bega valley shire council

Pambula River, Pambula Lake and Yowaka River Flood Study

Final Report

Volume 1 of 2: Report Text & Appendices

Revision 3
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Catchment Simulation Solutions

Pambula River, Pambula Lake and Yowaka River Flood Study

Final Report

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Bega Valley Shire Council	Derek Van Brackt

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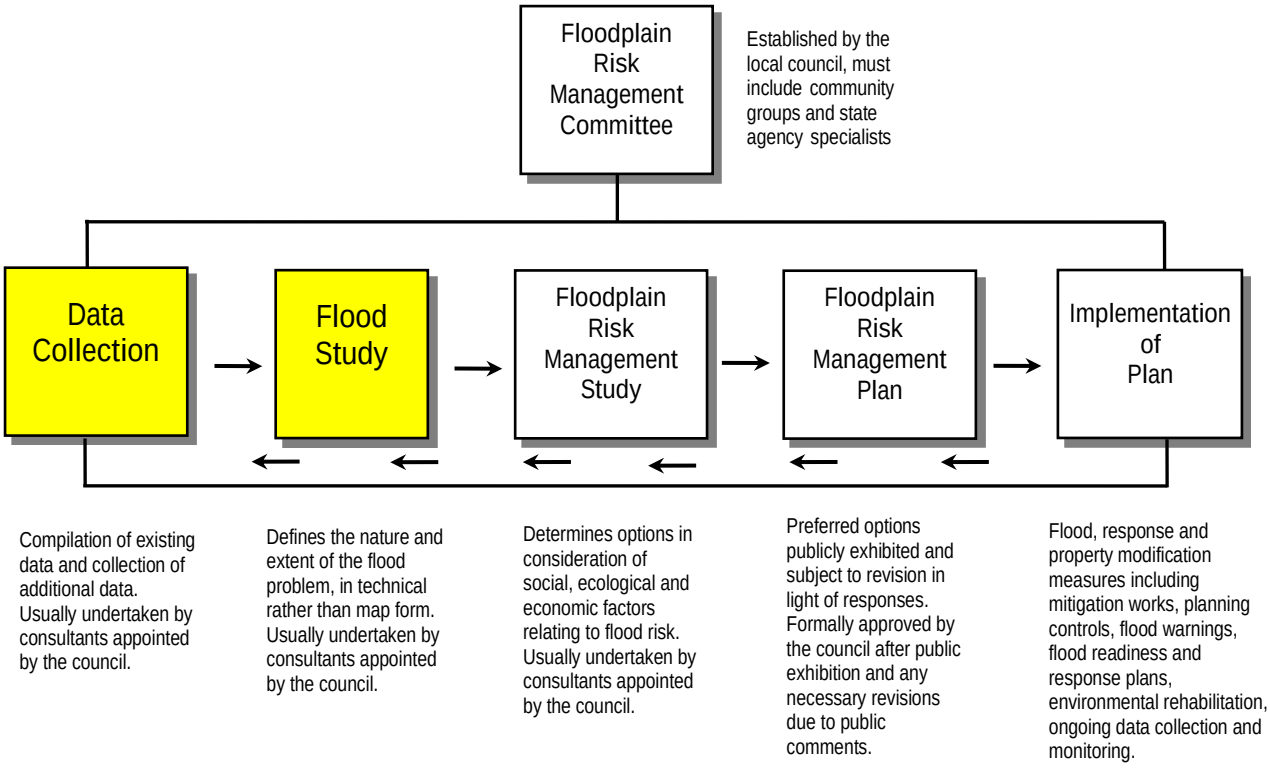
FOREWORD

The NSW State Government's Flood Prone Land Policy is directed towards providing solutions to existing flooding problems in developed areas and ensuring that new development is compatible with the flood hazard and does not create additional flooding problems in other areas. The Policy is defined in the NSW Government's '*Floodplain Development Manual' (NSW Government, 2005)*.

Under the Policy, the management of flood liable land remains the responsibility of Local Government. The State Government subsidises flood mitigation works to alleviate existing problems and provides specialist technical advice to assist Local Government in its floodplain management responsibilities.

The Policy provides for technical and financial support by the State Government through the following stages:



The 'Pambula River, Pambula Lake and Yowaka River Flood Study' represents the first of the four stages in the process outlined above. The aim of the Flood Study is to produce information on flood discharges, levels, depths and velocities, for a range of flood events under existing topographic and development conditions. This information can then be used as a basis for identifying those areas where the greatest flood damage is likely to occur, thereby allowing a targeted assessment of where flood mitigation measures would be best implemented as part of the subsequent Floodplain Risk Management Study and Plan.

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EXECUTIVE SUMMARY

Overview

The Pambula River, Pambula Lake and Yowaka River catchment covers an area of over 300 square kilometres within the Bega Valley Council Local Government Area (LGA). The catchment extends across forested and rural areas, as well as the villages of Pambula, South Pambula, Pambula Beach, Broadwater, Greigs Flat, Nethercote and Lochiel.

During periods of heavy rainfall in the catchment there is potential for water to overtop the banks of the various creeks and rivers and inundate the adjoining floodplain, including parts of the villages identified above. Flooding has been experienced across the catchment on a number of occasions including 1970, 1971, 1973, 1978, 1983 and 1985, as well as more recent events in 2011, 2012 and 2016. The 1971 flood is considered to be the largest flood on record.

Floodwaters in the catchment can damage property and vehicles and may pose a risk to life during large floods. In addition, flooding can overtop major transportation links within the catchment including the Princes Highway, Nethercote Road, Mount Darragh Road and Back Creek Road, which can inconvenience and isolate many individuals and families.

In recognition of the potential impact that flooding may have on the local community, Bega Valley Shire Council engaged Catchment Simulation Solutions to prepare a flood study for the Pambula River, Pambula Lake and Yowaka River catchment. It documents flood behaviour across the catchment for a range of historic and design floods. This includes information on flood discharges, levels, depths and flow velocities. It also provides estimates of the variation in flood hazard and provides an assessment of the potential impacts of climate change on existing flood behaviour.

Community Consultation

A questionnaire was distributed to over 300 properties within the catchment. The questionnaire aimed to secure information on community flooding experiences, with a particular focus on information that could be used to assist in the calibration of the computer flood models that would be developed during later stages of the project. A total of 21 questionnaire responses were received.

The responses to the questionnaire showed that around 30% of the respondents had been impacted by flooding. The most common reported flood impacts were roadways being cut by floodwaters as well as flooding of paddocks.

Computer Flood Models

Flood behaviour across the catchment was defined using two computer models that were developed specifically for the study:

- A hydrologic model of the catchment was developed using the XP-RAFTS software. The hydrologic model was used to simulate the transformation of rainfall into runoff and generate discharge hydrographs at various locations across the catchment.
- A hydraulic computer model of the river system and floodplain was developed using the TUFLOW software. TUFLOW is a two-dimensional hydraulic software package that takes the discharges hydrographs produced by the hydrologic model and simulates how that flow would move and be distributed across the catchment.

The XP-RAFTS and TUFLOW models were calibrated using historic rainfall and stream flow records along with surveyed flood marks. These marks were based on photographs and reported descriptions of flood behaviour that were provided by the community. The floods that were selected for calibration include events that occurred in 1971, 1985, 2011, 2012 and 2016. The outcomes of the calibration showed that the computer models were producing reliable reproductions of each historic flood.

Design Flood Simulations

The calibrated models were used to simulate the design 10%, 5%, 2%, 1%, 0.5% and 0.2% AEP floods based upon the 2019 version of Australian Rainfall and Runoff (Geoscience Australia). The Probable Maximum Flood (PMF) was also simulated. The results of each design flood were extracted, and figures were prepared to display the results. The figures are provided in Volume 2 and include:

- Floodwater Depths and Flood Level Contours: **Figures 19** to **25**
- Floodwater Speed (including velocity vectors): **Figures 26** to **32**
- Flood Hazard: **Figures 34** to **37** (flood hazard mapping shows the potential impact that floodwaters are likely to have on people and buildings in the study area)
- Hydraulic Category: **Figures 38** to **41** (hydraulic category mapping shows areas that should preserved for the conveyance and storage of floodwaters)

Analysis of Results

The mapping shows that flooding across much of the upper catchment is typically contained near the main watercourses owing to the "incised" nature of the floodplain in these areas. More extensive inundation is predicted across parts of the lower catchment where wider floodplains combine with topographic "constrictions" combined to create a series of "bathtubs". This includes south of Pambula as well as Griegs Flat.

The catchment is traversed by several important transportation routes. The results of the flood simulations show that Nethercote Road and the Princes Highway are very susceptible to inundation and are predicted to be cut by water in events as frequent as the 10% AEP flood. These roadways would typically be cut after as little as 5 hours of rainfall and would remain cut for a minimum of 6 hours. At least H3 hazard is predicted across these roadways which demonstrates that the depth and velocity of floodwaters would be sufficient to mobilise vehicles. Therefore, one of the greatest flood risks across the catchment is associated with people potentially driving through floodwaters.

While most properties and facilities are located outside of the floodplain, some properties have a greater flood exposure. In particular, the Colonial Motor Inn and Idlewilde Motor Inn

at Pambula are predicted to be exposed to a significant hazard during the PMF and access would also be cut. It is recommended that discussions are completed with the owners of each facility to highlight the significant hazard that could occur during the PMF and encourage the preparation of a "flood safe plan" that would promote early evacuation of staff and occupants during very large Pambula River floods.

The results of additional climate change simulations indicate that should both rainfall intensity and sea level continue to increase as projected, it would produce a notable increase in flood risk across all sections of the catchment. However, the area of the catchment located east of the Princes Highway would be most significantly impacted (as this area can be impacted by both sea level rise and increases in rainfall intensity).

Flood planning category constraint mapping was also prepared (refer **Figure 61** in Volume 2) and suggests that the land use zones defined in the Bega Valley Local Environmental Plan (LEP) 2013 are broadly compatible with the flood risk. However, there are vacant parcels of land at South Pambula that are zoned for industrial and residential uses that are more significantly constrained by flooding. Therefore, care will need to be exercised if these areas are developed in the future to ensure the development is compatible with the flood hazard and floodway and flood storage areas are preserved.