromine Shire Council and other stakeholders. Options were linked to Stormwater issues and Objectives. The issue with higher scores represent higher concerns from the local community. Some preliminary options are listed in Table 6-1. The detailed stormwater treatment strategies are discussed in Section 7.

Table 6-1: Stormwater Issues and Objectives and their link to Stormwater Management Options for Trangie Urban Catchment

Issue	Cause	Objectives	*Score of Issues	Options
Localised flooding due to lack of infrastructure	<ul style="list-style-type: none"> Lack of kerb & gutter and underground drainage system Flat terrain, lack of slope 	<ul style="list-style-type: none"> Optimal infrastructure, management & design (1117) Minimise localised flooding from stormwater (390) Improve aesthetic (148) 	1655	<p>Encourage stormwater retention policies for future development</p> <p>Apply kerb & gutter and underground drainage system to Trangie urban area</p>
Stagnant water due to flat terrain	<ul style="list-style-type: none"> Flat terrain, lack of slope Lack of infrastructure and street drainage system such as kerb & gutter or table drain 	<ul style="list-style-type: none"> Optimal infrastructure, management & design (1117) Minimise localised flooding from stormwater (390) Improve aesthetic (148) 	1655	<p>Encourage stormwater retention policies for future development</p> <p>Apply underground infiltration system</p>
Nutrients and Salinity	<ul style="list-style-type: none"> Fertilizer runoff from gardens and farms Lack of treatment of stormwater runoff 	<ul style="list-style-type: none"> Improve water quality (522) Improve aesthetics (148) Protect aquatic and terrestrial habitats (117) Protect community health and safety (190) 	977	<p>Apply stormwater quality treatment such as wetland or bioretention to Goan waterhole</p>
Creek bank erosion	<ul style="list-style-type: none"> Lack of scour protection to the stormwater pipe outlet Lack of scour protection to the creek bed/bank 	<ul style="list-style-type: none"> Improve water quality (522) Minimise erosion (322) Protect aquatic and terrestrial habitats (117) 	961	<p>Apply riverbank/bed protection measures</p>

Issue	Cause	Objectives	*Score of Issues	Options
Insufficient feedbacks from community consultation	<ul style="list-style-type: none"> Lack of community awareness on stormwater issues 	<ul style="list-style-type: none"> Improve community awareness (831) 	831	Implement community education program in terms of stormwater issues and impacts
Weeds and Impact on habitats	<ul style="list-style-type: none"> Water ponding along street strip due to uneven finished surface 	<ul style="list-style-type: none"> Improve aesthetics (148) Protect aquatic and terrestrial habitats (117) 	265	Remove weeds and apply native vegetation
Mosquito breeding	<ul style="list-style-type: none"> Stagnant water 	<ul style="list-style-type: none"> Protect community health and safety (190) 	190	Apply kerb & gutter and underground drainage system to Trangie urban area Apply underground infiltration system
Impact on natural species			117	

* Score of issues – the higher the score, the higher the priority that these issues are fixed, according to residents' feedback

7.0 STORMWATER MANAGEMENT OPTIONS CATEGORIES

Stormwater management options proposed for Trangie are classified under the following categories: Natural Processes, Source Control and Structural Options. Natural Processes and Source Control options are discussed in Sections 7.1 and 7.2, respectively. The structural options are listed and ranked in Table 7.1. Additional details for these options are shown in Section 8.

7.1. Natural Processes

Many of the stormwater issues in Trangie, such as weed overgrowth and creek erosion are caused by local development. Weed overgrowth issues have been raised by local communities and observed during the site inspection at several locations around Trangie. Weeds out-compete native vegetation communities, blocked stormwater flow, and may reduce habitat for native animals. Creek bank and bed erosion issues were observed in the creek channel between Saleyards Road and Goan waterhole. These issues can be mitigated by applying natural processes such as native vegetation and creek bank rehabilitation works.

7.2. Source Control

Source control is often the most cost-effective way to manage stormwater since it is far easier to prevent pollutants entering the system instead of removing the pollutants from the downstream system. Source control options identified in Trangie include a range of educational program, operational, and planning actions

Community education is a process of enhancing people's knowledge, understanding and skills. Applying suitable educational programs regarding stormwater quality source control can help to reduce the amount of pollutants entering the stormwater system.

Stormwater re-use and detention systems can reduce the volume and rate of stormwater runoff attributed to increased impervious areas from land development. By encouraging the developers and new land owners to install measures such as rainwater tanks and OSDs (on-site detention), the peak flow and overall nutrients from stormwater runoff can be reduced.

7.3. Structural Options

Several hotspots have been identified in the Trangie area with stormwater issues such as stagnant water and weed overgrowth. These issues were caused by the flat local terrain and uneven road verge gradings which cannot be easily be solved by applying non-structural options.

Table 7-1: Structural Options

Location	Description	Issues	Options
1	Intersection of Harris Street & Enmore Street	Stagnant water	Apply underground absorption trench at verge of intersection (Harris Street & Enmore Street)
2	Intersection of Bimble Box Ln & Mitchell Hwy	Algae, spike-rush and stagnant water	Create a swale and wetland system at Mitchell Hwy near the intersection of Bimble Box Ln & Mitchell Hwy
3	Southern side of Mungery Street between Mullah Street and Swift Street	Stagnant water	Re-grade the swale channel and let it naturally drain to the dam
4	Intersection of Dandaldo Street & Mungery Street	Stagnant water	Apply underground absorption trench at verge
5	Belgrove Street, between Campbell Street and Nicholas Street	Stagnant water	Apply kerb & gutter system and install an absorption trench at the road low point (verge)
Reach 1*	Creek/Concrete channel between Narromine Street and Saleyards Road	Stormwater outlet blockage issue	Apply regular maintenance to remove the sediment and pipe outlet blockage
Reach 2*	Creek channel between Saleyards Road and Goan Waterhole	Creek bank/bed erosion issue	Apply creek bed/bank erosion protection measures
Outlet 1*	Stormwater Culverts to Saleyards Road	Stormwater outlet scouring issue	Apply scour protection measures at stormwater outlets
Outlet 2*	Stormwater Culverts to Waterhole	Stormwater outlet scouring issue	Apply scour protection measures at stormwater outlets

*Photos of Reach 1,2 and Stormwater Outlet 1,2 are shown in Figure 7-2 to 7-5



Figure 7-1: Locations of the Stormwater Channel, Creek Reaches and Outlets



Figure 7-2: Existing Stormwater Outlet 1



Figure 7-3: Existing Stormwater Outlet 2



Figure 7-4: Existing Stormwater Reach 1



Figure 7-5: Existing Stormwater Reach 2

7.4. Evaluate Options

The options proposed in Table 7-1 are evaluated on the basis of their benefits and costs. The methodology developed from the NSW Environment Protection Authority (1997) has been implemented in assessing the options. The benefit index includes consideration of the environment impact, social impact, effectiveness, and ease of implementation.

7.4.1. Environmental Impact

The ecological values and constraints for Trangie have been assessed in Section 3. The environmental impact of each option has been assessed against the ecological constraints. The environmental impact weighting has been scaled from 5 to 1, with 5 having the most positive impact on the environment, and 1 having the least positive impact on the environment (Table 7-2)

Table 7-2: Environmental Impact Score

Impact	Weighting
Significantly beneficial to the overall environment	5
Significantly beneficial to the local environment or beneficial to the overall environment	4
Beneficial to the local environment or moderately beneficial to the overall environment	3
Moderately beneficial to the local environment	2
Minimum beneficial to the environment	1

7.4.2. Community Consultation

Table 7-3 shows the benefit index from the score of the community consultation that has been analysed in Section 6. The ranking of the proposed options based on the benefit-cost ratio is shown in Table 7-4. The ranking of the detail options is shown in Table 7-5. Table 7-5 forms the basis for the implementation strategy established in Section 8.

Table 7-3: Community Consultation Score

Issue Score	Community Consultation
<400	Low (1)
400-800	med-low (2)
800-1200	Med (3)
1200-1600	med-high (4)
>1600	High (5)

Table 7-4: Ranking for the Proposed Options based on Benefit Cost Ratio

Option	Cost (20 years Capital + Maintenance)	Benefit Factor				Benefit Cost Ratio	Ranking
		Effectiveness*	Impact on native vegetation and indigenous species	Community Consultation	Benefit Index		
1	\$10,000	med (3)	neutral (3)	high (5)	11	1.100	1
2	\$36,000 (\$16,000 Capital + \$500/a)	med (3)	neutral (3)	high (5)	11	0.306	7
3	\$30,000 (\$10,000 Capital + \$500/a)	med (3)	neutral (3)	high (5)	11	0.367	5
4	\$42,000 (\$22,000 Capital + \$1000/a)	med-high (4)	neutral (3)	med (3)	10	0.238	8
5	\$50,000 (\$40,000 Capital + \$500/a)	med (3)	neutral (3)	high (5)	3	0.060	18
6	\$50,000 (\$5,000/a)	med-high (4)	neutral (3)	med (3)	4	0.080	17
7	\$6,000	med-low (2)	neutral (3)	med (3)	2	0.333	6
8	\$100,000 (\$80,000 Capital + \$1,000/a)	med-high (4)	neutral (3)	med (3)	4	0.040	20
9	\$120,000 (\$100,000 Capital + \$1,000/a)	High (5)	beneficial (5)	med (3)	5	0.042	19

Option	Cost (20 years Capital + Maintenance)	Benefit Factor				Benefit Cost Ratio	Ranking
		Effectiveness*	Impact on native vegetation and indigenous species	Community Consultation	Benefit Index		
10	\$39,000 (\$19,000 Capital + \$1,000/a)	med-high (4)	beneficial (5)	med (3)	4	0.103	15
11	\$30,000 (\$20,000 Capital + \$500/a)	med-high (4)	beneficial (5)	med (3)	4	0.133	13
12	\$14,000 (\$10,000 Capital + \$200/a)	med (3)	beneficial (5)	med (3)	3	0.214	9
13	\$8,000 (\$4,000 Capital + \$200/a)	med (3)	beneficial (5)	med (3)	3	0.375	4
14	\$5,000	med-low (2)	neutral-beneficial (4)	med (3)	2	0.400	3
15	\$15,000 (\$5,000 Capital + \$500/a)	med (3)	neutral-beneficial (4)	low (1)	3	0.200	11
16	\$19,000 (\$9,000 Capital + \$500/a)	med-high (4)	neutral-beneficial (4)	low (1)	4	0.211	10
17	\$25,000	med (3)	neutral (3)	low (1)	3	0.120	14
18	\$45,000	med-high (4)	neutral (3)	low (1)	4	0.089	16
19	\$16,000	med (3)	neutral (3)	low (1)	3	0.188	12

Option	Cost (20 years Capital + Maintenance)	Benefit Factor			Benefit Cost Ratio	Ranking
		Effectiveness*	Impact on native vegetation and indigenous species	Community Consultation		
20	\$9,000 (\$5,000 Capital + \$200/a)	med-high (4)	neutral (3)	low (1)	0.444	2

*Effectiveness of each treatment measure has been analysed based on the hydraulic impact and efficiency

Table 7-5: Ranking Details for the Proposed Options

Issue/Causes	Options	Option Number	Ranking
Localised flooding due to: <ul style="list-style-type: none"> Lack of kerb & gutter and underground drainage system Flat terrain, lack of slope 	Encourage stormwater retention policies for future development	1	1
	Stagnant water due to: <ul style="list-style-type: none"> Flat terrain, lack of slope Lack of infrastructure and street drainage system such as kerb & gutter or table drain 	Apply underground infiltration system	2
Re-grad the swale channel to let the stagnant water drain to the dam		3	5
Apply kerb & gutter system and install an absorption trench at the road low point		4	8
Nutrients and Salinity due to:	Clean the outlet stormwater culverts to let the stagnant water freely pass through the culverts	5	18
	Residents' education program in relation to fertiliser use	6	17
		7	6

Issue/Causes	Options	Option Number	Ranking
<ul style="list-style-type: none"> Fertilizer runoff from gardens and farms Lack of treatment of stormwater runoff 	Create a swale and wetland system at Mitchell Hwy near the intersection of Bimble Box Ln & Mitchell Hwy	Site 2	20
	Create a swale along the southern side of Mungery Street and converting the existing pond into a wetland	Site 3	19
	Create a vegetated swale along Reach 2 and converting Goan Waterhole into a wetland	Reach 2	15
	Apply riverbank/bed protection measures	Reach 2	13
	Apply stormwater outlet scouring protection measures	Outlet 1	9
<ul style="list-style-type: none"> Insufficient feedback from community consultation due to <ul style="list-style-type: none"> Lack of community awareness on stormwater issues 	Implement community education program in terms of stormwater issues and impacts	14	3
	Remove weeds and apply native vegetation	Site 2	11
		Site 3	10
<ul style="list-style-type: none"> Weeds and Impact on habitats due to: <ul style="list-style-type: none"> Water ponding along street strip Uneven finished surface Mosquito breeding due to: <ul style="list-style-type: none"> Stagnant water 	Apply kerb & gutter and underground drainage system to Trangie urban area	Site 1	14
		Site 3	16
		Site 4	12

Issue/Causes	Options	Option Number	Ranking
	Clean the blocked culverts under the driveway and redefine the driveway	Site 5 20	2

The option number and ranking shown in this Table correspond to those in Table 7.4

8.0 IMPLEMENTATION STRATEGIES

Implementation strategies developed from the proposed stormwater management options in Section 7 take into account the stormwater values and objectives described in Sections 3 and 4. Based on the evaluation process in Section 7, these options have been developed into an Implementation Strategy, taking into account budgets, responsibility and timeframe. The implementation strategy is outlined in Table 8.1 below.

Table 8-1: Implementation Strategy

Action	Benefit Cost Ranking	Timeframe/Responsibility	Group Assisting Implementation
Option 1 <ul style="list-style-type: none"> Encourage stormwater retention policies for future development 	1	2020/Council	Council to engage consultants to develop Stormwater Management Policies in Development Control Plan for Narramine Shire Council
Option 20 <ul style="list-style-type: none"> Clean the blocked culverts under the driveway and redefine the driveway for Site 5 	2	2020/Council	N/A
Option 14 <ul style="list-style-type: none"> Residents' education program in relation to fertiliser use 	3	2020/Council	Council to engage consultants to develop workshop and relevant training materials
Option 13 Apply stormwater outlet scouring protection measures to Stormwater Outlet 2	4	2021/Council	Council to engage consultants to develop detailed design for the scouring protection measures
Option 3 <ul style="list-style-type: none"> Apply underground infiltration system for site 4 	5	2022/Council	Council to engage consultants to develop detailed design for the underground infiltration system
Option 7	6	2020/Council	N/A

Action	Benefit Cost Ranking	Timeframe/Responsibility	Group Assisting Implementation
<ul style="list-style-type: none"> Apply education program for residents in relation to fertiliser use 			
Option 2 <ul style="list-style-type: none"> Apply underground infiltration system for site 1 	7	2022/Council	Council to engage consultants to develop detailed design for the underground infiltration system
Option 4 <ul style="list-style-type: none"> Re-grad the swale channel to let the stagnant water drain to the dam 	8	2022/Council	Council to engage consultants to develop detailed design for the swale and wetland
Option 12 <ul style="list-style-type: none"> Apply stormwater outlet scouring protection measures to Stormwater Outlet 1 	9	2021/Council	Council to engage consultants to develop detailed design for the scouring protection measures
Option 16 <ul style="list-style-type: none"> Remove weeds and apply native vegetation for site 3 	10	2021/Council	Council to engage ecologist to develop vegetation management plan
Option 15 <ul style="list-style-type: none"> Remove weeds and apply native vegetation for site 2 	11	2021/Council	Council to engage ecologist to develop vegetation management plan
Option 19 <ul style="list-style-type: none"> Apply kerb & gutter and underground drainage system to Trangie urban area 	12	2023/Council	Council to engage consultants to develop detailed design for the kerb and gutter system

Action	Benefit Cost Ranking	Timeframe/Responsibility	Group Assisting Implementation
Option 11 <ul style="list-style-type: none"> Apply riverbank/bed protection measures 	13	2022/Council	Council to engage consultants to develop detailed design for riverbank/bed protection measures
Option 17 <ul style="list-style-type: none"> Apply kerb & gutter and underground drainage system to Trangie urban area 	14	2023/Council	Council to engage consultants to develop detailed design for the kerb and gutter system
Option 10 <ul style="list-style-type: none"> Create a vegetated swale along Reach 2 and converting Goan Waterhole into a wetland 	15	2022/Council	Council to engage consultants to develop detailed design for the swale and wetland
Option 18 <ul style="list-style-type: none"> Apply kerb & gutter and underground drainage system to Trangie urban area (16	2023/Council	Council to engage consultants to develop detailed design for the kerb and gutter system
Option 6 <ul style="list-style-type: none"> Clean the outlet stormwater culverts to let the stagnant water freely pass through the culverts from Reach 1 	17	2021/Council	N/A
Option 5 <ul style="list-style-type: none"> Apply kerb & gutter system and install an absorption trench at the road low point (Site 5) 	18	2023/Council	Council to engage consultants to develop detailed design for the kerb and gutter system

Action	Benefit Cost Ranking	Timeframe/Responsibility	Group Assisting Implementation
Option 9 <ul style="list-style-type: none"> • Create a swale along the southern side of Mungery Street and converting the existing pond into a wetland (Site 3) 	19	2022/Council	Council to engage consultants to develop detailed wetland design
Option 8 <ul style="list-style-type: none"> • Create a swale and wetland system at Mitchell Hwy near the intersection of Bimble Box Ln & Mitchell Hwy (Site 2) 	20	2023/Council	Council to engage consultants to develop detailed swale and wetland design

9.0 MONITORING

EPA's Managing Urban Stormwater: Council Handbook outlines the requirements for a monitoring program for stormwater management. The monitoring program can be classified into two broad types:

- Water quality and biological monitoring; and
- Observation monitoring

Stormwater monitoring can be undertaken for the following purposes:

- Assessing the prevailing conditions within a stormwater system or receiving waters;
- Obtaining water quality data for use in designing new stormwater management practices; and
- Determining the performance of existing stormwater management practices.

The conventional approach to monitoring relies solely on technical monitoring programs; however there is considerable benefit in non-technical monitoring undertaken by the community. If the community is involved in monitoring the success of a plan, a sense of community pride can be achieved, if the monitoring indicates that the plan is successful. On the other hand, it can be expected that they will be more likely to modify their behaviour if the objectives of the plan are not being met.

Making the results of technical monitoring programs readily available to the community, including both the detailed results of the program and a more widely circulated non-technical summary would be useful. Catchment Management Committees can also be a useful forum in both undertaking and reporting on monitoring programs. A suggested monitoring program for Council to consider for adoption is presented in Table 9-1.

Table 9-1: Monitoring and Testing Program

Parameters for Testing	Proposed Locations	Responsibility for Financing	Responsibility for Testing	Frequency of Testing
<ul style="list-style-type: none"> • Turbidity • Temperature • pH • Total Suspend Solids (TSS) • Total Nitrogen (TN) • Total Phosphorous (TP) • Chlorophy11 A • Electrical Conductivity 	Outlet 1	Council	Council	Monthly initially, to be reviewed and modified once trends are established, if necessary. Additional sampling under dry weather and wet weather conditions.
<ul style="list-style-type: none"> • Turbidity • Temperature • pH • Total Suspend Solids (TSS) • Total Nitrogen (TN) • Total Phosphorous (TP) • Chlorophy11 A • Electrical Conductivity 	Outlet 2	Council	Council	Same as above
<ul style="list-style-type: none"> • Turbidity • Temperature • pH • Total Suspend Solids (TSS) • Total Nitrogen (TN) • Total Phosphorous (TP) • Chlorophy11 A 	Intersection of Bimble Box Ln & Mitchell Hwy (Site 2)	Council	Council	Same as above

Parameters for Testing	Proposed Locations	Responsibility for Financing	Responsibility for Testing	Frequency of Testing
<ul style="list-style-type: none"> • Electrical Conductivity • Turbidity • Temperature • pH • Total Suspend Solids (TSS) • Total Nitrogen (TN) • Total Phosphorous (TP) • Electrical Conductivity 	Southern side of Mungery Street between Mullah Street and Swift Street (Site 3)	Council	Council	Same as above

9.1. Program for Revision

It is recommended that the stormwater management plan (SMP) be reviewed every five years. This would include reviewing the implementation strategy (and results of monitoring) developed as part of this plan, as well as any additional issues or processes that may have surfaced or are no longer relevant that may need to be updated in the SMP. This is discussed further in the following sections.

9.2. Revise Council Implementation Strategy

The implementation strategy is the basis for Council's stormwater management program and addresses each stormwater issue within the catchment in a cost-effective and community-focussed manner. It is dynamic and should evolve as stormwater works have been completed. Table 8.1 provides a schedule for review for the Trangie Stormwater Management Plan implementation.

9.3. Review the SMP Document

Since the stormwater objectives and issues are dynamic, the Stormwater Management Plan should be reviewed every five years, including the following:

- Results from any monitoring program e.g. water quality monitoring;
- The effectiveness of options implemented;
- Document what objectives and issues have been addressed;
- The effectiveness in satisfying community values;
- Newly arising issues and objectives;
- Improve the local understanding of issues within the catchment; and
- Identify if additional options need to be developed or if presented options need to be modified.

9.4. Mechanisms of Reporting

The process of implementing the SMP and reporting of the monitoring results should be included in Council's State of the Environment Report where possible and can be used as a valuable input into future improvement works programmes. The effectiveness of pollution control devices should be highlighted to pinpoint any weaknesses and aid in improving its effectiveness over the long term. This is particularly the case, as stormwater management is long term process and requires a process of continuous improvement.

APPENDIX A

Photographic Record of Stormwater Issues in Trangie

TRANGIE



Site 1



Site 2



Site 3



Site 4



Site 5



Reach 1



Reach 2



Stormwater Outlet 1



Stormwater Outlet 2

APPENDIX B

Community Involvement and Education

THE FOLLOWING INFORMATION WAS TAKEN FROM THE NARROMINE URBAN STORMWATER MANAGEMENT PLAN

Community Involvement

Community education programs are implementation strategies to prevent, control and treat stormwater by observing substantial environmental improvements, realising economic advantages and enjoying various associated quality-of-life benefits. Community benefits may include aesthetics or improving community relations.

While many day-to-day activities impact on stormwater runoff, there are control strategies that work.

Polluted urban runoff can be prevented in a cost-effective response that comes from preventative, enforceable efforts that integrate all levels of government, design professionals from multiple disciplines, private organisations, and the local community. The following strategies have been proven effective in many stormwater cases:

Preserving and utilising natural features and processes have many benefits. Undeveloped landscapes absorb large quantities of rainfall and vegetation helps to filter out pollutants from stormwater. Buffer zones, conservation design development, sensitive area protection, or encouragement to infill development all try to enhance natural processes and are among the most effective stormwater programs.

Strong incentives, routine monitoring and consistent enforcement to establish accountability are the key element in improving water quality. Programs with high accountability can reduce pollutant loading by 50% or greater.

Establishing a dedicated source of funding ensures long term viability of programs and public support. Detailed funding sources, such as stormwater utilities or dedicated grants, help ensure that stormwater programs are stable over time and help gain public support.

Strong leadership is often a catalyst for success. An individual is needed to champion the project and make it happen.

Effective administration is critical. This allows implementation of broad-based, multi-faced programs.

In summary, together the following summary key points build a strong framework for effective, efficient, and successful stormwater management over the long term.

- Plan and set clear goals.
- Encourage and facilitate broad participation.
- Work to prevent pollution first, rely on structural treatment only when necessary.
- Establish and maintain accountability.
- Create a dedicated funding source.
- Tailor strategies to the region and setting.

- Build broad-based programs.
- Evaluate and allow for evolution of programs.
- Recognise the importance of associated community benefits.

Implement a Public Education Program

Public education is an important part in stormwater management. This action provides ownership to the community by informing the community about values of healthy, well-maintained stormwater system. Public interest will be encouraged through education and ensured community involvement in the stormwater process. For example, leaves, grass clippings and organic matter from yards increase oxygen demands and may contribute nutrients to algae blooms that may result in fish kills. A significant source of nutrient input to water bodies is from grass clippings and leaves washed into drainage systems during storms.

The following are issues that should be addressed;

Appropriate car washing:

Washing cars on lawns and not on roadsides or driveways

Prevent excess waste water from entering stormwater drains

Appropriate litter disposal:

Educate community about effects and consequences of inappropriate litter disposal
outline correct litter disposal behaviour

Appropriate waste oil and other chemical disposal:

Ensure the community is aware of correct disposal for waste such as oil and other chemicals such as herbicides

Provide oil disposal facilities at service stations:

Promote any free domestic chemical collection services

Appropriate disposal of domestic animal droppings:

Encourage dog walkers to implement correct disposal of dog droppings encourage appropriate disposal methods for households (compost bins, garbage bins, sewer)

Appropriate garden and lawn maintenance:

Correct levels of fertiliser use in gardens

Encourage use of low maintenance, native plant species

Discourage hosting lawn clippings from entering the stormwater gutters

Safety awareness:

Prevent contact with high velocity stormwater flows

Encourage Public Involvement in the Stormwater Management Process:

Community involvement will provide a sense of ownership to the community and will aid the management of the urban stormwater system. The value of the stormwater system will be increased with the community's desire to maintain a healthy stormwater system. Public involvement should be encouraged during all stages of the stormwater process, including planning, implementation and review stages.

Various programs such as Streamwatch and Landcare groups, school syllabus and community groups can be used to promote awareness and involvement of the community in managing and monitoring section of the stormwater system.

APPENDIX C

Structural Assessment and Education Options

Possible Stormwater Management Devices

There are a range of devices in the market which assist in the management of stormwater problems. The NSW EPA and other stormwater management authorities in the or states, have published documents which describe these devices and various constraints and limitations associated with each.

Structural Measures

Rainwater Tanks

Rainwater tanks will be used for irrigation of the landscaped areas and toilet flushing within each allotment. The reuse of water collected by the tanks will prevent some stormwater pollutants from reaching downstream waterways.

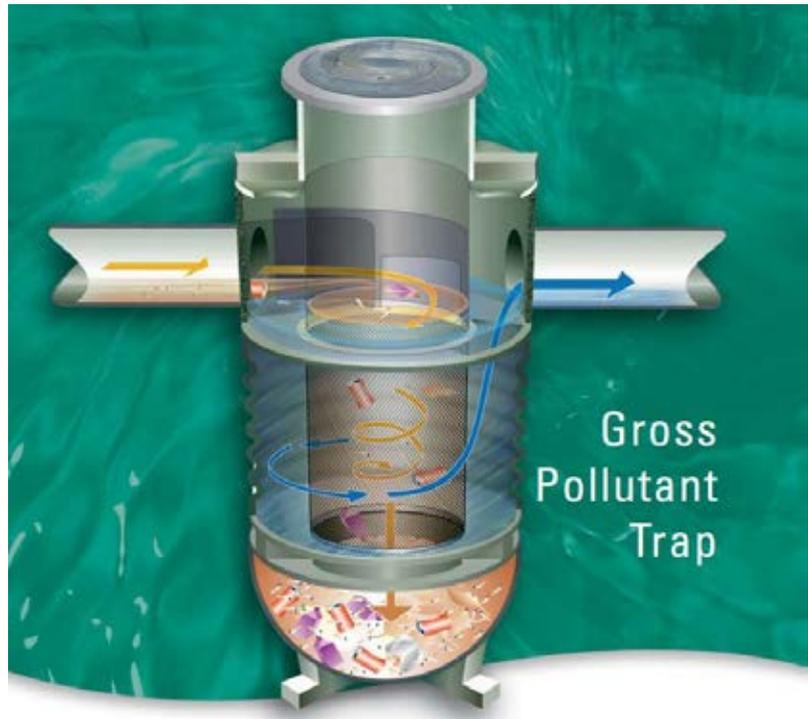
Gross Pollutant Traps

Gross pollutant trap (GPT) devices are typically provided at the outlets of stormwater pipes draining road runoff. These devices operate as primary treatment to remove litter, particulate matter, oils, grease and coarse sediments prior to discharge to a secondary treatment device.

GPTs have been modelled as CDS units for the purpose of defining treatment capabilities in MUSIC modelling. Alternative types of GPTs will be the subject of additional investigation during the detailed design stage.

WSUD Device Profile – Gross Pollutant Trap

A GPT is a device used to remove litter, organic matter and coarse sediments from stormwater. These devices can be installed within a stormwater system or at the end of it. A CDS unit is shown here as an example. This device uses the water velocity to create a centrifugal force within a mesh basket. Pollutants are trapped in the basket while water can pass through and return to the stormwater system.



Bioretention Basins and Raingardens

Bioretention systems are essentially large raingardens which comprise of an engineered filter media profile planted with drought tolerant species suitable for pollutant removal. These systems form part of the treatment train for the upstream sub-catchments and are utilised to facilitate the removal of fine sediments and sediments in stormwater runoff from the development, prior to discharge downstream.

The bioretention basins are to be constructed as standalone features located in available open space areas or easements.

Gross pollutants and coarse sediments will generally be collected in the entry areas of the raingardens, which can be designed as a forebay to contain litter in the entry area for ease of maintenance. These features will be detailed at the next design stage.

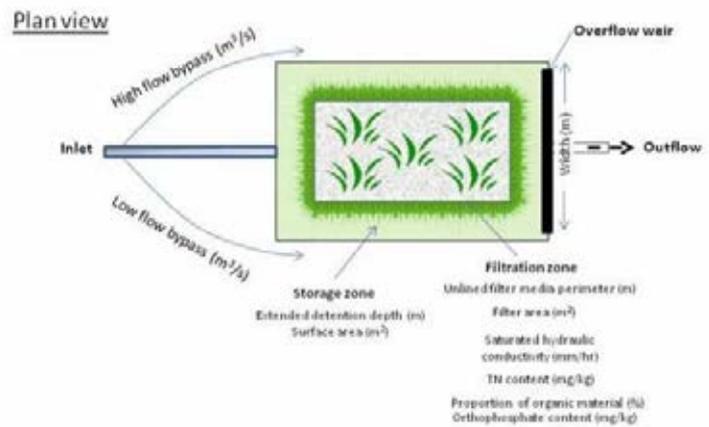
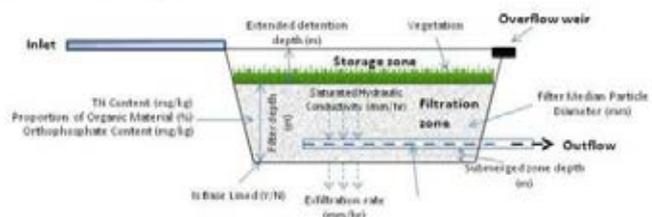
The proposed basins will generally consist of an extended detention zone designed to detain and treat frequent flows from the upstream catchments. The sizes of the basins have been configured to service the long-term developed catchments that will discharge to them. The surface of the basins will be mass planted with native, drought-tolerant species and the filtration beds will be typically 500mm deep.

WSUD Device Profile – Bioretention Systems

A bioretention basin is a special type of garden bed designed to treat stormwater and improve runoff quality. A bioretention system works by:

- collecting polluted stormwater from impervious urban areas
- storing stormwater at a shallow depth, allowing coarse sediments to settle out
- allowing stormwater to pass through specially selected soil media which traps smaller sediments and, using the biological action of plants and bacteria to remove nutrients
- returning treated stormwater to the stormwater system through a slotted pipe in the base of the garden bed profile.

Typical Detail – Bioretention

**Longitudinal section**

Bioretention Basin



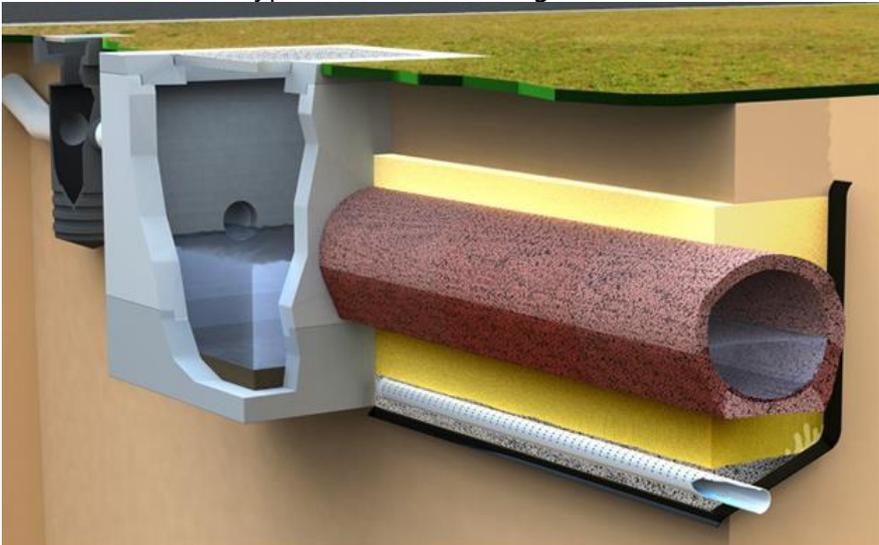
Constructed Wetlands

A constructed wetland is a large open shallow water body with extensive emergent macrophytes (large aquatic plants whose parts protrude above the waterline). Epiphytes (algae growing on the surface of aquatic macrophytes) are often associated with macrophytes in wetlands. Three key pollutant retention processes occur in constructed wetlands:

- Enhanced sedimentation
- Fine particle filtration
- Nutrient uptake by sediments, biofilms (eg epiphytes) and macrophytes

Sandfilters

Where above ground systems are not feasible, underground treatment systems comprising of porous pipes and sandfilter media are proposed to treat stormwater. A sandfilter is proposed to treat runoff that drains to the northern valley and is located beneath a grassed basin. Refer to Appendix C for proposed location of the sandfilter. Hydrocon pipes have been adopted for the purpose of defining pollutant removal relationships in MUSIC. Other products may also be suitable, and this would be the subject of further investigation at detailed design stage.

WSUD Device Profile – Sand Filter	
<p>Specially designed porous concrete pipes through which water is filtered to remove pollutants are used. They are particularly effective at removing suspended solids and phosphorus. The water that exfiltrates from the pipes is directed through a sand filter to remove nitrogen. A perforated pipe at the base of the sand filter collects the treated water and returns it to the pit downstream of the system from where it returns to the outlet pipe.</p>	<p>Porous Concrete Pipes</p> 
	<p>Typical Sandfilter configuration</p> 

Integration with Urban Design

The proposed stormwater quality devices will integrate with and enhance the existing landscape. Gentle vegetated batters will provide a safe and suitable appearance. Planting will consist of low maintenance native grasses.

Operation and Maintenance

Operation and maintenance of the proposed treatment systems are straightforward and are similar to maintenance of standard gardens and drainage infrastructure. Typical maintenance requirements are:

- Maintain bioretention vegetation, remove weeds and litter as required
- Empty GPT sump and basket every 3-6 months and after significant rainfall events
- Flush bioretention basin underdrainage as required (allow every 5 years)
- Replace bioretention media every 20-30 years (likely top 150mm)

Operation and Maintenance plans for the stormwater elements are proposed to be developed during detailed design. A Water Balance assessment will inform development of the Operation and Maintenance plan for the water bodies for aesthetic reasons as well as to effectively manage algae in the extended dry periods.



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Narromine Shire Council

Section 7.11 Contributions Plan 2019
-Heavy Vehicles

Narromine Shire Council Section 7.11 Contributions Plan – Heavy Vehicles 2019

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1. EXECUTIVE SUMMARY

1.1. Background

1.1.1. What are development contributions?

Development contributions are contributions made by those undertaking development approved under the Environmental Planning and Assessment Act 1979 (the Act). Contributions may be in the form of money, the dedication of land or some other material public benefit (or a combination of these). The mechanisms available for development contributions are limited to:

- In the case of contributions made under sections 7.11 or 7.12 of the Act - toward the provision or improvement of amenities or services (or the recouping of the cost of provision or improvement of amenities or services), or
- In the case of contributions made under a planning agreement prepared in accordance with sections 93F to 93L of the Act toward public purposes.

The Plan deals with Section 7.11 contributions.

1.1.2. Section 7.11 levies

Section 7.11 of the Environmental Planning and Assessment Act 1979 enables Council to levy contributions from development for the provision of public services and amenities required as a consequence of that development. Contributions may be in the form of cash payments, transfer or dedication of land to Council, or the provision of a Material Public Benefit or Works in Kind.

For Council to levy contributions under Section 7.11 there must be a clear nexus between the proposed development and the need for the public service or amenity for which the levy is being required and as detailed in a Contributions Plan.

This Section 7.11 Contributions Plan seeks contributions towards the additional costs of road maintenance from developments which generate frequent heavy haulage vehicle movements.

Accordingly, certain developments will be levied because of their impact on the frequency of road maintenance, determined by a consistent methodology based on heavy vehicle usage.

1.2. Purpose

The primary purpose of this Plan is to authorise the levying of contributions that will assist Council to provide public services and amenities to:

- Ensure roads are maintained in a reasonable condition for users as a result of damage caused by developments that generate frequent heavy haulage movements.

This Plan enables Council to require a contribution from development towards the provision, extension or augmentation of public services and public amenities that will, or are likely to be, required as a consequence of new development.

The contribution may involve payment of a monetary contribution.

Other purposes of this Plan are to:

- Provide an overall strategy for the coordinated delivery of public facilities and infrastructure consistent with Council's strategic plans and management plan;
- Provide a comprehensive strategy and administrative framework for the assessment, collection, expenditure, accounting and review of developer contributions towards the equitable provision of public services and amenities;

- Identify the additional services and amenities required to meet the demands arising from new development;
- Provide an adequate level of public services and amenities to meet demand arising from development within a reasonable time, as development occurs, and at a reasonable cost, without unduly impacting on the affordability of the proposed development;
- Ensure that the development contributions are based on reasonable estimates of cost;
- Ensure that the existing community is not unduly burdened by the provision of public services and amenities which are needed (either partly or fully) as a result of ongoing development in the LGA, and that there is a reasonable apportionment of cost between existing demand and new demand for public infrastructure provided by Council, and
- Ensure that contributions are fair and reasonable.

1.3. Nexus

All heavy vehicles contribute to the deterioration of road pavements. Australian Road Research Board (ARBB) research shows that an increase in the number of heavy vehicles using a road will accelerate the deterioration of a road, and lead to increased road maintenance costs being incurred by Council. The impact of heavy vehicles on the condition of road pavements has been well documented by Austroads and other authoritative sources.

Council maintains the LGA's roads at an adopted level of service. As a result of a development using heavy haulage vehicles, Council will need to undertake increased maintenance work to maintain this level of service. The extent of the increased maintenance is dependent on the heavy vehicular traffic generated by the subject development.

Increased road maintenance results in an increased drain on Council's finances. These increased costs will burden the community with providing the increased funds required by Council in order to maintain the existing level of service for the road network as a result of the development, unless the subject development provides a contribution commensurate with the increased maintenance costs.

The purpose of this methodology is to ensure that heavy vehicle haulage associated with a specific development provides a fair contribution towards the additional costs incurred by Council as a result of any heavy haulage traffic associated with that development.

The costs of keeping roads in a satisfactory condition occur in three main areas:

- Rehabilitation:
 - Regional sealed pavement rehabilitation;
 - Rural sealed pavement rehabilitation, and
 - Unsealed pavement rehabilitation/gravel resheeting or gravel patching.
- Reseals
 - Maintenance reseal (i.e. regional and local roads)
- Maintenance
 - Annual routine maintenance, and
 - Heavy patching or stabilisation of selected sections.

A traffic generating development will be required to contribute a proportion of all of the above costs based upon the heavy vehicle Equivalent Standard Axle (ESA) impact on the regional or local road used by the heavy vehicles in question, within a given period of time. Developments will be required to regularly report their haulage tonnages and the types of vehicles involved, in order for these costs to be accurately determined.

The methodology used by the Plan to determine the contribution is based on the average annualised road maintenance costs, and the length, and type, of roads to be used by heavy vehicles associated with the subject development

The contribution and its calculation do not apply to State Roads that are the funding responsibility of the State Government, and not Council, such as the Mitchell or Newell Highways.

The operation of this Plan will also generate the need for planning, administration and management activities associated with this Plan, in order to regularly review, update and manage the future provision of infrastructure.

1.4. Exemptions:

This Plan does not apply to:

- Extractive industries with an average annual approved output of up to and including 5,000 m³ of solid material, or
- Other developments within an average annual approved total haulage of up to and including 7,500 tonnes of material, or
- Development located in a Business, or Industrial land uses zone.

1.5. Structure of the Plan

This Plan is arranged into a summary and 7 sections as detailed below:

Section 1	Executive Summary and Purpose of the Plan.
Section 2	Introduction
Section 3	Operation of the Plan.
Section 4-	Administration
Section 5	Nexus
Section 6	Transport Facilities
Section 7	Plan Administration Costs

1.6. Summary of Contributions Rates

Contribution rate:

Table 1: Heavy Haulage Vehicle Movement Generating Development Contribution Summary

Contribution Type	Per annum rate per tonne per kilometre of road hauled material
Road maintenance	As determined by the methodology in Section 6
Plan Management and Administration	1% of the above figure
TOTAL	Total of the above as calculated

Note: these amounts are subject to indexation.

2. INTRODUCTION

2.1. Name of the Plan

This Plan is referred to as the Narromine Shire Council Section 7.11 Contributions Plan 2019.

This Contributions Plan has been prepared in accordance with the relevant provisions of the Environmental Planning and Assessment Act 1979, as amended (the Act), the Environmental Planning and Assessment Regulation 2000, the Department of Planning and Infrastructure's Development Contributions Practice Notes 2005, relevant Ministerial Directions and Department of Planning and Environment Circulars and Guidelines.

2.2. Area to Which the Plan Applies

This Contributions Plan applies to the Narromine Shire Council Local Government Area.

2.3. Types of Development to which this Plan applies

This Plan applies to:

- Developments that generate heavy haulage vehicle movements.

Note: "development" referred to in this clause has the same meaning as in the Act.

Exemptions:

Certain developments which use heavy vehicle haulage are exempt from the payments for the heavy vehicle contribution, in order to:

- Assist the viability of smaller local scale enterprises;
- Simplify administration of the Plan, and
- Recognise the generally higher design standards in respect of vehicle loadings of roads in business and industrial areas.

The exempt developments are:

- Extractive industries with an average annual approved output of up to and including 5,000 m³ of solid material, or
- Other developments within an average annual approved total haulage of up to and including 7,500 tonnes of material, or
- Development located in a Business or Industrial zone.
- Development undertaken by or on behalf of Council, unless undertaken as a business enterprise.

2.4. Commencement of Plan

This Contributions Plan takes effect on **XX XX 2019**.

2.4.1. Savings and transitional arrangements

A development application which has been submitted prior to the adoption of this Plan but not determined shall be determined in accordance with the provisions of the Plan which applied at the date of determination of the application.

2.5. **Relationship to other Plans and Policies**

This Plan complements the Narromine Shire Council Section 94A (7.12) Plan and its successors.

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3. OPERATION OF THE PLAN

3.1. Method of Operation - Authorisation

In determining a Development Application or issuing a Complying Development Certificate to which this Plan applies, this Plan authorises the Council to impose a condition of consent requiring the payment of a monetary contribution in accordance with the provisions of this Plan, or in lieu thereof accept the provision of a material public benefit or works in kind.

Prior to the issue of a Complying Development Certificate for development to which this Plan applies, the issuer of the certificate must impose a condition pursuant to this Plan if such condition may be imposed.

Complying Development Certificates must be assessed and issued by Council if the developer wishes Council to consider land dedication, material public benefits or works-in-kind.

3.2. Types of Contributions

There are a number of alternative methods of settlement of Section 7.11 developer contributions. These are as follows:

- Monetary contribution;
- Dedication of land;
- Material Public Benefit, or
- Works in Kind.

Where a developer negotiates a material public benefit (for works not in the works schedule), works in kind (for items included in the works schedule), or the dedication of land, in lieu of paying any part of the monetary contribution required under this Plan, the applicant must still pay Council's reasonable costs for the management of the Plan (plan management and administration contributions).

The Act also provides the ability for the Council to consider entering into a Planning Agreement (PA) as part of a development application or when rezoning land. Public amenities and services delivered through a PA may be in addition to or instead of the payment of a monetary contribution under Section 7.11.

3.3. Monetary contribution

This Plan identifies the monetary contribution required for the maintenance of roads. The contribution amount payable will be included as a condition of consent on any development approval issued. Details of how and when the amount will be adjusted will be included in the consent as detailed in this Plan.

3.3.1. Dedication of land

Dedication of land in lieu of monetary contributions described in this Plan will only be considered when Council deems that the land is in a location and has physical and servicing characteristics that make it suitable for the designated purpose.

All costs of dedication are to be borne by the applicant, including but not limited to, survey, legal and administration costs.

The land is to be in a condition suitable for its intended purpose cleared of all debris, weeds and waste materials. The land is to have a compliance certificate from a registered testing authority stating that the land is free from contaminated and hazardous materials and substances.

3.3.2. Works in Kind / Material Public Benefits

A works in kind (WIK) is the undertaking of a work or provision of a facility that is scheduled within a Contributions Plan, in lieu of the part or full payment of either a monetary contribution or the dedication of land that would normally apply. WIK are generally offered and assessed as part of the development application process. Applicants seeking Council's acceptance of a WIK arrangement should initially discuss such a proposal with Council officers to determine whether Council would agree to enter into such agreement and to establish Council's requirements.

A material public benefit (MPB) may be offered by the developer in part or full satisfaction of a condition requiring the payment of a monetary contribution. A MPB may include the provision of work that is not scheduled within a Contributions Plan. Council may accept the provision of a MPB if it can be justified why it is of equivalent or greater benefit to the community compared to what has been identified under the Plan.

Such alternative development contributions arrangements may be negotiated with the Council in connection with the carrying out of development in the following circumstances:

a) Offer made to the Council as part of a development application

If an applicant does not wish to pay a monetary Section 7.11 contribution in connection with the carrying out of development, the applicant may include in a development application for the development a proposal to carry out the works towards which a contribution or levy would otherwise have been applied.

The Council will consider the alternative arrangement as part of its assessment of the development application. If the Council agrees to the arrangement and grants consent to the application, it will impose a condition of consent requiring the works to be carried out. If the Council does not agree to the alternative arrangement, it may grant consent subject to a condition imposed under Section 7.11 requiring payment of the monetary contribution.

b) Offer made to Council following the grant of development consent:

If development consent has been granted to the carrying out of development subject to a condition under Section 7.11 requiring payment of a monetary contribution towards the cost of public amenities and public services, the applicant may request in writing that they instead provide to the Council a material public benefit in part or full satisfaction of the requirements of the relevant condition. This application should be made in the form of a formal modification of development consent made under section 96 of the Act.

The material public benefit may be the carrying out of work or another public benefit but not the payment of money or the dedication of land free of cost.

If the Council agrees to the applicant's request, the applicant is required to comply with the alternative arrangement and is not required, in part or whole, as relevant, to comply with the conditions imposed under Section 7.11. If the Council declines the applicant's request, the applicant will be required to comply with the requirements of the conditions imposed under Section 7.11.

In either case, in deciding whether to agree to the applicant's request, the Council will have regard to the requirements of the current Revised Development Practice Notes (DIPNR 2005) and may consider matters such as, but not limited to, the following:

- The need for the facility and how it achieves the outcome being sought by this Plan and the imposition of the condition;
- The purpose and objectives of this Plan and any relevant plans or strategies;
- Whether the alternative will prejudice the timing or the manner of the provision of the infrastructure for which the contribution was required, and

- Full details of the quantities, finishes and costings of the proposed works.

The acceptance of a WIK agreement or a MPB will be at Council's absolute discretion, and aside from any exceptional circumstances, no credits will be granted for in-kind works carried out by the developer that are in excess of the approved contribution amount. Where the value of the WIK, MPB or dedication of land is less than the value of the required contribution, the applicant will be required to settle the balance of the contribution by way of a monetary contribution and/or land dedication.

All works in kind will be designed and constructed in accordance with relevant Australian Standards and in accordance with Narromine Shire Council's Engineering Code.

3.4. Planning Agreements

An applicant may offer to enter into a Planning Agreement with the Council in connection with a development application or a rezoning application that is made for the purposes of being able to subsequently make a development application. Provision is made for Planning Agreements under Sections 7.4-7.10 of the Environmental Planning and Assessment Act 1979, as amended.

Under a Planning Agreement the applicant may offer to pay money, dedicate land, carry out works, or provide other material public benefits for public purposes. The applicant's provision under a Planning Agreement may be additional to, or instead of, making contributions under Section 7.11 of the Act.

The offer to enter into a Planning Agreement, together with the draft Agreement, will generally need to accompany the relevant development or rezoning application. The Council will publicly notify the draft Agreement and explanatory note relating to the draft Agreement along with the relevant application and will consider the Agreement as part of its assessment of the relevant application. If the Council agrees to enter into the Agreement, it may impose a condition of development consent requiring the Agreement to be entered into and performed.

Council encourages the use of Planning Agreements, particularly for larger and/or more complex development.

3.5. Payment of the Contribution

3.5.1. Timing of Payments

The time of payment of contributions shall be as follows:

- Within 28 days of receipt of a quarterly notice from the Council stating the contribution amount pursuant to the previous quarter's heavy haulage vehicle activity.

3.5.2. Deferred or Periodic Payments

Council may consider the deferred payment of contributions or payments made by periodic instalments.

A request for deferral or periodic payment must be made in writing to Council, stating the proposed length of deferral, and may only be accepted where:

- There are valid reasons for the deferral or periodic payment;
- The deferral will not prejudice the efficiency and operation or cash flows of the Plan;
- The granting of the request for deferred payment will not jeopardise the timely provision of works or land identified within the Plan;
- A suitable bank guarantee (or equivalent security) can be, and is, provided in the event that the request is accepted by Council;
- The applicant intends to make a contribution by way of a planning agreement, works-in-kind or land dedication in lieu of a cash contribution and Council and the applicant have a legally binding agreement for the provision of the works or land dedication, and

- The periodic or deferred contributions are paid, including indexing, at no cost to Council.

The conditions under which Council may accept deferred payment by way of a bank guarantee are:

- The bank guarantee is by an Australian Bank;
- indexing will be calculated from the date the contribution was due until the date of payment in accordance with the CPI indexing provisions stated in Section 3.8 of this Plan;
- The bank guarantee is for a maximum period of twelve months;
- The amount of the bank guarantee is the sum of the total contribution or the amount of the outstanding contribution at the time of deferring payment, plus an amount determined by Council to include any anticipated indexation for the next thirteen months following the date the contribution was due;
- The bank unconditionally pays the guaranteed sum to Council if Council so demands in writing, no earlier than 12 months from the provision of the guarantee or completion of the work, whichever occurs first;
- The bank must pay the guaranteed sum without reference to the applicant or landowner or other person who provided the guarantee, and without regard to any dispute, controversy, issue or other matter relating to the development consent or the carrying out of development in accordance with the development consent;
- The bank's obligations are discharged when payment to the Council is made in accordance with the approved bank guarantee or when Council notifies the bank in writing that the guarantee is no longer required, and
- Council's registration and release of bank guarantee fee is paid.

Any outstanding component of the contribution shall be indexed quarterly in accordance with the Consumer Price Index movements. Indexing will be calculated from the date the contribution was due until the date of payment.

3.6. **Complying Development**

Accredited Certifiers must impose a condition requiring monetary contributions in accordance with this Plan, in accordance with Section 7.11 of the Environmental Planning and Assessment Act. The amount of the contribution is to be determined in accordance with the formulas contained in the Plan and the current contribution rates. The conditions imposed must be consistent with Council's standard Section 7.11 consent conditions and be in accordance with this Plan. It is the responsibility of accredited certifiers to correctly calculate the contribution and apply the Section 7.11 contribution.

3.7. **Goods and Services Tax**

Monetary Section 7.11 development contributions are exempt from the Federal Government Goods and Services Tax (GST).

3.8. **Adjusting Contribution Rates**

To ensure that the value of contributions is not eroded over time by movements in the Consumer Price Index, (CPI) land value increases, the capital costs of construction of facilities and administration of the plan or through changes in the costs of studies to support the Plan, the Council will index the contribution rates indicated in this Plan, on a quarterly basis, with reviewed rates to apply from the first working day of December, March, June and September.

This Plan authorises Council to undertake these index based changes without the necessity of preparing a new or amending contributions plan.

The contribution rates will be reviewed and subsequently indexed by reference to the Construction costs by the Consumer Price Index (All Groups – Sydney) as published quarterly by the Australian Bureau of Statistics.

In accordance with Clause 32(3)(b) of the Environmental Planning and Assessment Regulations, the following sets out the means by which Council will index contribution rates that are set out in this Plan:

For changes to the Consumer Price Index (Sydney All Groups), the contributions will be reviewed quarterly in accordance with the following formula:

$$\text{New Contribution Rate} = \frac{C \times \text{CPI 2}}{\text{CPI 1}}$$

where:

- C is the initial contribution rate at the time of adoption of the Plan, expressed in dollars
- CPI 2 is the Consumer Price Index Number (Sydney All Groups) available at the time of the review
- CPI 1 is the Consumer Price Index Number (Sydney All Groups) at the date of adoption of the Plan, or its subsequent amendment

3.8.1. Adjusting Contributions at the Time of Payment

Contributions required as a condition of development consent will be adjusted at the time of payment using the following formula.

Contribution amounts will initially be calculated and regularly updated in accordance with the terms of Clause 2.7 at the time development consent is granted. The contribution amounts included in a development consent are to be adjusted at the date of payment on the basis of the contribution rates that are applicable at the time of the payment, and not at the date of the approval of the development.

Adjustments to the contributions amount in a consent will be made in the following manner:

$$CP = \frac{CDC + (CDC \times (CRP - CRC))}{CRC}$$

Where:

- CP is the amount of the contribution calculated at the time of payment;
- CDC is the amount of the original contribution as set out in the development consent.
- CRP is the contribution rate at the time of payment
- CRC is the contribution rate at the time of the original consent or quarterly statement

The current contribution rates are published by Council and are available from Council Offices.

3.9. Reassessment of Contributions

Council may consider an application for the reassessment of the development contributions payable. This may result in the contribution being reduced, waived or modified.

Where a condition of development consent has already been imposed requiring the payment of a contribution, the applicant will need to lodge an application to review the consent in accordance with Section 8.3 of the Environmental Planning and Assessment Act 1979, as amended.

The request shall be in writing and provide sufficient information to satisfy Council of the inappropriate nature of the contribution and the implications to Council of reducing or waiving the contribution in the particular circumstances.

3.10. Review of the Plan

This Plan may be reviewed in full, or in part, when considered appropriate, having regard to the rate and type of development, cost of facility provision, and community response to service and facility provision.

A complete review of this Plan is anticipated every five (5) years from the date of commencement of the Plan.

3.11. Funding and Timing of Works

The contributions made to Council under the Plan may fully or partially fund the public amenities and services identified in this Plan. The contribution rates have been determined on the basis of apportionment between the expected development and other sources of demand. In circumstances where public amenities and services are not fully funded by contributions, the remaining funds will be supplied from other Council sources.

Public amenities and services are required at the time demand is created, which may be before sufficient contributions are received. Council's ability to forward fund these services and amenities is very limited, and consequently their provision is largely contingent upon the availability of contributions. Pooling of funds to assist with the provision of infrastructure, as detailed in Section 3.12 will be considered and used when necessary.

Council will aim to spend all funds within a reasonable time and in a manner which achieves an equitable high standard of road maintenance.

To provide a strategy for the implementation of the services and amenities levied for in this Plan, and to use contributions in the most effective manner, work will be reprioritised. This will take into account development trends, population characteristics, existing funds, funds from other sources (where required) and anticipated revenue flows. The priorities for Council's maintenance works will be published in Council's Delivery Program.

3.12. Pooling of Contributions

This Plan expressly authorises monetary Section 7.11 Contributions paid for different purposes to be pooled and applied (progressively or otherwise) for those purposes. The priorities for the expenditure of the contributions are shown in the Works Schedules (if any).

3.13. Accountability

Financial management and accountability are important components of Section 7.11, and Council is obliged to maintain an accurate and up to date register of all Section 7.11 contributions.

Monetary contributions received under the authority of this Plan must be recorded and kept through a separate account specifically established for this Plan. The records must indicate the contributions received, contributions expended and must include the interest, if any, earned on invested funds for each account.

These records are updated on a monthly basis.

Separate accounting records are maintained for all Council's Section 7.11 and Section 7.12 Contribution Plans. Information on Section 7.11 accounts and funds relating to this Plan will be provided in a condensed format within Narromine Shire Council's Annual Report/s in accordance with requirements of the Environmental Planning and Assessment Regulation.

Information is also available in Council's contribution register relating to this Plan, which can be inspected at Council during normal business hours.

4. ADMINISTRATION OF THE PLAN

4.1. Management Costs of the Plan

There is a substantial time and cost overhead associated with this Plan and its implementation.

Accordingly, costs associated with the preparation, administration and management of this Plan will be levied on all applications which result in a contribution payable under this Plan. These costs are shown as a separate element in the rates schedule and the method of calculation is described in Section 6 and covers the implementation review, monitoring and updating procedures set out in the Plan. In addition, studies are undertaken to determine the design and costing of works as well as to review the development and demand assumptions of the Plan.

Where a MPB or WIK agreement is negotiated between a developer and the Council, the Plan Administration and Management Contribution levy will still apply. This amount will cover plan review costs and also Council's costs associated with negotiating the MPB or PA and supervision of the work undertaken.

5. NEXUS AND METHODOLOGY

This section of the Plan establishes the relationship (nexus) between the expected types of development in the Contribution Areas and the demand for additional public services and facilities to meet the needs of that development.

Nexus is the relationship between the expected types of development in the area and the demonstrated need for additional public facilities created by those developments. The concept of nexus is often referred to in the following terms:

- Causal Nexus – 'what'. This is a demonstration that the anticipated development will or is likely to create a need or increases the demand for a particular public facility.
- Spatial or physical nexus – 'where'. Spatial nexus requires that the proposed public facility be located so as to serve the needs of those who created the demand for it.
- Temporal nexus – 'when'. Temporal nexus seeks to ensure that the public facility will be provided in a timely manner to benefit those who contributed towards it.

The level of provision sought for the facilities identified in this Plan is considered reasonable and are required to satisfy the expected demands arising from relevant development in the Plan's Contributions Area. New or expanding development utilising heavy vehicle haulage will increase the need for maintenance of certain public roads. It will therefore be necessary for increased maintenance to be provided in response to the impact of increased heavy vehicle usage.

Table 2: Facilities categories

Category	Types of Services/Facilities
Heavy vehicle Generating Development	Road maintenance (heavy haulage vehicle impacts),
Plan Management and Administration	Management of development contributions and works, and review of the Plan.

Details of the methodology for calculating the contribution towards increased maintenance costs are attached to this Plan.

6. HEAVY VEHICLE GENERATING DEVELOPMENT

6.1. Introduction

The contributions provided for in this Plan are required to meet the increase in road maintenance from new development within the identified Contribution Area.

The key documents supporting these works are identified below:

- Narromine Shire Council Community Strategic Plan 2027 Narromine Shire Council
- Council Revised 2017/18-2020/21 Delivery Plan 2018-2019 Narromine Shire Council
- Council Operational Plan 2018-2019 Narromine Shire Council
- Council Long Term Financial Plan Narromine Shire Council (adopted 2018)
- Asset Management Plan
- Asset Management Policy 2017 Narromine Shire Council
- Bitumen and Asphalt Resurfacing Policy Narromine Shire Council
- Narromine Shire Council Roads Manual
- Austroads Guide to Pavement Technology Part 2: Pavement Structural Design (2012)

6.2. Nexus

Facilities provided for within this Plan are consistent with the Council's Community Strategic Plan (CSP), and in particular:

- Outcome 3.6: OUR ROAD NETWORK IS SAFE, WELL MAINTAINED AND APPROPRIATELY FUNDED
 - Action 3.6.1: Ensure local and regional roads are safe, well constructed and maintained

A contribution is sought in the case of development that generates significant heavy haulage vehicle movements. It is well documented that heavy vehicles accelerate the deterioration of road surfaces, and lead to a requirement for more frequent and expensive remediation and maintenance works if road service standards are to be maintained. Accordingly, such developments may be required to contribute towards the costs of the resultant more frequent maintenance regime.

6.3. Apportionment

In relation to heavy vehicle haulage contributions, the contribution rate has been calculated solely on the demand attributable to a proposed development, and as a result no apportionment has been applied.

6.4. Methodology

All heavy vehicles contribute to the deterioration of road pavements. An increase in the number of heavy vehicles using a road will accelerate the deterioration of a road, and lead to increased road maintenance costs being incurred by Council. The impact of heavy vehicles on the condition of road pavements has been well documented by Austroads and other authoritative sources.

Council maintains the Local Government Area's roads at an adopted level of service as specified in the Narromine Shire Council's Asset Management Plan – Transport (AMP6). As a result of a development using heavy haulage vehicles, Council will need to undertake increased maintenance work to maintain this level of service. The extent of the increased maintenance is dependent on the heavy vehicular traffic generated by the subject development.

Increased road maintenance results in an increased drain on Council's finances. These increased costs will burden the community with providing the increased funds required by Council in order to maintain the existing level of service for

the road network as a result of the development, unless the subject development provides a contribution commensurate with the increased maintenance costs.

The purpose of this methodology is to ensure that heavy vehicle haulage associated with a specific development provides a fair contribution towards the additional costs incurred by Council as a result of any heavy haulage traffic associated with that development.

The costs of keeping roads in a satisfactory condition occur in three main areas:

- Rehabilitation:
 - Regional sealed pavement rehabilitation;
 - Rural sealed pavement rehabilitation, and
 - Unsealed pavement rehabilitation/gravel resurfacing;
- Reseals
 - Maintenance reseal (i.e. regional and local roads)
- Maintenance
 - Annual routine maintenance, and
 - Heavy patching or stabilisation of selected sections.

A traffic generating development will be required to pay a proportion of all of the above costs based upon the heavy vehicle Equivalent Standard Axle (ESA) impact on the regional or local road used by the heavy vehicles in question. An Equivalent Standard Axle (ESA) is defined as a Dual Tyred Single Axle transmitting a load of 80kN (or 8.2 tonne) to the pavement (Austroads).

The contribution and its calculation do not apply to State Roads that are the funding responsibility of the State Government, such as the Mitchell or Newell Highways.

6.4.1. Roads and Design Life

Council maintains a mix of sealed and unsealed roads. These roads have been subdivided into three categories for the purposes of this Plan:

- Regional sealed pavement;
- Local sealed pavement, and
- Unsealed pavement.

Each road type has a different design life and maintenance requirements.

Austroads Pavement Design Guides contain design tables where pavement design life can be expressed in accordance with design traffic loadings (ESA). Thus, a standard life of pavement can be expressed as ESAs. This means that the life of a pavement can be expressed as the total number of equivalent axles that should pass over it prior to replacement.

The standard life (assumed design life) for the road categories above is expressed as ESA are:

- | | |
|--------------------------|---|
| - Regional sealed roads: | approximately 1,000,000 ESA over 60 years |
| - Local sealed | approximately 1,000,000 ESA over 90 years |
| - Unsealed roads | approximately 200,000 ESA over 15 years |

A sealed road incurs construction costs, maintenance costs and replacement of the wearing course over its design life. An unsealed road incurs ongoing costs for maintenance and gravel resheeting and heavy gravel patching, with additional work required if there is significant damage for natural events, such as flood events.

6.4.2. Maintain the Narromine Shire Council Roads Network

The Table below indicates the costs of maintaining specific road types as determined by Council, at the time of preparation of this Plan. The figures are those generally applying across Council's road network, however specific roads have differing maintenance costs. They are derived from the Narromine Shire Council Roads Management Strategic Plan. This information can be used to calculate the "notional" cost of regional and rural sealed roads, as well as unsealed roads, over their design life. The actual current cost of these works, as they relate to the specific roads affected by a development, will be used by Council in calculating a contribution, in order to ensure that the calculated contribution closely reflects actual costs.

Table: General cost of roads over their design life

Road type	Cost per km	How often
Regional sealed roads:		
Rehabilitation	\$400,000	at 60 th year
Reseals (average width of 8m)	\$40,000	at 15 th year
Maintenance	\$3,080	annually
Local sealed roads		
Rehabilitation	\$250,000	at 90 th year
Reseals (average width of 6m)	\$35,000	at 15 th year
Maintenance	\$3,080	annually
Unsealed roads		
Resheet	\$50,000	at 20-25 th year
Maintenance	\$2,500	annually

Applicants are advised to consult with Council in order to determine the current costs for the above maintenance activities for the specific roads affected by their proposal, prior to assessing the likely contribution of a specific development.

Based on the General Table above, the total cost per kilometre of a **regional sealed** road over its assumed design life is:

$$\begin{aligned}
 & \$ \text{ maintenance} \times 55 \text{ yrs.} + \$ \text{reseal (@ 15}^{\text{th}}, 30^{\text{th}}, 45^{\text{th}} \text{ years)} + \$ \text{ reconstruction (@60}^{\text{th}} \text{ year)} \\
 & = (\$3,080 \times 55) + \$40,000 \times 3 + \$400,000 \\
 & = \$689,400 \text{ per km}
 \end{aligned}$$

The total cost per kilometre of a **local sealed** road over its assumed design life is:

$$\begin{aligned}
 & \$ \text{ maintenance} \times 84 \text{ yrs.} + \$ \text{ reseal (@ 15}^{\text{th}}, 30^{\text{th}}, 45^{\text{th}}, 60^{\text{th}}, 75 \text{ years)} + \$ \text{ reconstruction (@ 90}^{\text{th}} \text{ year)} \\
 & = (\$3,080 \times 84) + \$35,000 \times 5 + \$250,000 \\
 & = \$683,720 \text{ per km}
 \end{aligned}$$

The total cost per kilometre of an **unsealed road** is over its assumed design life:

$$\begin{aligned} & \$ \text{ maintenance} \times 18\text{yrs} + \$ \text{ resheet gravel (@ 20th year)} \\ & = (\$2,500 \times 18) + \$50,000 \\ & = \$95,000 \text{ per km} \end{aligned}$$

6.4.3. Approach to Measuring Traffic Impacts

The calculation of the contribution is based on a comparison of the pre and post development use by heavy vehicles of the roads affected by the development.

The methodology considers the average annualised road maintenance costs, and the length and type of roads to be used by heavy vehicles associated with the subject development. Increased maintenance costs are calculated using the ESA loading on the road per vehicle as a proportion of the total loadings on the road. This is then converted to a total cost per tonne (1000 kilograms) per annum over the designated route travelled by the vehicles.

Predevelopment numbers of heavy vehicles on the roads will be based on the details provided in the documentation submitted with the Development Application (if considered satisfactory by Council), and verified by traffic counts over a minimum period of 1 month, prior to the commencement of the development.

Where the designated travel route involves the use of more than one road, a separate count for each road may be necessary. This should be confirmed with Council.

The increased costs associated with each road will be calculated separately, and the total contribution payable for the development will be the sum of all the calculated contribution rates for all the individual roads on the designated travel route/s.

6.4.4. Measuring Traffic Impacts at DA Stage

An assessment of vehicle movements generated by a development is required as part of the Statement of Environmental Effects (SEE) or Environmental Impact Statement (EIS) accompanying the proposed development application.

6.4.5. Measuring Traffic Impacts, Post DA Determination

Notwithstanding the assessment carried out at DA Stage, Council will require ongoing reporting of haulage movements and tonnages in order to ensure an accurate assessment of contributions towards maintaining the relevant roads.

A quarterly report will be required from the operator of the development. The quarterly report should include details of the number and type of vehicle movements over the past 3 months, including tonnages hauled. Details of the extracted volume of material will also be required, as is usually submitted annually in returns to the NSW Government Department with responsibility for mines and quarries (if relevant). The documents should be audited and certified by the operating company's auditor.

Council may require confirmation of the accuracy of the operator's records at the operator's expense, if Council feels there are discrepancies in the operator's records or no audited statement is provided by the development. If the confirmation process determines that the operator's records are accurate within a tolerance of 5 percent, Council will assume responsibility for the relevant expenses, such as traffic surveys, etc.

There is a relationship between the volume of material extracted from the ground and the vehicle movements generated. For extractive industries, generally a 30% loose volume factor is used for conversion of solid volume to loose volume and therefore, it is assumed that an average haulage truck of loose fill volume 10 m³ represents 7.7m³ of solid volume extracted. Should an applicant be of the view that this volume factor is inappropriate an alternative factor may be applied provided it is justified to Council's satisfaction.

6.4.6. Method of Assessment

The impact of heavy vehicles on roads will be calculated using ESA (equivalent standard axle), which provides a widely accepted way of determining the likely damage to a road pavement from heavy vehicles. The ESA of the relevant heavy vehicles in the operator's annual return will be calculated using the prevailing AUSTRROADS vehicle classification.

Only loaded truck movements will be included in the calculations.

The calculation of contributions will be expressed as a yearly cost, calculated annually and payable quarterly.

6.4.7. Contributions Methodology Formula

This Plan applies a consistent formula to determine the contribution of heavy vehicle haulage towards road maintenance.

This formula considers:

- Use of the roads in question expressed in ESA
- The design life of the roads
- The lifecycle costs of maintaining the roads

Different road vehicles have different axle configurations and different axle load configurations. In turn, vehicle class configurations are converted to equivalent standard axles (ESA).

The Austroads Guide to Pavement Technology Part 2: Pavement Structural Design (2012) provides a methodology for the identifying the ESAs for different vehicles. The table below shows the ESA applying to specific vehicle classes.

Vehicle class	Vehicle type (Austroads classification)	ESA
1	Car	0
2	Light vehicle with towing/ commercial van	0
3	Two axle truck	1.2
4	Three axle truck	1.6
5	Four axle truck	2.2
6	Three axle articulated truck	1.8
7	Four axle articulated truck	2.2
8	Five axle articulated truck	2.8
9	Six axle articulated truck	2.8
10	Seven + axle articulated truck	3.4

The calculation of the periodic contribution relating to any heavy haulage development is determined by calculating the aggregate impact of the subject heavy vehicle movements on each of the road type described above. The periodic contribution is determined by applying the following formula:

$$\begin{aligned}
 \$C &= \frac{\$Reg \times ESA \times Reg \text{ Length}}{Reg. \text{ life}} + \frac{\$Local \text{ seal} \times ESA \times Local \text{ sealed Length}}{Local \text{ seal life}} \\
 &+ \frac{\$Unseal \times ESA \times Unsealed Length}{Unsealed life}
 \end{aligned}$$

where:

- \$C is the monetary contribution payable by the development for the relevant period (e.g. preceding quarter) in dollars
- \$Reg is the standard cost of regional road per kilometre over the design life in dollars, being \$689,400
- \$Local sealed is the standard cost of local sealed road per kilometre over the design life in dollars, being \$683,720
- \$Unseal is the standard cost of local gravel road per kilometre over the design life in dollars, being \$95,000
- ESA is the total number of ESAs generated by the development in the preceding period
- Reg life is the standard life of a sealed regional road, which is 1,000,000 ESA
- Local sealed life is the standard life of a local sealed road, which is 1,000,000 ESA
- Unsealed life is the standard life of a local gravel road, which is 200,000 ESA
- Reg Length is the total length of regional sealed road travelled by the development's laden heavy vehicles estimated at the time of the development application, in kilometres
- Local seal Length is the total length of local sealed road travelled by the development's laden heavy vehicles estimated at the time of the development application, in kilometres
- Unsealed Length is the total length of local unsealed road travelled by the development's laden heavy vehicles estimated at the time of the development application, in kilometres

6.4.8. Notional examples

Example 1

A fictitious quarry is proposed. The distance travelled on Shire roads from the quarry to the nearest State road is approximately 10 km of local sealed roads.

The applicant states that the quarry will produce 100,000 tonnes of material each year.

The haulage of the excavated material will involve 4000 Class 8 vehicle movements.

Because only one type of road (local sealed) is involved, the formula is:

$$\$C = \frac{\$Local \text{ sealed} \times ESA \times Local \text{ sealed Length}}{Local \text{ sealed life}}$$

$$\$C = \frac{\$683,720 \times 11,200 \times 10}{1,000,000}$$

= \$ 76,577 per annum

Example 2

A fictitious mine is proposed. The distance travelled on Shire roads from the mine to the nearest State road is approximately 5 km of regional sealed roads, 10 km of local sealed roads and 5 km of local unsealed roads.

The applicant states that the mine will produce 50,000 tonnes of material each year.

The haulage of the excavated material will involve 2000 Class 7 vehicle movements.

Because all three road types are involved, the formula is:

$$\begin{aligned} \$C &= \frac{\$Reg \times ESA \times Reg \text{ Length}}{Reg. \text{ life}} + \frac{\$Local \text{ sealed} \times ESA \times Local \text{ sealed Length}}{Local \text{ sealed life}} \\ &+ \frac{\$Unseal \times ESA \times Unsealed Length}{Unsealed life} \end{aligned}$$

$$\begin{aligned} \$C &= \frac{\$689,400 \times 4,400 \text{ (i.e. } 2.2 \times 2000) \times 5}{1,000,000} + \frac{\$683,720 \times 4,400 \times 10}{1,000,000} \\ &+ \frac{\$95,000 \times 4,400 \times 5}{200,000} \\ &= \$15,167 + \$30,084 + 10,450 \\ &= \$55,701 \text{ per annum} \end{aligned}$$

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7. PLAN ADMINISTRATION COSTS

7.1. Nexus

The preparation and administration of a Section 7.11 plan requires resources. Council employs staff to undertake the financial accounting of contributions, and implement the Plan and its works. In addition, consultant studies and specialist advice (e.g. legal and valuation) are obtained to assist with Plan preparation, management and review.

The costs involved with administering Section 7.11 are an essential component of the efficient provision of facilities necessitated by development within the Contributions Areas.

7.2. Strategy

The Plan aims to provide funds to ensure the efficient management of the Section 7.11 planning and financial processes within Council. These processes will be ongoing throughout the life of the Plan.

Council staff that are accountable for facility/service planning and delivery will be involved in reviewing and updating the Plan. This may include review of the works schedules or the latest information on community needs to ensure that facility planning is current and appropriate. This may also include engaging specialist consultants (e.g. planning and engineering specialists) to carry out studies.

7.3. Calculation of Contribution

The estimated cost of Council staff and specialist consulting assistance in the preparation, implementation, management and administration of this Plan is 1% of the value of contributions.

Table 3: Plan Preparation and Management Contributions

Contributions Area	Contribution
Plan Management Administration- Heavy Vehicle Generating Development	1% of the calculated contribution