

**ITEM 4 DRAFT FAIRY AND CABBAGE TREE CREEKS FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN**

The Wollongong Local Government Area is naturally prone to flooding due to our unique topography as water travels down the escarpment toward the ocean.

The draft Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan (FRMSP) follows on from the most recent Flood Study adopted in June 2020. The draft Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan was prepared in accordance with the New South Wales (NSW) Flood Prone Land Policy and the principles of the NSW Government's Flood Risk Management Manual. The Fairy and Cabbage Tree Creeks catchment includes the suburbs of Balgownie, Mount Pleasant, Mount Ousley, Fairy Meadow, North Wollongong, Keiraville and Gwynneville as well as parts of Wollongong and Towradgi.

The draft Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan was publicly exhibited from 11 September to 16 October 2023. Council received more than 200 submissions which commented on various aspects of the draft Study and Plan. Most residents were supportive of the recommended options within the draft Study and Plan. It is recommended that the Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan be adopted.

### RECOMMENDATION

Council adopt the Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan.

### REPORT AUTHORISATIONS

Report of: Nathan McBriarty, Manager Infrastructure Strategy + Planning  
Authorised by: Joanne Page, Director Infrastructure + Works

### ATTACHMENTS

- 1 Location Plan - Fairy and Cabbage Tree Creeks Catchment
- 2 Central Area Floodplain Risk Management Committee Meeting Minutes 3 April 2024
- 3 Executive Summary - Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan
- 4 Engagement Report - Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan (2023)

### BACKGROUND

The Fairy and Cabbage Tree Creeks Flood Study (2010) was reviewed and updated in the revised Flood Study (2020) to account for changes associated with Council's Blockage Policy (2016). The Flood Study (2020) provides the most up-to-date information on flooding for the catchment and provided the basis for the draft Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan.

The NSW Government's Flood Risk Management Manual provides a framework to ensure the sustainable development and activation of floodplain environments and incorporates the NSW Flood Prone Policy. Under the Policy, planning for flood liable land is led by Local Government, with State Government subsidising flood mitigation works and providing specialist technical advice to assist Councils in performing their floodplain management responsibilities. The Policy provides for technical and financial support by the State Government through five sequential stages:

- 1 Flood Study – Determines the nature and extent of flooding.
- 2 Floodplain Risk Management Study – Evaluates risks and management options for the floodplain in respect of both existing and proposed development.
- 3 Floodplain Risk Management Plan – development of a plan of management for the floodplain based on the evaluation work in the Floodplain Risk Management Study.
- 4 Implementation of the Plan – taking action to implement the agreed flood modification measures, response modification measures, and property modification measures.

- 5 Review – reviews are recommended on average every 5-10 years and in response to significant changes or events.

The draft Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan was prepared in accordance with the NSW Government's Floodplain Development Manual and the Australian Rainfall and Runoff 2019 guidelines. It includes a review of the 2010 Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan.

The preparation of this Study and Plan has been overseen by the Central Area Floodplain Risk Management Committee, comprising membership of Councillors, community representatives and State Government agencies.

On 3 April 2024, an overview of the draft Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan was presented to the Central Area Floodplain Risk Management Committee, and the Committee recommended the report be adopted by Wollongong City Council (refer Attachment 2).

## PROPOSAL

It is proposed that Council adopt the Floodplain Risk Management Study and Plan for the Fairy and Cabbage Tree Creeks catchment. This will enable Council to implement identified priority options and seek funding from the State Government.

Implementation of identified options in the Plan is estimated to cost in the order of \$14.3 million based on current cost estimates. Funding for specific options will be considered in future budget cycles and prioritised as resources allow. Executive Summaries of the 'Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan' are included in Attachment 3.

After the adoption of the Floodplain Risk Management Study and Plan, the following actions will be undertaken –

- Incorporate the Flood Risk Precinct Mapping into Council's GIS system.
- Update the relevant Section 10.7 Planning Certificate codes relating to flooding.
- Update the flood planning levels.
- Update the relevant sections within the Wollongong DCP 2009.
- Prepare Grant submissions to State and Federal Government seeking assistance to implement options within the implementation plan; and
- Commence the implementation of the plan (subject to funding).

## CONSULTATION AND COMMUNICATION

The draft Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan was developed through consultation with the local community, a Technical Working Group, and the Floodplain Risk Management Committee. The draft Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan was publicly exhibited from 11 September to 16 October 2023.

Consultation occurred via:

- Distribution of over 12,678 newsletters and questionnaires/feedback forms to all residents, businesses, and property owners within the floodplain area at the commencement of the public consultation phase to give opportunity for them to provide feedback.
- Media release and notice in the Illawarra Mercury.
- Council's website.
- Public exhibition and community information session.
- Emails/letters to Neighbourhood Forum 5.

- Emails/letters to other stakeholders including State Government agencies, schools, and business and industry bodies.
- Social media posts.
- Meetings of the Floodplain Risk Management Committee.
- Meetings of the Technical Working Group.

The exhibition project webpage was viewed 344 times and reports were downloaded 187 times. Council received more than 200 submissions including 148 hard copy surveys returned by mail and email, 23 online surveys, 15 Aboriginal stakeholder submissions and 15 submissions in community consultation session. The key themes from the submissions were creek and vegetation maintenance; stormwater infrastructure and maintenance; development and planning control; natural mitigation and erosion.

The submissions are summarised in Council’s Engagement Report (Attachment 4).

Most residents were supportive of the recommended options within the draft Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan.

**Drop-in Community Information Session**

A drop-in community information session at the Guest Park, Fairy Meadow took place on 19 September 2023 and was attended by more than 105 community members and 11 staff from Council, Department of Planning and Environment, and the consultant. Attendees were given opportunity to ask questions to the engineers working on this project and provide comments on the proposed options. People suggested additional or alternative measures to reduce flood impacts. They also noted their observations of flooding and flood impacts in these areas. Common questions were around development, insurance, prioritisation and how the proposed mitigation strategies would work and their impact on surrounding properties.

**Aboriginal Stakeholder Meetings**

Meetings with Aboriginal stakeholders were held between 1 September 2023 to 16 October 2023. Aboriginal stakeholders spoke from personal and cultural experience when providing input on the draft FRMS&P. Some key points the meetings raised were about protecting natural areas and if intervening, site inspections be carried out, investigate natural interventions to ease the speed of high flowing creeks, implement mitigation strategies in already intervened (concreted) culverts and drains. There were concerns raised regarding the proposed McMahons Street detention basin, given the area is in a natural state.

**Central Floodplain Risk Management Committee**

On 3 April 2024, an overview of the draft Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan was presented to the Central Floodplain Management Committee. The Committee recommended the report be adopted by Wollongong City Council (refer Attachment 2).

**Outcome of Community Consultation**

Comments from the community and from State Government agencies have been reviewed and, where appropriate, incorporated into the final version of the Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan.

**PLANNING AND POLICY IMPACT**

This report contributes to the delivery of Our Wollongong 2032 Goal 1 – We value and protect our environment. It specifically delivers on the following:

Community Strategic Plan 2032	Delivery Program 2022-2026
Strategy	Service
1.3 Increase our resilience to natural disasters and a changing climate to protect life, property and the environment.	Stormwater Services

## SUSTAINABILITY IMPLICATIONS

The recommended options within the draft Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan have been assessed on the principles of sustainability in social, environmental, cultural, and economic terms, using a multi-criteria assessment.

## RISK MANAGEMENT

The draft Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan provides an improved understanding of the flood behaviour and flood risk on the existing and future communities within the catchment and provides ways to manage the flood risk efficiently and effectively into the future.

## FINANCIAL IMPLICATIONS

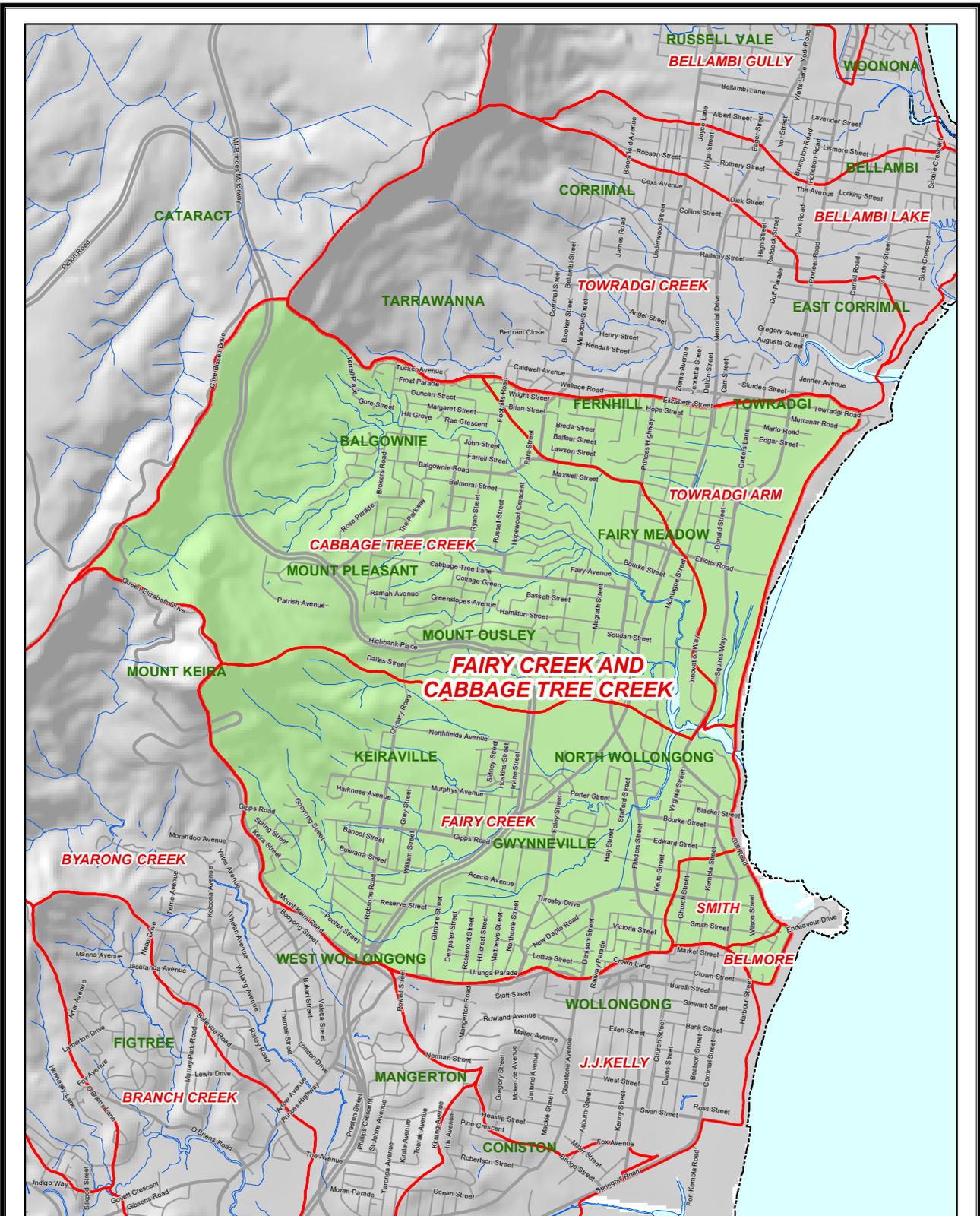
The preparation of this Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan has cost \$223,701.50 (GST inclusive); with approximately two thirds being funded by State Government. Implementation of all options within the Floodplain Risk Management Plan is estimated to cost in the order of \$14.3 million based on current cost estimates. Allocation of funds to priority options will be considered in future budget cycles and delivered as resources allow.

Pending adoption of the Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan, applications to State and Federal Governments will be made for financial assistance to implement options from the Floodplain Risk Management Study and Plan. Where successful, grants are usually provided in the ratio of 2:1 (two parts State Government, one part Council).

## CONCLUSION

The draft Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan has been prepared with the cooperation, assistance, and support of many stakeholders, including community members and State Government representatives.

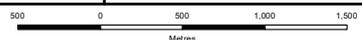
The draft Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan will allow for the implementation of appropriate flood risk management strategies such as planning controls, emergency response measures, education, and infrastructure solutions to benefit the community and businesses within the catchment. The report and associated flood data will be uploaded to the NSW Flood Data Portal so it can be publicly accessed, with the aim of providing improved understanding of flood behaviour and flood risk while supporting future decision making for flood risk mitigation for the Fairy and Cabbage Tree Creeks catchment.



### Fairy and Cabbage Tree Creeks Catchment



- Fairy Creek and Cabbage Tree Catchment
- Other Catchment
- Catchment Boundary
- Watercourse



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## MINUTES

## FLOODPLAIN RISK MANAGEMENT COMMITTEE (CENTRAL AREA)

at 4.00 pm

Tuesday, 3 April 2024

### In Attendance

Cr J Dorahy (Chair), Cr T Brown, Cr C Blakey, Nathan McBriarty - Manager Infrastructure Strategy and Planning (Acting), Ali Sevenler - Floodplain Management Engineer, Yelia Pandika - Floodplain Management Engineer, Petar Milevski - Floodplain Management Engineer, Motiur Rahman - Floodplain Management Engineer, David Green - Land Use Planning Manager, Clare Robinson - Emergency Management Officer, Glenda Fewings - Administration Officer, Shaza Raini - Department of Planning Industry and Environment, Oscar Garratt - Rhelm, Leon Collins - Advisian, Felix Taaffe - GRC Hydro, Stuart Milling - Transport for NSW, Andrew Monk - Transport for NSW, Jean Groves - Neighbourhood Forum Representative, David Hearne - Community Representative.



**MINUTES**

**FLOODPLAIN RISK MANAGEMENT COMMITTEE –  
 CENTRAL AREA**



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## MINUTES

## FLOODPLAIN RISK MANAGEMENT COMMITTEE – CENTRAL AREA



### 1 STANDING AGENDA ITEMS

#### 1.1 Welcome and Introduction

In line with NSW Health guidelines about Novel Coronavirus, we have made some changes to the way we are engaging the community, to keep our staff and people in our community safe. Instead of having face-to-face conversations with people, meetings are currently being conducted via Teams.

#### 1.2 Acknowledgement of Country

The traditional owners of the land were acknowledged.

#### 1.3 Apologies

Apologies were received and accepted on behalf of M Mariner.

#### 1.4 Disclosures of Interests

Nil

#### 1.5 Confirmation of Minutes of Previous Meeting

The Minutes of the Meeting held on 19 July 2023 were accepted by the Committee.

### 2 FLOOD MANAGEMENT UPDATE

#### 2.1 Allans Creek Floodplain Risk Management Study and Plan

Public exhibition of the draft Allans Creek Floodplain Risk Management Study and Plan was completed on 9 October 2023. Following the closure of the exhibition period, the submissions received from the community were consolidated/reviewed.

An update on the progress of this project was presented by the consultants from Rhelm. The presentation outlined:

1. The Project Scope
2. Work Completed to Date
3. Public Exhibition Outcomes:
  - 211 Submissions received
  - 77 Attendees at drop in session
  - The key themes included creek maintenance and erosion concerns, development application approvals, flood insurance premiums, council responsiveness, specific location issues, individual property concerns, community education and widening of Byarong Creek upstream and downstream of the Princes Highway.

Cr J Dorahy questioned the risk options for Byarong Creek and channel widening – where on Byarong would this be located? Oscar advised widening upstream of Princes Highway and further explained that properties have been purchased through the voluntary purchase scheme. A detention basin to offset impacts down near Figtree Oval would be challenging and would not stack up in terms of the cost benefit ratio.

**Action: It is proposed that the committee recommend that Council adopt the Allans Creek Floodplain Risk Management Study and Plan (2024).**

Moved by Cr T Brown

Nil Objections

MINUTES

FLOODPLAIN RISK MANAGEMENT COMMITTEE –  
CENTRAL AREA



## 2.2 Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan

Public exhibition of the draft Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan was completed on 16 October 2023. Following the public exhibition, the submissions received from the community were consolidated/reviewed.

An update on the progress of this project was presented by the consultants from Advisian. The presentation outlined:

1. The Project Scope
2. Work Completed to Date
3. Public Exhibition Outcomes

Jean questioned if the reason for James Pearson Park not going ahead was because of the cost factor? Leon advised the benefit in terms of the traffic down stream did not add up economically as there was limited space to detain water and the impacts of this on flooding down stream.

Cr Dorahy noted that the view on page 10, figure 8.3 of the presentation, does highlight flooding, a higher number of properties are flooded in this catchment compared with the Allans Creek catchment. Leon noted he had not looked in detail at the Allans Creek study but noted flooding was relatively broad. Cr J Dorahy asked who looks after the flood warning monitoring and trigger levels and the the implementation of these functions is it the SES or WCC? Leon advised in terms of flood warning it would be BOM warnings, council does have some work under way and systems to place. Ali advised Council has Flood Aware which is a flash flood warning system however these can be precarious and we do not want a system that will warn people of every rainfall event, council is still investigating options – there is not simple solution. Nathan advised Council knows there are other means and measures and at the moment the team are providing You Tube videos for managing safety and the communications team have released these in multiple languages to help with prevention.

Jean advised water flows under James Pearson Park in the privately owned creek – the Williams Street creek between Chalmers and Williams Street - and this takes a lot of water in a big downpour, with the owners expected to keep this clear and clean. In this area of the creek there are huge concrete blocks, would council ever consider helping the owners as a one off to get these out of the creek with their machinery? Nathan advised 60% of water courses are private and therefore we need to be careful as a one off opportunity would normally be as a response to an emergency, without an emergency we could be asked to do on all private land and this is not feasible. Jean advised if council is happy to use the creek as a drainage system then council have a responsibility and conscience to help these property owners as its to councils benefit to remove the concrete blocks. Cr J Dorahy advised he understands the position however potentially there could be an option for council to provide advice on creek improvements.

Cr C Blakey advised College Place has a transient population and therefore there is not alot of knowledge in place for these residents and they are only targeted on an emergency basis. Is there something we can do? Nathan advised we can definately look at this and target locations once the plan is adopted.

Cr J Dorahy asked could Memorial Drive culvert upgrades be widened or expanded, would this be quite costly, would this come under state government as it is a state road? Ali advised this plan would be Transport for NSW (TfNSW) and Andrew advised TfNSW would fund this out of its own funds and not apply for grant money. Andrew advised he had a quick glance at the costing and TfNSW would need to assess to see if it would be financially viable.

Cr C Blakey advised she has heard from residents re McMahan Place as they are concerned with the impact of an environmental basin – Leon advised it was not on this project. Motiur advised this will be covered under Item 2.3 - McMahan Basin.

**Action: It is proposed that the committee recommend that Council adopt the Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan (2024).**

Moved by Cr T Brown

Nil Objections

MINUTES

FLOODPLAIN RISK MANAGEMENT COMMITTEE –  
CENTRAL AREA



### 2.3 Wollongong City Floodplain Risk Management Study and Plan

The final draft Wollongong City FRMS&P has been prepared by Council's consultant. An update on the progress of this project was presented by the consultants from GRC Hydro and covered:

1. Previous and current modelling.
2. The status of flood risk management plan measures.
3. An updated floodplain risk management plan.
4. Flood Mitigation.
5. Voluntary house raising and voluntary house purchase.
6. Flood modification measures.
7. Next Steps:
  1. Committee endorses public exhibition.
  2. Finalise report for public exhibition.
  3. Public exhibition and receipt of feedback.
  4. Incorporate feedback and finalise report for council adoption.

Andrew questioned if the road raising exercises had been assessed for what the affects upstream would be? Felix advised yes, I can show the impacts however it does not indicate impacts on properties as there are proposed road raising and culvert upgrades. Andrew questioned is this due to the flat nature of the downstream area? Felix advised, yes and it can get through and as the 3 locations do not have a huge upstream catchment it makes it more achievable.

Jean asked does the area of 1.8km that is very flat where the water slows down have a solution to speed up the water and clear it faster? Felix advised there are several options being looked at however nothing has been decided as yet; vegetation, earthworks in the park; can the water be drained somewhere else were all looked at.

Cr J Dorahy advised at the golf course at the end of Spring Hill Road there was a creek, has it ever been looked at as a more effective solution to have it reinvented than to raise the level of the road? Felix advised it was looked at in the 2015 study and it was a natural low point that would take flow and the constraints were going west to east; there was ecological impact for a large area and there would be a need for ongoing dredging for the required outlet and the cost was noted to be very high.

Cr T Brown asked for the options and if there had been any ball park costings on these options? – Felix advised costs estimates were not provided for three of the options for Spring Hill Road due to being TfNSW infrastructure. Andrew Monk advised cost will be significant and one of the option presents constraints with the railway over-bridge.

**Action: It is proposed that the Committee recommend exhibition of the draft plan to the community.**

Moved by Cr T Brown

Nil Objections

### 2.4 Detailed Design of McMahon Basin

Council did a concept design a couple of years ago:

- Stage 1: Data Collection
- Stage 2: Design Development Phase is ongoing

Once this has been finalised Council will seek committee consultation before going out to public consultation (limited to the directly impacted properties in the vicinity of the works)

Cr C Blakey and Stuart Milling raised environmental issues in this area. Motiur has forwarded to consultant to be considered in the report.

MINUTES

FLOODPLAIN RISK MANAGEMENT COMMITTEE –  
CENTRAL AREA



**2.5 Allans Creek – Debris Control Structure at The Avenue (Figtree Oval) Design**

Ali advised Northrope have been engaged and they are on track for delivering the design this financial year, 2023/2024.

Cr C Blakey asked if the potential bridges to connect to Figtree Oval needed to have the flood risk study first and does this now open up options for creek bridges to provide connectivity? Ali advised there is no specific proposal in that area – any proposed bridge will require a flood impact assessment to quantify flood impacts to the surrounding area.

**3 GENERAL BUSINESS**

**3.1 Business Arising from Previous Minutes**

Nil

**4 NEXT MEETING**

The date of the next meeting is to be advised.

**5 CLOSE MEETING**

The meeting closed at 5.34pm

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Wollongong City Council

Fairy & Cabbage Tree Creeks Floodplain  
Risk Management Study & Plan

## Executive Summary

### Introduction

The Fairy and Cabbage Tree Creeks catchment is located within the Wollongong City Council Local Government Area (LGA) in the Illawarra Region of New South Wales. The catchment comprises an area of approximately 21 km<sup>2</sup> draining from the Illawarra Escarpment to the Tasman Sea through Fairy Lagoon, which is an intermittently closed and open lake or lagoon (ICOLL). The study area also includes the Smith Street and Belmore Basin catchments which drain to Belmore Basin Harbour and have a combined area of about 0.7 km<sup>2</sup>.

The study area encompasses suburbs such as Balgownie, Mount Pleasant, Mount Ousley, Fairy Meadow, North Wollongong, Keiraville and Gwynneville as well as parts of Wollongong and Towradgi. The major tributaries draining the catchment are Cabbage Tree Creek, Fairy Creek and Towradgi Arm. A number of major transport links also pass through the catchment including the Princes Motorway (M1), Mount Ousley Road, Princes Highway, Memorial Drive and the Illawarra Railway.

The catchment has a history of flooding, with extensive damage caused to private and public property located near the creeks and major drainage channels during a flood in August 1998.

Wollongong City Council (Council) is responsible for local planning and land management within its LGA, including the management of flood prone land. Previous floodplain risk management activities completed by Council in the study area have included the *Fairy and Cabbage Tree Creeks Flood Study* (Advisian 2020), *Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan* (Bewsher Consulting 2010), and the implementation of flood risk management measures including detention basins, creek modification works, riparian corridor management and voluntary property purchase.

Council engaged Advisian (*part of the Worley Group*) to undertake an updated *Fairy and Cabbage Tree Creeks Floodplain Risk Management Study and Plan* (FRMS&P) in response to various factors including release of Council's Revised Conduit Blockage Policy (2016), recent improvements in flood modelling technology, the availability of new data, and changes in the catchment. Flood modelling and mapping has been updated as part of the FRMS&P to reflect changes to the design flood estimation process associated with the release of *Australian Rainfall and Runoff: A Guide to Flood Estimation 2019* (ARR2019) and related local data.

The study provides an improved understanding of the potential impacts of floods on the local community and will inform the ongoing management of flood risk in the Fairy and Cabbage Tree Creeks catchment.

### Local Flood History

The Fairy and Cabbage Tree Creeks catchment has experienced several significant floods over the past decades including events in March 1975, March 1983 and August 1998. A flood also occurred in the Illawarra Region in October 1999 but was not particularly severe within the Fairy and Cabbage Tree Creeks catchment.

The 1998 flood caused significant disruption and damage to public and private property. Floodwaters created high hazard conditions at numerous properties in close proximity to watercourses and drainage channels, as well as on major and local roads. Significant clean-up operations were required following the flood.



**Wollongong City Council**

**Fairy & Cabbage Tree Creeks Floodplain  
Risk Management Study & Plan**

Rainfall and flood severity may vary significantly across the catchment due to its topography and size. Typically, rainfall in the upper catchment is higher and more intense than along the coast owing to the orographic influence of the Illawarra Escarpment, as was the case during the August 1998 storm. Rainfall in the catchment and Illawarra Region in general can also vary from north to south, as evident during the October 1999 storm when flooding was far more severe in the neighbouring Allans Creek catchment than within the study area.

During the 1998 flood, significant blockage of culverts and bridges with debris was observed. These blockages are believed to have contributed to the flood levels observed in areas upstream of some of these structures.

**Existing Flood Behaviour**

Flood modelling and mapping has been updated as part of the FRMS&P to reflect changes to the design flood estimation process associated with the release of *Australian Rainfall and Runoff: A Guide to Flood Estimation 2019* (ARR2019) and related local data. This process is described in a separate report titled *Fairy and Cabbage Tree Creeks Flood Study Update* (Advisian 2022).

For design flood events from the 20% Annual Exceedance Probability (AEP) up to and including the 1 in 500 AEP a critical storm duration of 90-minutes was found for much of the study area. This is generally indicative of a 'flashy' catchment where flooding occurs in response to relatively short durations of intense rainfall and flood levels quickly rise and fall over the course of a few hours.

Slightly longer critical storm durations of 120-minutes to 360-minutes were generally found for the lower catchment, from around Memorial Drive downstream for Cabbage Tree Creek and the Princes Highway downstream for Fairy Creek. This indicates that flooding in these areas is more sensitive to the total volume of rainfall than other parts of the catchment, and that floodwaters may rise somewhat slower and remain elevated for several hours.

Flood model results indicate that flooding can be widespread along the various creeks, and numerous minor tributaries and local overland flow paths in the study area. While numerous properties may be affected, many others are located high on ridges and would remain unaffected by flooding even during the Probable Maximum Flood (PMF).

Flood extents along incised creek channels and in steeper areas of the catchment generally increase in relatively small increments with flood magnitude. However, in the lower, flatter areas of the catchment floodwaters from various tributaries converge and flood extents and depths can increase markedly with flood magnitude, particularly in the PMF event. Such areas include along much of the upstream (western) side of Memorial Drive and the M1 Motorway, Fairy Creek upstream of the Princes Highway, and much of the area to the east of Memorial Drive and the Princes Highway which includes the floodplains of Cabbage tree Creek, Fairy Creek, Fairy Lagoon and Towradgi Arm.

During the 1% AEP flood event, areas of high flood hazard that may pose a significant threat to life and property (e.g.  $\geq$  H4 Hazard) are generally constrained to defined water courses, open channels and flood flow paths. However, there are various exceptions most notably Exeter and Achilles Avenues adjacent to lower Fairy Creek in North Wollongong, properties along the western edge of Memorial Drive in Fairy Meadow between Kingsford and Norman Streets, and College Place in Gwynneville. Flood depths and velocities also become significant along various roads in the study area and would affect vehicle stability and pose constraints for evacuation and emergency response.



**Wollongong City Council**

**Fairy & Cabbage Tree Creeks Floodplain  
Risk Management Study & Plan**

During the PMF event, the extent and degree of hazard posed to life and property would increase significantly, with buildings vulnerable to structural damage or failure in various areas. Evacuation and emergency response constraints would also be significantly worse, with some areas requiring early evacuation to avoid rapid isolation and inundation.

**Assessment of Property Affection**

To allow an assessment of properties likely to be affected by above floor flooding, and to subsequently undertake estimation of flood damages, a database was prepared for properties within the floodplain including information on the habitable floor levels and building types.

Design flood levels were interrogated against the property database to provide an assessment of buildings expected to be flooded above floor. Results of the analysis are discussed in the following.

*Above Floor Flooding by Design Flood Event*

- Overall, the level of affection is high, with over 2,000 properties expected to be flooded above floor level in the PMF. This is in the order of 15% of all properties in the study area.
- In a 1% AEP event about 480 properties are expected to be flooded above floor, representing about 4% of all properties in the study area.

*Above Floor Flooding by Suburb*

- The highest concentration of affection is in North Wollongong, with up to 60% of properties flooded above floor level in the PMF. The major watercourses of Fairy Creek, Cabbage Tree Creek and Towradgi Arm converge into Fairy Lagoon in this low-lying coastal area. This results in a broad floodplain that impacts most properties in the area.
- Fairy Meadow has the next highest concentration of affection with about 35% of properties flooded above floor level in the PMF. It also has the highest total number of affected properties with about 850, representing some 40% of all affected properties in the study area. The affected properties are primarily concentrated in the floodplains of Cabbage Tree Creek and Towradgi Arm from about the Princes Highway in the west to Squires Way in the east.

*Depth of Above Floor Flooding*

- The depth of above floor flooding is less than 0.5 metres for most affected properties across all design events (e.g. about 80% of properties in the 1% AEP and 65% of properties in the PMF).
- The number of properties expected to experience depths of 1.0 metre or more above floor is relatively low for all events except the PMF. The number increases from one property in the 20% AEP and 10% AEP events to 11 in the 1% AEP event and 18 in the 1 in 500 AEP event. In the PMF this number jumps to 190 properties.
- At properties experiencing 2 metres or more of flooding above floor level there would be an increased risk to life. No properties are expected to be inundated to such depths until a 2% AEP event when there would be only one. Only two properties would be expected to be flooded to 2 metres or more above floor level in the 1% AEP, 1 in 200 AEP and 1 in 500 AEP events. This number jumps to 21 properties in the PMF.



**Wollongong City Council**

**Fairy & Cabbage Tree Creeks Floodplain  
Risk Management Study & Plan**

### Estimation of Flood Damages

Flood damages are adverse economic impacts that private and public property owners experience as a consequence of flooding. A flood damage assessment has been undertaken for the study area to quantify the impact of flooding in economic terms following the methodology presented in the *Floodplain Risk Management Guideline: Residential Flood Damages* (OEH, 2007). This includes calculation of the following two key measures:

- Annual Average Damages (AAD), a measure of the cost of flood damage that could be expected each year by the community, on average over a long time period.
- The present value of flood damages (typically over a 50 year period at a 7% discount rate), which represents the sum of all future flood damages that can be expected over the calculation period expressed as a dollar value.

Key findings regarding flood damages estimated for the Fairy and Cabbage Tree Creeks study area are summarised as follows:

- Significant flood damages would be expected even in a 20% AEP flood event. Owing to its higher probability of occurrence, this event results in the largest contribution to AAD and hence present value of damages.
- Direct damages increase incrementally with increasing event magnitude from \$11.6M in the 20% AEP event, to \$46.3M in the 1% AEP event, and \$59.8M in the 1 in 500 AEP event. There is then a significant increase to about \$200M in the PMF.
- Contribution to AAD generally decreases with increasing event magnitude, with the more frequent events contributing more greatly to the total AAD and present value of damages.
- Direct flood damages for residential land use are several times higher than those for non-residential land use across all design events.

### Potential Impacts of Climate Change

Climate change is expected to alter the severity of flood impacts through sea level rise (SLR) and an increase in the intensity of heavy rainfall events.

As part of the flood study update several climate change scenarios were simulated and have been used to assess the potential implications of climate change on above floor flood affectation and flood damages. The following is notable from the results:

- It was found that the climate change scenario had the largest impact on the 20% AEP, with an increase of almost 80% in the number of properties expected to be flooded above floor level, and an increase of about 50% in flood damages calculated for the event.
- Impacts on the 1% AEP were also significant, with an increase of almost 40% in the number of properties expected to be flooded above floor level, and an increase of about 35% in flood damages for the event.
- Increases in the number of properties flooded above floor and in calculated flood damages were comparatively minor in the PMF.
- Overall, a 20% increase in rainfall intensity and sea level rise of 0.9 metres due to climate change would be expected to have a significant impact on property affectation and the economic impact of flooding. The Average Annual Damage and net present value of flood damage would be expected to increase by about 40%.



Wollongong City Council

Fairy & Cabbage Tree Creeks Floodplain  
Risk Management Study & Plan

### Approaches to Managing Flood Risk

According to the *Floodplain Development Manual* (2005), floodplain risk management measures can be separated into the following categories:

- Property modification measures.
  - These measures include flood planning controls for future development to ensure that land uses are compatible with flood risk. They can also include voluntary house raising and purchase, or flood-proofing of buildings, which can act to reduce flood damages.
  - These measures are discussed in **Chapter 8: Land Use Planning and Property Modification**
- Response modification measures.
  - These typically include emergency response management measures, flood predictions and warnings and community flood awareness and preparedness.
  - These measures are discussed in **Chapter 9: Flood Emergency Response Management,**
- Flood modification measures.
  - These are typically structural works, such as **culvert upgrades**, flood protection levees, flood detention basins or bypass floodways, which act to reduce flood damages.
  - These measures are discussed in **Chapter 10: Assessment of Flood Modification Measures.**

### Land Use Planning and Property Modification

A key objective of this study is to provide improved flood information to support land use planning activities in the study area. Effective land use planning can help ensure that the flood risk posed to a community does not increase moving into the future.

- Review of existing planning instruments including the Wollongong LEP 2009, Wollongong DCP 2009, and the Fairy Lagoon Entrance management Policy (2007)
- Development of a series of flood planning maps including 'Flood Risk Precincts' which are to be used to inform the application of flood-related development controls across the floodplain
- Assessment of the potential cumulative impacts of future development on flood behaviour
- Review of the potential of Voluntary Purchase and Voluntary House Raising as options to reduce flood risk in the study area.

As a result of the above investigations, several recommendations regarding the update of planning controls and property modification scoping studies have been made as presented in **Table 8-4**.



Wollongong City Council

Fairy & Cabbage Tree Creeks Floodplain  
Risk Management Study & Plan

### Flood Emergency Response Management

The NSW State Emergency Service (SES) is the legislated Combat Agency for floods and is responsible for coordinating other agencies involved with flood emergency management.

New detailed information on flood behaviour and impacts in the study area has been made available as a result of this FRMS&P for consideration by SES in their planning and incorporation into the Local Flood Plan as appropriate. This includes the following:

- Assessment of flood affectation at 'Sensitive Land Uses and Critical Use Facilities' such as emergency response facilities, aged care facilities, childcare centres and preschools, schools, caravan parks and student accommodation.
- Assessment of flood affectation along the Illawarra Railway.
- Assessment of the frequency and duration of inundation along major roads.
- Mapping of Flood Emergency Response Classifications (FERCs) to provide an indication of the relative vulnerability and requirements of different areas in flood emergency response situations.
- Assessment and provision of information on the sequential impacts of flooding as water levels rise throughout the catchment.
- A review of current flood warning arrangements in the catchment.

As a result of the above investigations, several recommendations to help improve flood emergency response have been made as presented in **Table 9-9**.

### Flood Modification Measures

An initial list of potential flood modification measures was compiled based on the following:

- Measures identified in the previous FRMS&P (Bewsher 2010).
- Measures targeting potential flood problem areas identified through phone calls made to Council by residents about flooding issues.
- Measures targeting flood problem areas with modelling indicating several properties affected by above floor flooding.

This list comprising more than 40 potential measures across the catchment underwent an initial assessment considering the feasibility, likely costs, and potential benefits of each option. From this assessment 12 measures were identified warranting further investigation.

Detailed investigation of the 12 preferred measures involved hydraulic modelling, cost estimation, calculation of reductions in flood damages, cost-benefit analysis and multi-criteria analysis. Through this process a relative ranking of the measures was determined.

The highest-ranking flood modification measures include vegetation management, debris control structures, upgrade of culverts beneath Memorial Drive, and modification of the Foothills Road Basin outlet structure. The resulting recommendations are presented in **Table 10-7**. If all the recommended measures were implemented, it is estimated that this would protect 38 properties from above floor flooding in the 1% AEP flood and reduce Annual Average Damages (AAD) by \$150,000.



Wollongong City Council

Fairy & Cabbage Tree Creeks Floodplain  
Risk Management Study & Plan

### Floodplain Risk Management Plan

It is recommended that the Floodplain Risk Management Plan for the Fairy and Cabbage Tree Creeks catchment include the management options presented in the following:

- **Table 8-4 Recommendations relating to Land Use Planning and Property Modification**
- **Table 9-9 Recommendations relating to Flood Emergency Response Management**
- **Table 10-7 Recommendations relating to Flood Modification Measures.**

This Final Draft Floodplain Risk Management Study and Plan is to be placed on public exhibition to allow the local community and stakeholders to provide feedback on the recommendations. The Floodplain Risk Management Committee will then consider the submissions received and make any appropriate changes before finalisation and adoption of the Floodplain Risk Management Study and Plan by Council.

DRAFT



OUR WOLLONGONG JOIN THE CONVERSATION



# Fairy & Cabbage Tree Creeks Floodplain Risk Management Study and Plan

## Engagement Report November 2023

Fairy and Cabbage Tree Creeks FRMS&P - Engagement Report November 2023 - Doc ID 24685935

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The information in this report is based on data collected from community members who chose to be involved in engagement activities and therefore should not be considered representative.

This report is intended to provide a high-level analysis of the most prominent themes and issues. While it's not possible to include all the details of feedback we received, feedback that was relevant to the project has been provided to technical experts for review and consideration.

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## Executive Summary

As part of our commitment to managing flood risks in our region, Wollongong City Council reviewed the Fairy and Cabbage Tree Creek Floodplain Risk Management Study and Plan (FRMS&P). We asked the community to comment on the draft Fairy and Cabbage Tree Creek FRMS&P from 11 September – 16 October 2023. We shared the preliminary options recommended for flood mitigation and draft reports with the community and key stakeholders and sought their input.

### Engagement Strategy

We sent letters, Frequently Asked Questions (FAQ), a map and a survey to more than 12, 678 residents and owners of properties identified as flood affected. Identified key stakeholders were emailed information about the project.

The Community Engagement team hosted various engagement activities and opportunities to submit feedback throughout the engagement period. These included:

- Hard copy surveys posted out to residents
- An online information page and survey via the Our Wollongong web page
- A community drop-in session at Fairy Meadow Community Centre on the 19 September 2023
- Aboriginal stakeholder engagement from 1 September 2023
- Ongoing engagement opportunities for the community to lodge formal submissions including photos and videos

### Participation

Wollongong City Council received over 200 responses during the engagement period. There were 171 survey responses – 148 hard copy surveys returned by mail and email, and 23 online surveys. There were 6 meetings that took place with Aboriginal stakeholders in the community, where approximately 15 Aboriginal members of the community provided input. Over 105 people attended the community drop-in session on 19 September 2023 at Fairy Meadow Community Centre. 15 people provided formal submissions to Council, including key stakeholders.

### Results

The key findings in the proposed flood mitigation relevant to Fairy and Cabbage Tree Creeks catchment saw Flood Mitigation Option 3 (FM3) Memorial Drive culvert upgrade was most favoured. Debris control structures and vegetation management to improve creek flow were most supported in the general flood mitigation options.

The community was asked to comment on the proposed options as well as explain their experience with flooding in the area. The dominating themes included:

- Vegetation management and debris control
- Review and upgrade current storm water systems
- Development controls
- Natural mitigation interventions
- Erosion

Aboriginal stakeholders spoke from personal and cultural experience when providing input on the draft FRMS&P. Some key points the meetings raised were about protecting natural areas and if intervening, site inspections be carried out, investigate natural interventions to ease the speed of high flowing creeks, implement mitigation strategies in already intervened (concreted) culverts and drains. There were concerns raised regarding McMahons Street detention basin, given the area is in a natural state.

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The community drop-in session on 19 September 2023 has over 105 attendees and 11 staff from Council, Department of Planning and Environment, and the flood consultant Advisian. The community had the opportunity to ask questions about the draft FRMS&P. There were copies of the plan, maps and videos shown at the session. Common questions were around development, insurance, prioritisation and how the proposed mitigation strategies would work and their impact on surrounding properties.

Formal submissions were received and reported to the flood engineers. NSW South East SES and Endeavour Energy made formal submissions. Other submissions by Neighbourhood Forum 5, Keiraville Resident Action Group ("KRAG"), other community groups and individuals were recorded and sent to the engineers in full to assess in relation to the draft FRMS&P.

### **Next Steps**

We will use this feedback to inform any required revisions to the draft Floodplain Risk Management Study and Plan. The recommended options will require further investigation, consultation and approvals before going ahead. We will continue sharing information and seek input as we progress.

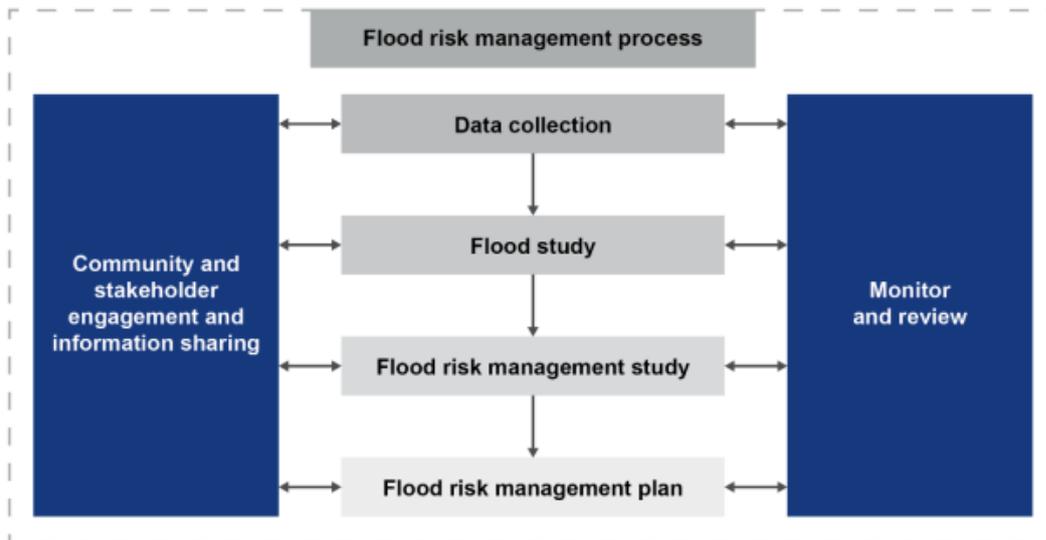
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## Background

As part of our commitment to managing flood risks in our region, we reviewed the Fairy and Cabbage Tree Creek Floodplain Risk Management Study and Plan (FRMS&P). The previous plan was created in 2010. We reviewed the flood study in 2019 and updated it under FRMS&P with ARR2019 guidelines. The updated flood models and mapping with the most recent inputs by the community in 2019 outlines what the risks/damages from floods might be. We then updated our plan for mitigating (reducing) these. This is what a FRMS&P does. The FRMS&P identified flooding “hotspots”, and explained what the risks and damages from floods may be in the Fairy and Cabbage Tree Creeks catchment. The report presented potential options for ways we could mitigate (reduce) those risks. Examples of these measures include:

- Emergency response plans.
- Building new or improving existing structures that collect and carry stormwater into drains or creeks, e.g. detention basins or culverts.
- Land zoning and development controls that guide what can and can't be built on flood-prone land.
- Voluntary purchase of houses built in areas of high flood-risk.
- Voluntary house raising of eligible houses.
- Flood education programs.

We consider changes to flood risk because of these strategies and under future conditions, eg. climate change and future development. The reports include recommendations for strategies to reduce flood risk.



### Flood study reviews and previous engagement

The community has provided valuable input to previous flood investigations within the Fairy & Cabbage Tree Creeks catchments, with the most recent inputs provided in 2019 as part of the flood study reviews. The community provided accounts of their observations of flooding and feedback on the flood mapping through online surveys and at community drop-in sessions. The flood models were updated as a result. The Fairy & Cabbage Tree Creeks Flood Study (2020) was updated and finalised following their public

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exhibitions. It was then adopted at Council's meeting on 29 June 2020.

The draft Floodplain Risk Management Study & Plan (for public exhibition) was prepared by Advisian in September 2023. This was made available to the community via the Our Wollongong webpage.

### Fairy & Cabbage Tree Creeks Catchment

- 21.7km<sup>2</sup> study area
- Includes Fairy Creek, Cabbage Tree Creek and the Towradgi Arm waterways
- The area is roughly bounded by Towradgi Road in the north and Crown Street in the south.
- Fairy Meadow is the primary commercial zone, the main University of Wollongong campus is near the centre of the catchment, and the 'Innovation Campus' lies in the lower catchment between the Fairy Creek and Towradgi Arm waterways
- Residential, commercial and open space land uses
- Drains to Fairy Lagoon, North Wollongong and Belmore Basin, Wollongong



### Stakeholders

Stakeholders identified prior to the start of the engagement period included:

- Flood-affected residents, ratepayers and businesses
- Aboriginal stakeholders
- Participants in previous engagements
- Northern Floodplain Committee
- Development industry
- NSW Department of Planning and Environment
- Endeavour Energy
- NSW SES South Eastern Zone
- Local affected schools
- Lord Mayor & Councillors
- Sydney Water
- Register of Interest - Flood
- Neighbourhood Forum 4 and 5
- Transport for NSW
- Schools
- Emergency Services
- General community

### Methods

#### Communication Methods

Methods	Details of Methods
Letter	<p>12, 678 letters were delivered to local residents, businesses and property owners.</p> <p>The letter included:</p> <ul style="list-style-type: none"> <li>• Letter</li> <li>• FAQ (Responses to questions about the draft plans)</li> <li>• Flood mitigation options map (Draft proposed flood mitigation map showed the 16 recommended mitigation options)</li> </ul>

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	<ul style="list-style-type: none"> <li>• Hard-copy survey (Asking people's preference on strategies and any other comments or questions)</li> </ul>
Email to key stakeholders	An email brief and FAQ was sent to key stakeholders
Aboriginal stakeholder meetings	Aboriginal stakeholders were emailed the information and invited to attend a meeting with a flood engineer working on the project to learn more and have their questions answered.
Register of Interest	836 emails were sent to participants registered on the Our Wollongong website with an interest in 'flood'
Our Wollongong website	<p>The project webpage hosted background information and supporting documents:</p> <ul style="list-style-type: none"> <li>• FAQ (Responses to questions about the draft plans)</li> <li>• Flood mitigation option map (showing 16 recommended mitigation options)</li> <li>• Floodplain Risk Management Study and Plan 2023</li> <li>• Q&amp;A forum</li> <li>• Online survey</li> </ul>
Community Information Session	<p>A drop-in information session was held at Fairy Meadow Community Centre on Tuesday 19 September 3:30pm – 6:30pm, where we displayed:</p> <ul style="list-style-type: none"> <li>• Draft Floodplain Risk Management Study and Plan reports</li> <li>• Comparison between ARR2019 and ARR1987</li> <li>• Design flood extent map B1 – 1% AEP, 5% AEP and Probable Maximum Flood</li> <li>• Flood risk precincts</li> <li>• First event flooded above floor</li> <li>• Map showing location of the recommended options</li> <li>• Impact mapping</li> </ul> 
Library information stand	<p>Located at Wollongong City libraries there was the following:</p> <ul style="list-style-type: none"> <li>• Survey</li> <li>• FAQ</li> <li>• Maps</li> <li>• Fairy and Cabbage Tree Flood Study 2023</li> <li>• Fairy and Cabbage Tree Flood Plan 2023</li> </ul>

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Advertiser	A notice appeared in the Illawarra Mercury to advertise the engagement on the following dates: <ul style="list-style-type: none"> <li>• 6 September 2023</li> <li>• 4 October 2023</li> </ul>
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## Engagement

- Hard copy survey (posted with letter)
- Our Wollongong website
  - An online survey was used to capture participants' comments.
  - An online Q&A forum was provided for participants to ask questions about the draft plans.
- Community Drop-in session 19 September 2023
- Face-to-face meeting with Aboriginal stakeholders
- Emails

## Results

All affected residents, owners and identified stakeholders were invited to provide feedback on the Draft Fairy and Cabbage Tree Creek FRMS&P from 11 September – 16 October 2023.

Aboriginal engagement commenced 1 September 2023.

## Engagement Participation

Engagement Activities	Participation
Drop-in session	105+
Aboriginal stakeholders engaged	15
Online Participation via Our Wollongong	
<ul style="list-style-type: none"> <li>• Aware – Total number who viewed the project webpage.</li> </ul>	344
<ul style="list-style-type: none"> <li>• Informed – Total number who clicked a hyperlink, e.g. to download the draft plans.</li> </ul>	187
<ul style="list-style-type: none"> <li>• Engaged – Total number who contributed to the project, e.g. by submitting comments via the survey or posting a question to the Q&amp;A.</li> </ul>	25
Online Q&A Submission	3
Written Submissions	15
Unique Photo Submissions	14
Survey Participation	
Hardcopy surveys (returned by mail and email)	148
Our Wollongong Survey	23
<b>Total surveys</b>	<b>171</b>

## Submission results

We received more than 200 submissions. This was a combination of surveys via online and hard copy, written submissions and meetings with Aboriginal Elder in the community. Representatives from the following organisations made either an open submission or submitted responses via the survey:

- Local Aboriginal Elders

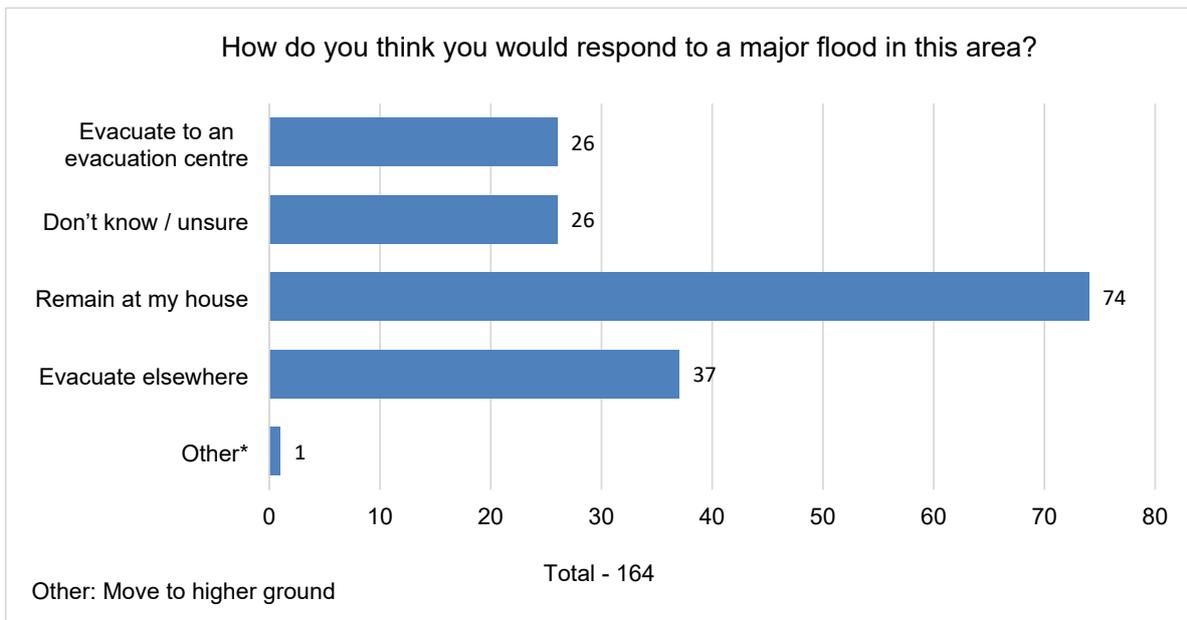
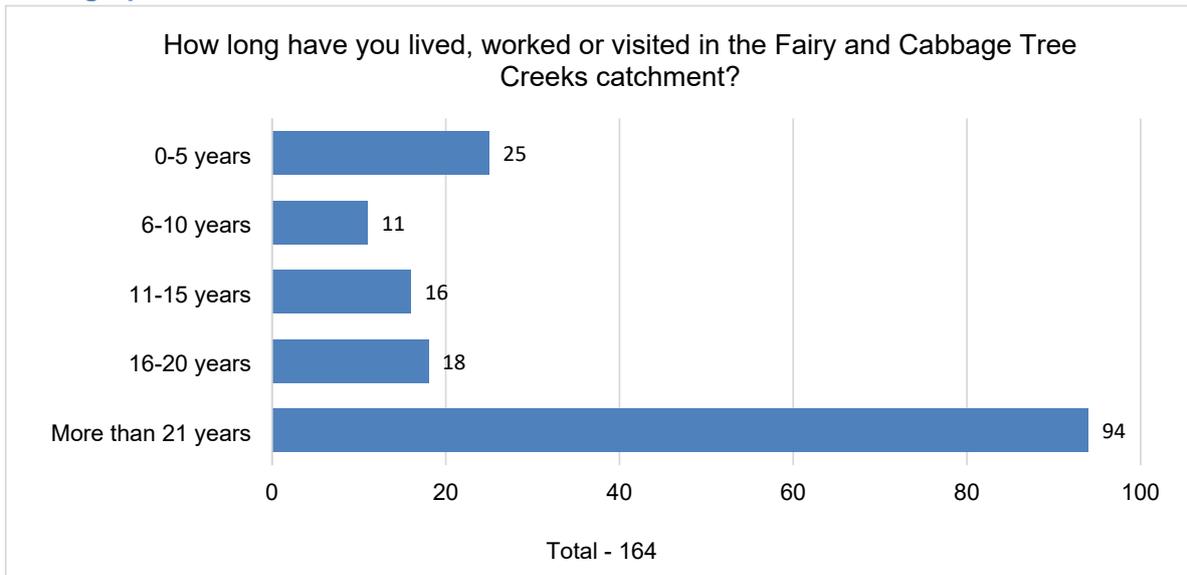
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- Endeavour Energy
- NSW SES – South Eastern Zone
- Neighbourhood Forum 5 and Keiraville Resident Action Group

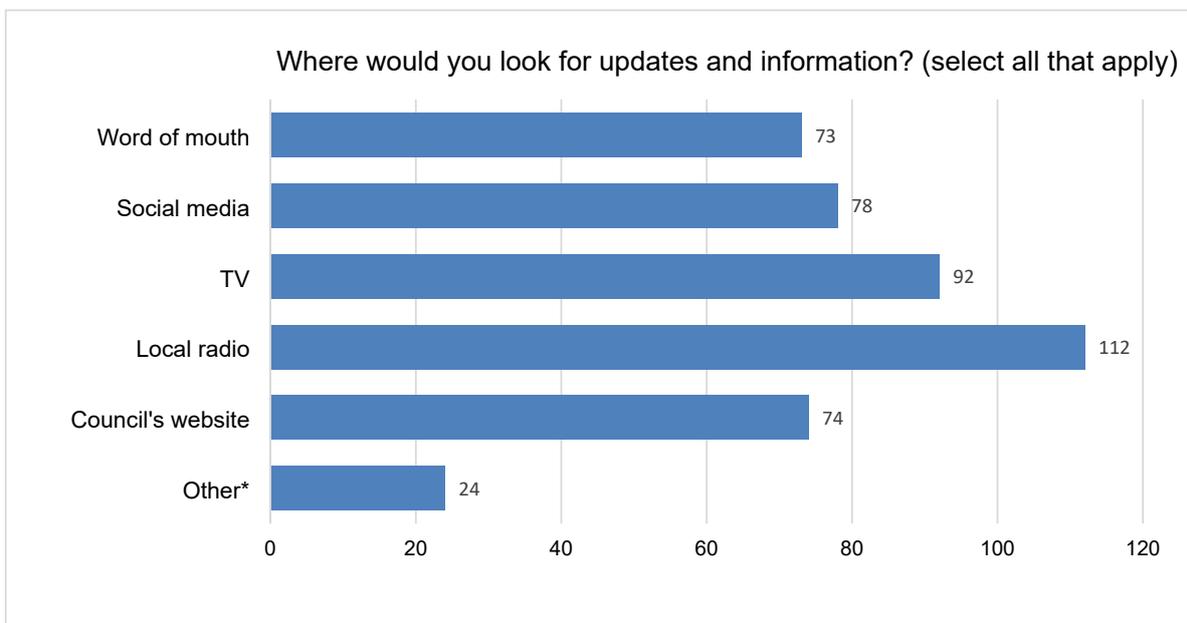
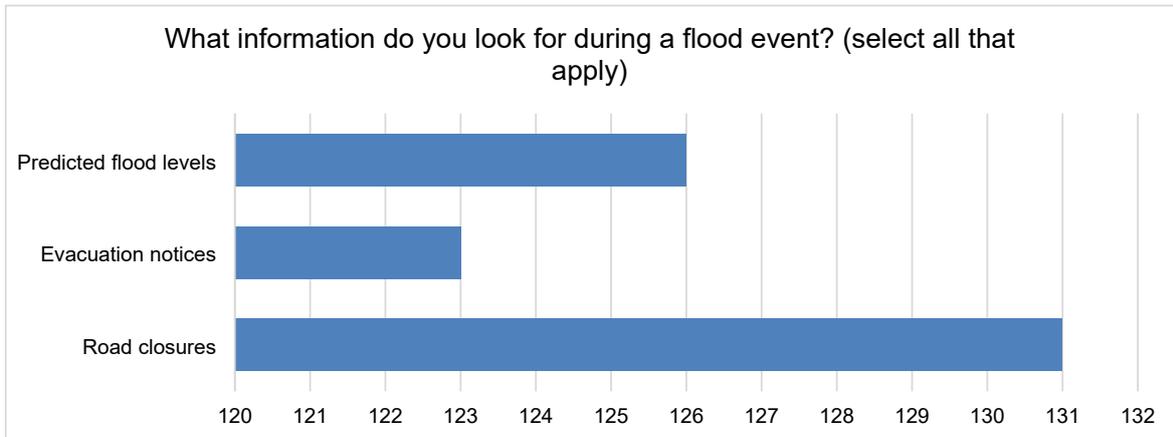
### Online and Hardcopy Survey Feedback

We received online and hardcopy surveys. Some were only partially completed, with either some of the questions skipped or only partially completed. The summary of the feedback is as follows:

#### Demographics and General Flood Questions



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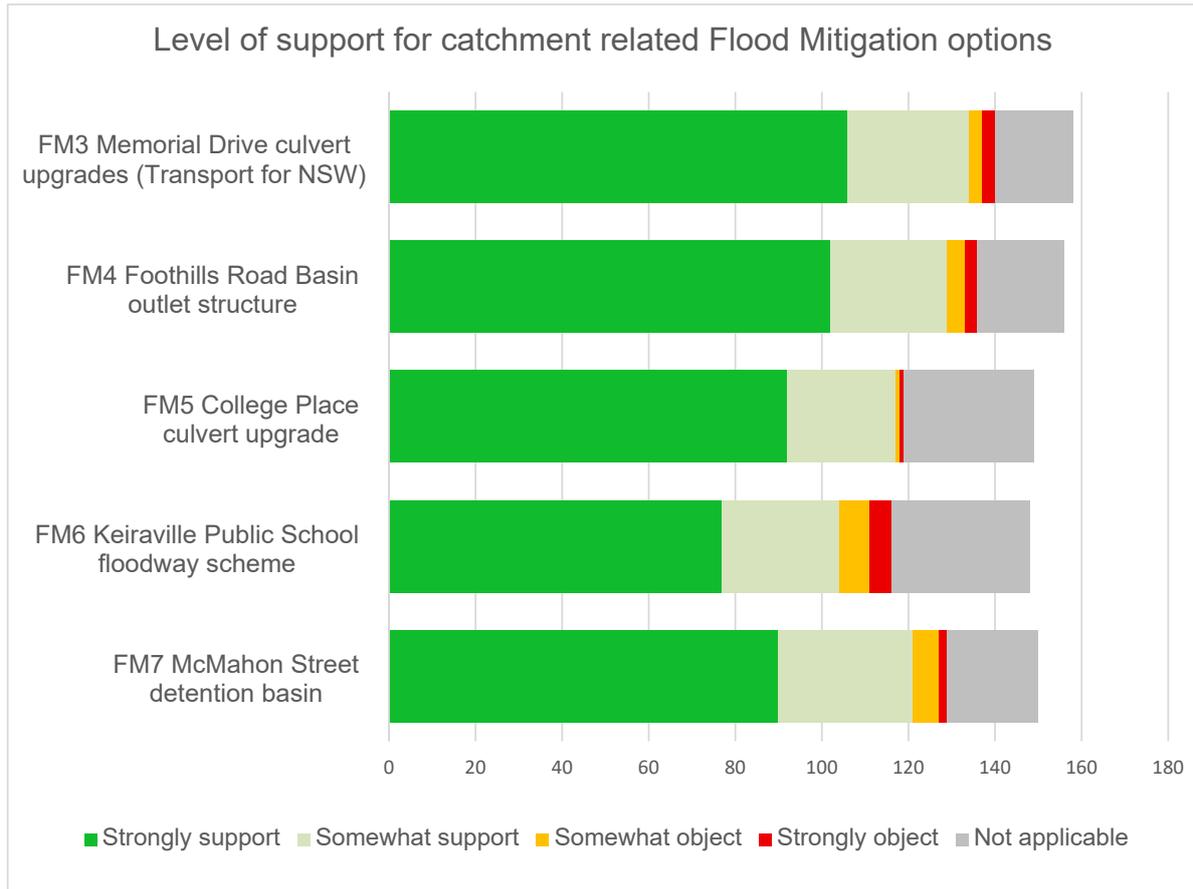
Other\*:

- Work place announcements
- Live traffic app
- Home has never flooded therefore has not needed to worry
- Mobile SMS text message
- Door knocking and under door message
- Bureau of Meteorology and weather apps
- SES website and Hazards Near Me app
- Look at the water level in the reserve close to property
- Family and neighbours

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### Mitigation Option Results

Respondents were asked to indicate their level of support for the following options for managing flood risk in the Fairy and Cabbage Tree Creek Catchment.



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Some people elaborated on their level support for specific flood mitigation suggestions. They included:

From my experience the introduction of the **FM4** Foothills Rd Detention Basin has, by accelerating water flow, had a deleterious impact on the lower portion of the branch of Cabbage Tree Creek. I have seen the portion of the creek immediately to the east of Foothills Road erode rapidly in the last five-six years.

Holding pit up stream? Culvert **FM3** opens to totally vegetated creek/ drain, trees need removal.

+  
Regular cleaning of culverts and downstream areas to ensure water can flow without restriction. This was the issue in 1998 Aug Flood (**FM3**).

Provide access to College Place culvert (**FM5**) for large machines to clean out both side.

While the work at Foothills Road (**FM4**) is effective in retaining water the job was not completed.

In relation to Kingsford Street Fairy Meadow the two **FM3** Memorial Drive culvert upgrade would vastly reduce flood hazard on the western side of Memorial Drive. The flooding of Kingsford Street in 1998 was directly attributed to the culvert restriction with water backing up and flowing through from Chapman Street and Jardine Street. The volume burst through rear fences on the north side of building blocks flooding into Kingsford Street.

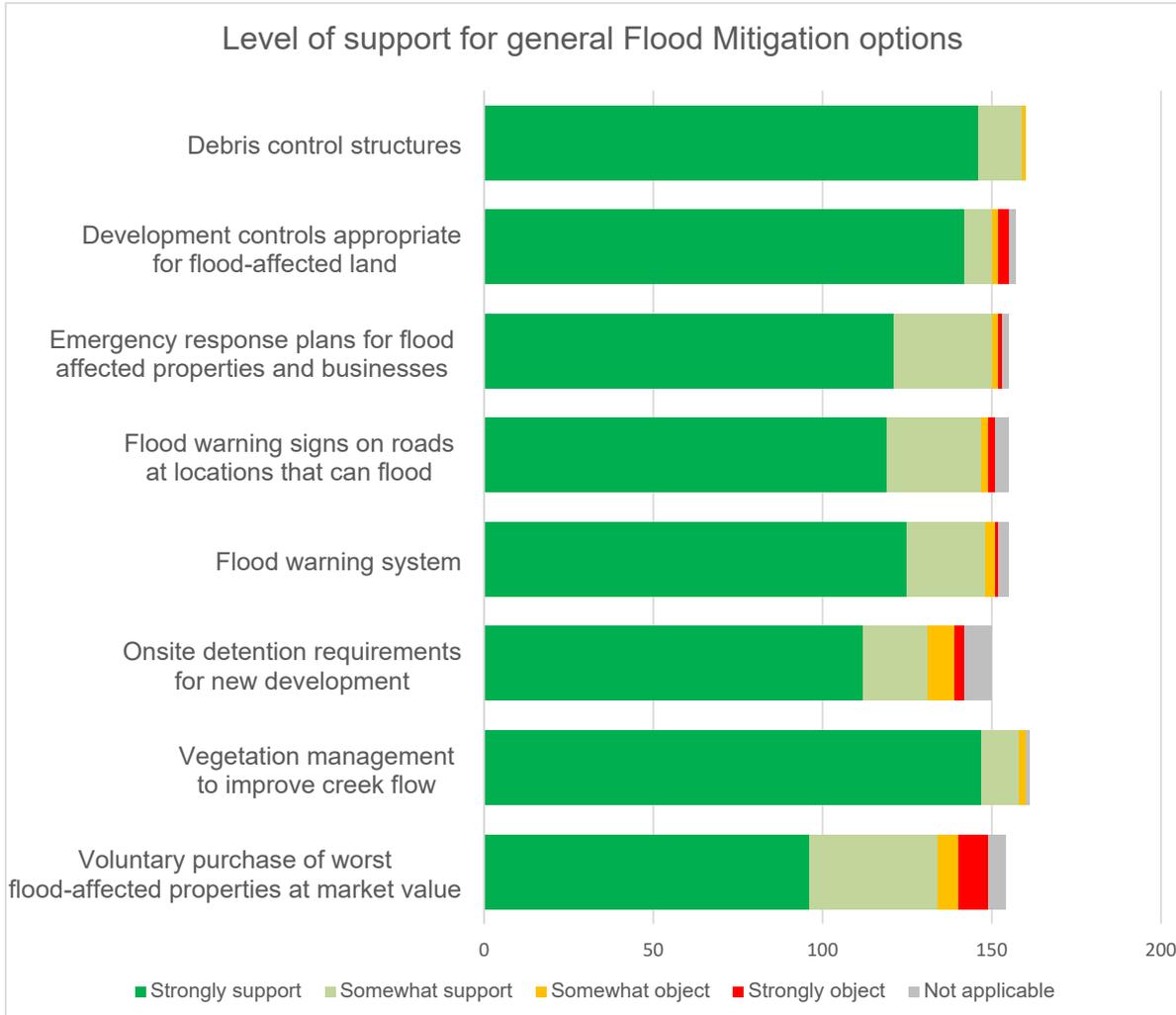
Creek on the south side of Keiraville primary school (other side of Gipps street) - as mentioned in **FM6** this creek is at its peak and therefore cannot accept more water if redirected from the schools oval as described in your information pack.

As a resident living south of Keiraville primary school we are always 'close' to flooding, so it concerns me that a plan (**FM6**) would include sending more water that way, thus increasing my risk. Really reducing my risk would involve less water (you shouldn't be planning to flood

The proposal to include a detention basin on **FM7** McMahon St is totally unacceptable. The proposal is counter to the WCC's own assessment of this water course as a Category 2 which should be managed for its valuable terrestrial and aquatic habitat. The proposal is in opposition to environmental protection, biodiversity conservation and riparian corridor management. It is ironic that the proposal includes the destruction of the natural environment which will in fact make both climate change and the flooding intensify.

Prioritise **FM7** McMahon Street detention basin as multiple new dwelling constructions on once open ground will intensify flood risk and cause more traffic chaos on cabbage tree lane to the added units and townhouses extra vehicles using this road.

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Advance the **flood warning system** - set up a personal contact system. Telephoning each household and / or texting them to inform them of the impending danger, when to leave by, where to go, how to secure their home etc. Some elderly, and some young people have deliberately discarded social media and mobiles, so all communication mediums need to be included. BTW, I think AU does disaster communication incredibly well. People also need to learn how to protect their homes for minimal damage, during these events."

It would be permanently solved the flood problem if council can do **voluntary purchase** of worst flood-affected residential properties at market value.

**Flood warning signs** on roads should only be in place if there is regular flooding in the area and only between the points on the road which experience the flooding, otherwise mobile flooding signs are adequate.

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Respondents were asked if they had other suggestions or comments for managing flood risk in the catchment. These are summarised in the following key themes:

### **Regular cleaning of debris and vegetation management**

Over half of the people who suggestions via the survey wrote they wished for Council to be more proactive and regular in cleaning out drains, culverts and creeks. Requests to make it a priority to clean drains was clearly evident in the data.

People described rubbish, foliage, grass clippings and other debris block drains, which then created pools of water, which led to flooding of homes. Sediment and silt build up was also a concern raised by respondents. Some respondents mentioned that flooding occurs even in smaller flooding events due to blocked drains, creeks and culverts.

Respondents also voiced their discontent at having to contact Council regularly to clear drains. People wanted a regular schedule and wished to be made aware of what the schedule is, including how Council plans to maintain the relevant drain. People in support of debris control structures wished to ensure Council would establish a regular system of cleaning to avoid blockages and pool of debris, otherwise the mitigation strategy is “redundant”.

Suggestions were also raised regarding Council regularly street sweeping areas with high numbers of deciduous trees, particularly in autumn or when high wind is predicted, to reduce the risk of blockages in drainage systems. Similarly, a suggestion was provided about the opportunity to implement waste bins with closures that would reduce the risk of rubbish blowing over in high winds and ending up in drains and streams. Other suggestions were made regarding the need to educate the community to consider their rubbish collection in high wind and rain events.

Some specific locations requiring debris clearing and vegetation management included:

- Culvert at end of Smith Street, Fairy Meadow
- Cabbage Tree Creek including in Balgownie and nearby the Fraternity Club
- Winton Place Balgownie to Walkway bridge access to Lombard Ave and Ellengowan Crescent
- Smiths Creek storm water drain - catches at the road at Wilson St because the drain splits into two
- Northern distributor, Memorial Drive nearby Clifford Street
- Culvert at College Place
- Corner of Cole Street and Tucker Avenue
- Low point area west of Memorial Drive (nearby Lila Avenue)
- Puckeys Creek in North Wollongong (to reduce bank erosion)
- Chalmers Street
- Fairy Creek
- Retention basin at Brokers Road (silted up)
- Cabbage Tree Lane Creek

There were concerns raised in the survey regarding the private management of creeks within property boundaries. People discussed that creeks in their neighbouring properties were not maintained well. They would like Council to take over management of high-risk creek and water ways. This was perceived to be a particular need in houses that are rented or managed by Strata, as referenced by a respondent in Fairy Meadow. According to participants, poor-management of bank erosion, and debris build up in neighbouring or up-stream properties, caused flooding to their property. Desire for private owners to be educated and held accountable by Council was requested by some.

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Photos



Water at the end of Smith Street, Fairy Meadow by Memorial Drive. Flooding to be affected by overgrown culvert.



Overgrown Council culvert located at rear of residential homes in Matthews Street, Wollongong. Water pooling in flood event February 2022.



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**Current Storm Water Drainage Systems**

Large numbers of feedback were related to upgrading and improving drainage by Wollongong City Council. Comments were around:

- Increasing capacity of storm water drains,
- Hosting regular inspections of storm water
- Audit and review current stormwater channels in LGA and if the system is adequate in dealing with storm water specific to the site. Replace as necessary.

Responses mentioned specific locations regarding improving and/or upgrading drainage included:

- Western side of the reserve between 40-45 Bootie Street, Balgownie
- Cabbage Tree Creek culvert walls (nearby Fraternity Club)
- Ravenwood Place, Mount Keira (mountain overland flow)
- Parkview Grove, Mount Ousley culvert
- Northbourne Ave joins Mount Ousley Road northbound - after the roundabout.
- Memorial Drive, Northern Distributor
- Reserve Street into Melaleuca Park, Keiraville (causing flooding downhill in Akuna and Nyrang Street)
- Carters Lane, Towradgi
- Rae Crescent, Balgownie
- Low point at north-east section of Ellengowan Crescent, Fairy Meadow
- Hamilton Street, Fairy Meadow within the creek after the Foothills Road Basin.
- Soudan Street and Collerary Avenue, Fairy Meadow
- Bourke Street North Wollongong to relieve Blackett Street and beyond
- Meadow Street, Fairy Meadow to relieve Alexander Street
- Sperry Street and Matthews Street, Wollongong
- Hopewood Crescent, Fairy Meadow culvert walls
- Parkview Grove culvert upgrade
- Bill Madden Park, Mount Pleasant sumps and pipe work
- Koolabong Park to Botanic Gardens, Keiraville
- Keira Park, Mount Keira

**Photos**



Carters Lane, Towradgi

Water unable to drain leading to submitter’s backyard and garage flooding

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	<p>Intersection of Akuna and Nyrang Street Keiraville</p> <p>Storm water flow described to have come from Melaleuca Park</p>
	<p>Water flowing down from Dymock Street Reserve into Hopewood Crescent</p>

### Development Controls

Imposing stricter development controls were elaborated upon in further comments within the survey. The consistent thread was that respondents did not want Council to approve any more developments in flood prone areas. This was because large developments increase impervious grounds meaning water flows faster across the surface and does not allow any water to be absorbed into soil or vegetation.

Other people made statements related to development controls which included:

- Developments have water tanks to retain water.
- Require a fixed amount of unbuilt space/ gardens for new developments
- Restrict size and position of development proposals considerate of surrounding storm water in area.
- Any large development which introduces large impervious ground areas should include extensive adequate infrastructure to drain water away.
- Review any planning request which receives more than 15 complaints indicating that flooding will be the result of a large development, as the locals are more aware of the immediate environment.
- Disallow any new developments within 100 meters of the beach.

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- Private storm water pipes should have compulsory grates to protect against large rocks and debris entering the system.
- Build pavements which act as very wide gutters to direct water flow but are still good to walk on.
- Encourage developers to be innovative in the development of the site eg raised above water lines whilst still complementing the surrounds.
- Restrict clearing vegetation to create housing - Build up, not out.
- Any structures with properties below should be carefully constructed with additional safety management infrastructure to ensure that any structural damage will not lead to sudden large releases of water into residential areas.

### Natural Mitigation Strategies

Some respondents suggested Council consider managing creeks with a more “natural” approach, such as to vegetate the area to slow down the flow of water, particularly in high flowing areas of streams. They wished to use of reeds, boulders and other strategic vegetation around creek lines and streams to be investigated and implemented. Increasing absorbent grounds nearby flood prone areas was a request, with one respondent stating that Brokers Road basin’s surrounding farmland absorbed a lot of water in recent floods and eased overland flowing water.

Others suggested planting trees and vegetation with high water tolerance in and around creeks to soak up water and stabilise banks and surrounds. Embankment support was a priority. One respondent stated:

Hopewood Crescent has reeds within it and watching after flood event these were all flatten and providing a natural lining for the creek bottom and banks. Maybe the planting of reeds in some parts of the creek system may help?

Some comments asked Council not to intervene with creeks and let them flow in their natural stream. Requests were made to reduce barriers and prioritise the protection of animal habitats, including frogs, and appropriately consider in Council’s mitigation plan.

### Erosion

Bank erosion and compromised embankment was a concern raised by residents, particularly for those who have lived in the catchment a long time and have witnessed the changes in creek lines over time and in recent adverse weather events. The speed in which water is travelling in some parts of Fairy and Cabbage tree creek is causing significant erosion of banks. And when large banks collapse, homes are threatened by the large pieces of debris, boulders and rocks state some respondents.

Areas of concern included:

- Creek flowing through Parkview Grove, Mount Ousley into south-west of Foothills Road Reserve.
- Creek at rear of Hamilton Street, Fairy Meadow as putting houses at risk within the creek after the Foothills Road Basin.
- Creek parallel to Virginia Street, North Wollongong running north towards Puckeys Lagoon.
- Creek along Achilles Avenue and Exeter Avenue.

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- Guest Park, Fairy Meadow.

Photos	

**Guest Park Bank Erosion 2013 – 2022**

1. 20 January 2013
2. 9 February 2020
3. 8 March 2022
4. 7 April 2022
5. 3 July 2022
6. 3 July 2022

*“I lived at Anama Street back in 1969, the creek was one meter wide, with banks slowly rising each side to form the creek basin. Now it’s a huge concrete culvert some 10m in width and 3 m high, and we still can’t keep the flood water within this structure. We have watched long standing trees along the creek bank simply wash away with the force of water eroding the banks of the creek, you can see the impact it’s had on one section of creek that we can observe over time.*

*“My observations are that we have limited properties impacted by rising flood water, because the creek does not break its banks as it used to do many years ago (with great human & property damage) and release the kinetic energy of water over the flood plains its now focused within the creek banks for longer and hence the devastating impact on erosion.”*

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### Specific mitigation requests

Some respondents were specific with suggestions they wished to be considered:

- Relocate one of the proposed debris control structures near TAFE further west to near M1 Freeway
- Slow overland flow water from escarpment into Bass Street Mount Ousley
- Investigate and protect Montague Street (as it affects access to the local SES unit)
- Flooding across Carters Lane and Campus East have not been addressed and should be prioritised as roads are used for evacuation
- Create outflow from Towradgi arm into Puckey's estate
- Investigate and mitigate risks in North Wollongong suburb
- Mitigate flooding around Clifford Street beneath the Elliott's Road bridge
- Review any planning request which receives more than 15 complaints indicating that flooding will be the result of a large development, as the locals are more aware of the immediate environment.
- Create one way road through Stuart Park along the creek from the lagoon carpark to Squires Way with lockable gates if needed for quicker exit from floods
- Water aeration to increase air and reduce stagnation of water
- Enforce compulsory notification by landlords and Real Estate Managers to inform prospective rental tenancy applicants and buyers of the dangers with flooding on the property
- Continuous conversation had with residents who experience flooding to listen and consult on what mitigation strategies would be effective.
- Where the water table is high build wells and recycle water units
- Build more reservoirs
- Better engage with local SES and emergency services
- Provide funding or facilitate landowners to raise the height of properties onto high concrete steel reinforced pillars.
- Provide properties at risk of flooding with deliveries of sand/stones to increase the height of their land in areas which are prone to flooding.

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## Photos



Flooding on Clifford Street under Elliotts Road bridge, Fairy Meadow.

“The nearest proposed works is the FM3 Memorial Drive Culvert Upgrades at the east end of Smith St. That is 500 metres away. Not likely to help with the flooding we experience in Clifford Street.

This is not muddy floodwaters from the creek. It is clean clear stormwater that simply cannot get away quick enough.”

### Other identified themes

The community did raise other themes in their feedback. These included:

- Climate change – people wished for Council to action their strategies quickly and efficiently given the threat of climate change and increased likelihood of extreme weather events.
- Not affected – some people explained they had never been affected by floods and were surprised their property had been recognised in a flood prone area.
- Priority – people wished to understand how the mitigation strategies were prioritised as some believed their situation was of higher priority and would be more impactful.

### Aboriginal Stakeholder Engagement

Engagement with Aboriginal stakeholders commenced on the 1 September 2023. There were 15 Traditional Custodians and knowledge holders who were spoken to, with support from the engagement team and flood engineers. Some of the Traditional Custodians and knowledge holders have lived experience of flooding, including in the 1998 floods.

There was support for debris control structures to be erected, so long as they were over existing culverts and concreted areas. Aboriginal Elders were hesitant to support the installation of debris control structures over creeks that in a relatively natural state without a site inspection having been completed. Questions were asked about the process of installing debris control structures, and to ensure consideration of appropriate heights for the area.

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Participants did raise concerns over the proposed detention basin recommendation at McMahons Street. As the area is in a relatively natural state, the comments shared spoke on the potential for the site to possess Aboriginal artefacts. This was supported by Council's Heritage Officer who examined the creek line with Council's earliest map from 1938 and recognised it to be the same path as it is in the current day. There is a high potential that the creek line was used by Aboriginal people, with a strong likelihood that the site could hold artefacts. Aboriginal stakeholders requested a site review and someone onsite to monitor any works was requested should that the McMahons Street detention basic recommendation be pursued.

A request was made for Council to investigate natural systems including reeds, rocks and vegetation as a mitigation strategy to slow down the speed of water flow. This would assist with erosion of creeks but also create a natural filtering system in waterways. Aboriginal Elders spoke about their concern about the impacts that hard infrastructure has on the biodiversity, including eels, birds and frogs. They wished Council to be considerate of the environmental impact some of the recommendations alluded to, including upgrading culverts.

### Community drop-in session

A community drop-in session was hosted on Tuesday 19 September 2023. There were several staff members including flood engineers and engagement officers, as well as external officers assisting the community. More than 105 people came to the session over the 3 hours and asked staff a range of questions. Some of the key themes included:

- Debris clearing and regular vegetation management desired and needed.
- Insurance – not being able to get insurance or unable to afford.
- How were the mitigation strategies calculated to be the best? How did the priority of strategies work?
- “How do mitigation recommendations directly affect my property?”
- Development enquiries related to flood prone classed land.
- Private management and maintenance of creeks and water ways.
- Confusion with maintenance schedule of Council – disgruntled at need to contact Council regularly and request cleaning or maintenance of Council culverts, creeks and drains.
- Difficulty navigating relationship with neighbours and privately maintained creeks.
- New developments upstream causing flooding downstream and why is Council approving the DA's.

### Customer enquiries

Council received customer requests that were motivated by the engagement. This included 12 Customer requests. The requests were allocated to the Flood Engineer, who would respond back to the customer's enquiry with the information they were seeking.

### Other key stakeholder submissions

We received several written submissions from key stakeholders, including:

- Endeavour Energy
- NSW SES – South Eastern Zone
- Neighbourhood Forum 5
- Keiraville Resident Action group (KRAG)

Lengthy and/or technical submissions, including submissions specific to properties were provided in full to the working group for the draft Fairy and Cabbage Tree floodplain risk management study and plan.

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Photos that were submitted that are not included within this report were directly sent to the flood engineers.

### **Endeavour Energy**

The energy provider offered advice regarding their flood response plan and impacts of floods on the network. They stated:

*A flood mitigation strategy that assists in maintaining road access to critical infrastructure allows for electricity supply to be maintained for a longer period and quicker restoration of supply.*

### **NSW SES South Eastern Zone**

NSW SES South Eastern Zone reported to Council that “Between all 3 volumes (Draft Floodplain Risk Mitigation Study and Plan), the plans meet all the requirements the NSWSES need to support the planning for flood response.”

### **Keiraville Resident Action Group (“Krag”)**

Krag submitted a formal response to Council, which called for the following actions from Council:

- Undertake a risk management study of stormwater affected areas in Keiraville
- Review the capacity of stormwater systems in Keiraville, particularly west of Robsons Road
- Impose a moratorium on further multi-unit developments until the risks are addressed.

Krag identified 4 key sites of concern.

1. Botanic (Kooloobong) Stream
2. Cedar Grove/Nyrang Park Stream
3. Andrew Ave/Keiraville Public School Stormwater System
4. Tathra Park/ Nyrang Park Stormwater System

### **Neighbourhood Forum 5**

At NF5 meeting on 4th October, the forum concluded:

- NF5 remain concerned that the affected areas of Keiraville, Gwynneville and North Wollongong in the 2022 flood events need to be further considered in the proposals
- Request comprehensive site inspections of affected residents be undertaken before completing review

## **Next Steps**

We will use this feedback to inform any required revisions to the draft Floodplain Risk Management Study and Plan. These are preliminary discussions about the recommended options. They will each require further investigation, consultation and approvals before going ahead. We will continue sharing information with the community and key stakeholders and seek input as we progress.