

Improving flood resilience in the Hawkesbury-Nepean Valley through land use planning

Department of Planning,
Industry and Environment
Background Paper
October 2019

Acknowledgement

**NSW Department of Planning, Industry and Environment
acknowledges the Traditional Custodians of the land and pays
respect to all Elders past, present and future.**

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Cover image:

View down to the winding Hawkesbury River from Marramarra National Park, John Spencer/OEH

Contents

A new approach to planning for The Hawkesbury-Nepean Valley	2
Relationship of the Regional Land Use Planning Framework to the Warragamba Dam Raising	3
What makes the Hawkesbury-Nepean Valley so unique?	4
What are the challenges for managing flooding in the Valley?	6
Relationship of the Regional Land Use Planning Framework to the Warragamba Dam Raising	3
Historic events	8
Potential physical effects of severe flooding	9
Potential risk to life from flooding	10
Understanding the flood risk and the land use planning response	12
Existing consideration of flood risk in land use planning in the Hawkesbury-Nepean	12
Improving resilience through land use planning in the valley	13
Next steps	14
Working together to Improve outcomes for the community	15
Appendices	16
Appendix A - Risk Considerations	17
Exposure	17
Appendix B - Land Use Planning Direction for the Valley	18
Environmental Planning and Assessment Act	18
Section 9.1 (formerly S117) of the EP&A Act	18
Hawkesbury Nepean Specific Advice - Western City District Plan	19
Controlling sensitive activities on the floodplain	20
Appendix C - Floodplain Risk Management Documents	21
NSW Flood Prone Land Policy	21
Floodplain Development Manual	21
National Best Practice AIDR Handbook 7 and Guidelines	22

The purpose of this paper is to provide information as to why there is a need to develop a Regional Land Use Planning Framework.



Image courtesy of Destination NSW

A new approach to planning for The Hawkesbury-Nepean Valley

The Hawkesbury-Nepean Valley (the Valley) is one of the most unique floodplains in Australia. Not only does it contain a unique landscape formed by the River(s), it's also home to some of the growth areas of Western Sydney, as well as some of the earliest areas of European settlement in Australia.

Flooding risks and challenges in the Valley have been documented in *Resilient Valley, Resilient Communities: the Hawkesbury-Nepean Valley Flood Risk Management Strategy* (the flood strategy). This strategy represents an integrated approach to identifying and responding to the flood risk in the Valley. Part of the response in the flood strategy is how to ensure that land use planning identifies and responds to flooding risks.

Outcome three of the flood strategy outlines that the Department of Planning, Industry and Environment is to develop a regional land use planning framework for the Hawkesbury – Nepean Valley to ensure communities in the Valley are more flood resilient.

The dam wall raising is about reducing the flood risk to those living in the Hawkesbury Nepean Valley.

The flood hazard, future population pressures, evacuation capacity/capability, and existing settlement patterns means there needs to be a suite of management strategies including a land use planning approach. The land use planning approach will need to take into account the different characteristics and relationships to the floodplain as well as the evacuation constraints and the complexity of evacuation in a severe to extreme flood.

Developing a Regional Land Use Planning Framework to respond to flood risk in such a diverse social, economic and environmentally diverse area requires a collaborative approach. A one size fits all approach will not work given the diversity of the issues, risks and flood conditions.

Actions need to be identified and considered using a basin wide approach, that integrates flood risk and land use potential. These actions will guide a future settlement pattern for the Valley.

Relationship of the Regional Land Use Planning Framework to the Warragamba Dam Raising

There is no single or simple solution that will remove the flood risk in the Valley. The proposed Warragamba Dam wall raising by around 14 metres is about reducing the flood risk to those living in the Hawkesbury-Nepean Valley.

Planned development will still occur in the Valley, however, this development will need to be managed to ensure the benefits of the dam wall raising in reducing the risk to life and property damage for those developments are not lost.

The proposed dam raising does not provide more land for development in the floodplain. The dam wall raising is about reducing the risk to existing and current permissible development. The dam raising proposal was identified as the most effective option for managing the significant flood risk to the current development in the Valley. Any future development will be managed to ensure the benefits of the dam raising are not removed.

Any new rezonings will only occur if it can be demonstrated that they can be evacuated safely based on current warning times.

What makes the Hawkesbury-Nepean Valley so unique?

The Hawkesbury-Nepean Valley sits on the western edge of Australia's largest city, and is expanding to accommodate Greater Sydney's growth. There will always be pressure to accommodate more housing, jobs and urban development within and close to the Hawkesbury-Nepean floodplain. The floodplain is also in the heart of the Western Sydney region, one of Australia's largest and most diverse economies with an annual gross regional product of about \$104 billion in 2013/14.

A Metropolis of Three Cities – Greater Sydney Region Plan provides a 40-year vision to enable a more productive, liveable and sustainable Greater Sydney (See Figure 1). The population of Greater Sydney is projected to grow to 8 million over the next 40 years, with almost half of that population residing west of Parramatta. This requires an additional 725,000 dwellings to be built across Sydney, supported by an additional 817,000 jobs, and all forms of infrastructure and supporting services to make all the cities of Sydney connected, easy to move around and enjoyable places to live.

The *Greater Sydney Region Plan* elevates the importance of Western Sydney with the Western Sydney City Deal aiming to deliver almost 200,000 jobs, more housing and better transport across the region. The Western City District Plan outlines that the strong relationship and collaboration between key centres in the area and unprecedented transport investments provide major links for people and freight within the district and to other areas in Greater Sydney.

Based on population projections from the Department of Planning, Industry and Environment and the local councils in the area, the population is forecasted to grow in line with existing rezonings and precincts that have already been approved. It is the spatial configuration and distribution of this population that will be the challenge and will need to be managed.



WESTERN SYDNEY REGION

Annual gross regional product (2013/14)

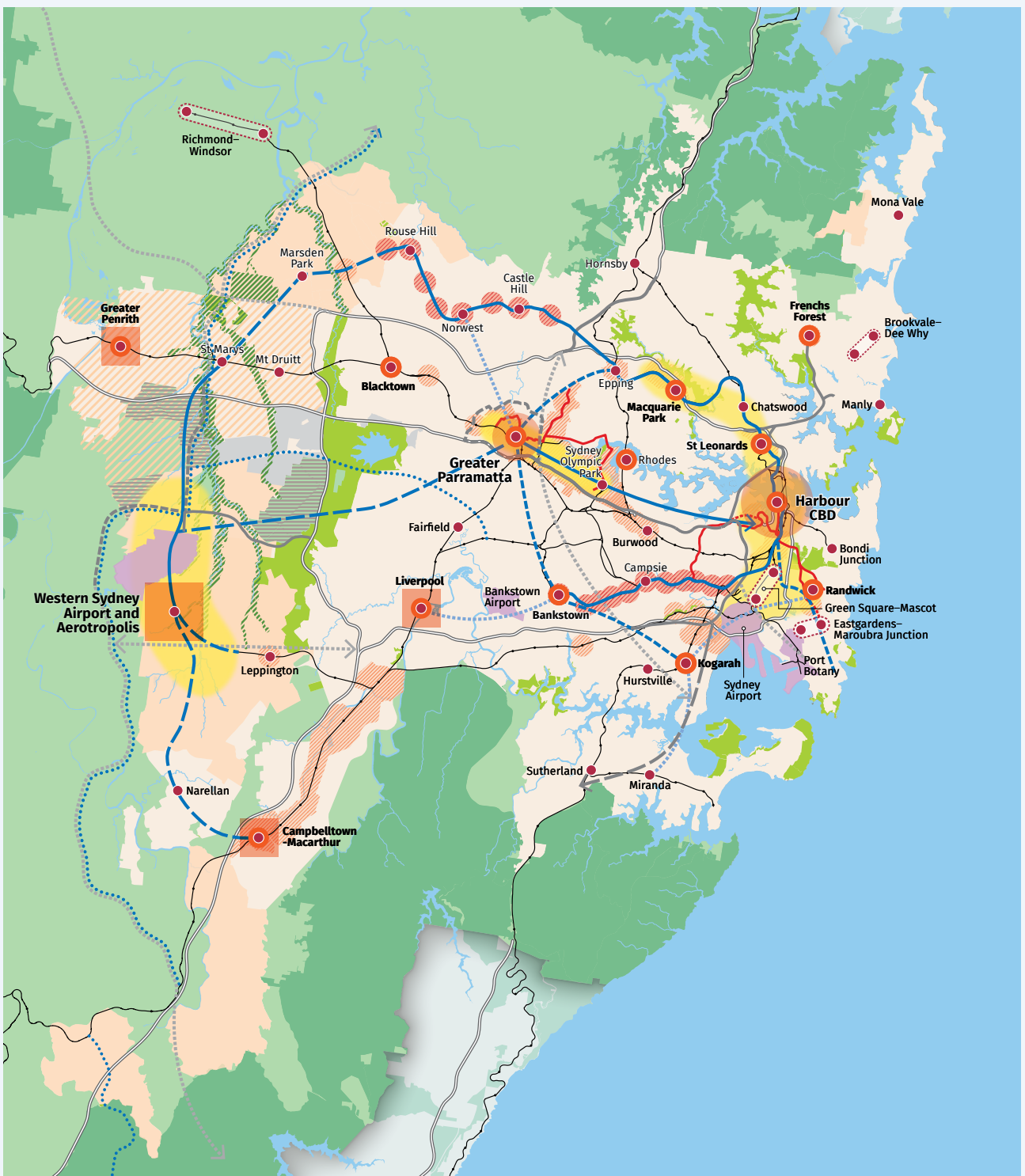
\$104 billion



40 YEAR VISION

**productive
liveable
sustainable
safe**

Figure 1: Spatial plan for Greater Sydney (derived from the Greater Sydney Region Plan)



What are the challenges for managing flooding in the Valley?

The natural characteristics of the Hawkesbury-Nepean Valley make it particularly vulnerable to severe to extreme flooding which contributes to the high flood risk. The Insurance Council of Australia classifies flood risk in the Valley as the highest natural disaster risk in New South Wales.

The combination of large upstream catchments and narrow downstream sandstone gorges results in floodwaters backing up behind these natural 'choke points'. As shown by Figure 2, floodwaters rise rapidly, causing significant flooding both in depth and area. The Hawkesbury-Nepean Valley is different to most other coastal floodplains and river valleys where the valley progressively widens as rivers approach their mouths.

For floods larger than a 1 in 100 chance per year, flows coming into the Hawkesbury-Nepean River and its tributaries are much higher than those that flow out of the Castlereagh gorge between Penrith and Richmond, and the 100 kilometre long gorge between Sackville and Brooklyn. This causes a 'bathtub effect' in which floodwaters spill out of the main river and flood the valley. The towns affected by flooding include Penrith and Emu Plains in the upper floodplain, and Richmond, North Richmond, Windsor, McGraths Hill, Bligh Park, Pitt Town and Wilberforce in the lower floodplain, together with a number of small communities along the Sackville gorge down to Brooklyn.

Floodwaters in the Valley are likely to get much deeper than most other floodplains in NSW and Australia. In floodplains such as those in Lismore (on the NSW north coast) and Nyngan (in inland NSW), the difference between a 1 in 100 chance per year flood and the Probable Maximum Flood is about two to three metres. At Windsor, this difference is about nine metres.

The 'bathtub' effect also means that during heavy rain, floodwater enters the floodplain much faster than it can escape, meaning that water levels rise quickly. Flood levels on the Hawkesbury-Nepean floodplain can rise at a rate of 0.5 m/hr for several hours and can even rise at over 1.0 m/hr for shorter periods. At these rates, a house on the lower areas of the floodplain could be submerged in less than six hours.



FLOODING IN THE VALLEY



CHOKER POINTS



BATHTUB EFFECT

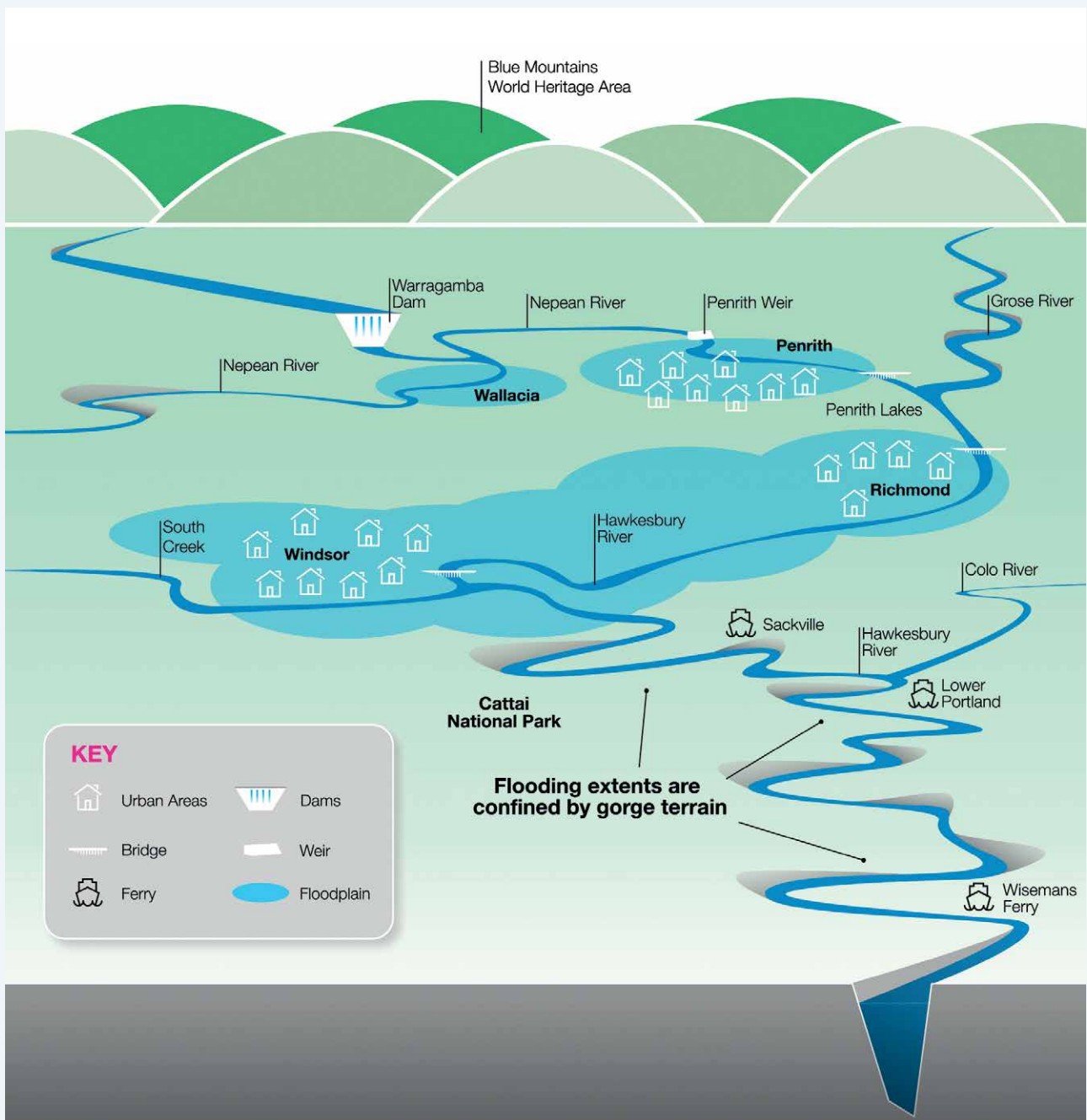


COMPARATIVELY DEEPER FLOODWATERS



FASTER FLOODWATERS

Figure 2: 'Bathtub' effect in the Hawkesbury-Nepean Valley



Source: INSW

Historic events

The Hawkesbury-Nepean system has experienced floods throughout history, as illustrated the Table 1. The flood in 1867 was the largest on record in European settlement and approximated to between a 1 in 200 and 1 in 500 chance per year flood event.

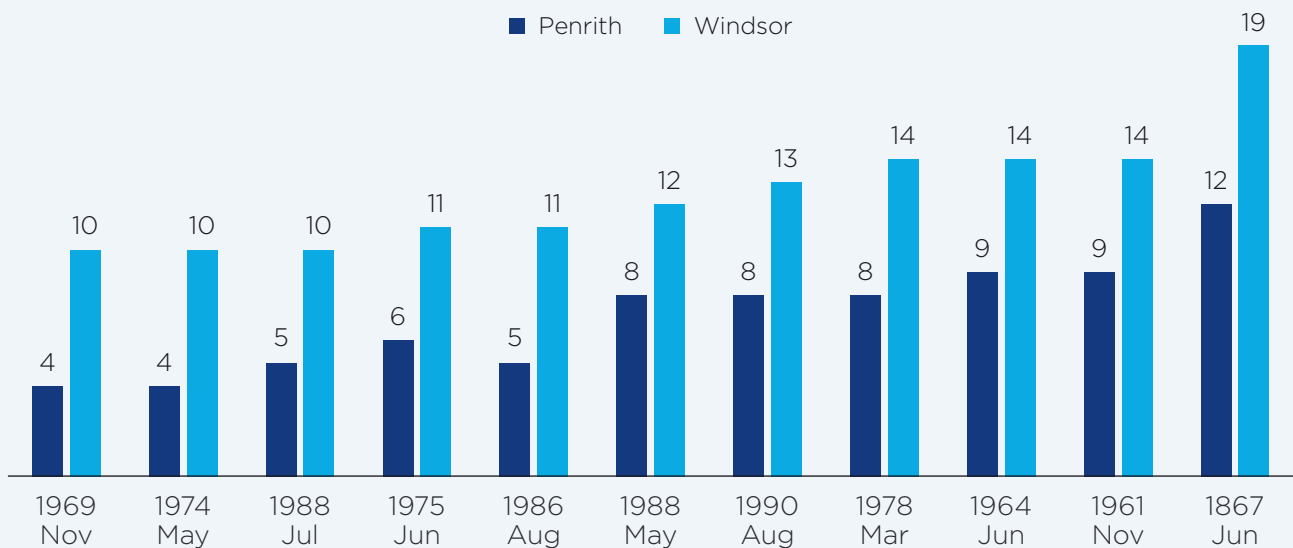
Analysis of sediments within the Nepean Gorge shows that prior to European settlement, at least one flood reached or exceeded the level of a flood with about a 1 in 1000 chance per year flood event (Saynor and Erskine, 1993). Such a flood would reach around 20 metres at Windsor.

To place these floods in context, some of the rivers in Victoria which flooded in 2011 experienced floods with a 1 in 200 chance per year flood event, while various catchments in Queensland

experienced floods in 2011 - 2013 between 1 in 200 chance per year flood event (Bundaberg, 2013), 1 in 500 chance per year flood event (Roma, 2012, and Toowoomba City, 2011), and around a 1 in 1000 chance per year flood event (Lockyer Valley, 2011). The most recent 2019 floods in Townsville exceeded a 1 in 100 chance per year flood event. In addition, NSW has had a range of events in excess of the 1 in 100 chance per year floods, including: Dapto 1984, Nyngan 1990, Coffs Harbour 1996, Wollongong 1998, Newcastle 2007, Dungog 2015 and Picton 2016.

The recent run of floods across the country that have exceeded existing floodplain management 'norms' provides an important historical context for taking a land use approach that addresses the full range of floods.

Figure 3: Summary of recent historical events in the Valley



RIVER DEPTH DURING HISTORIC FLOODING
APPROX. FLOOD DEPTH FROM NORMAL RIVER LEVEL (m)

Potential physical effects of severe flooding

Large flood events in the Hawkesbury-Nepean Valley could impact the entire NSW economy.

The Insurance Council of Australia considers floods in the Hawkesbury-Nepean Valley to be the highest natural disaster risk in New South Wales. The NSW Government also recognise the potentially significant risk to life and property in the event of a large flood. The total damages associated with a 1 in 100 chance per year flood are conservatively estimated at over \$2 billion.

If a flood similar to that of 1867 occurred today, the estimated damage across the Valley would cost \$5 billion, rising to \$7 billion by 2041 if population grows in line with current land use planning policy.

THE DIRECT PHYSICAL EFFECTS OF EXTREME FLOODING ACROSS THE VALLEY ARE LIKELY TO LEAD TO THE FOLLOWING OUTCOMES:

Roads would be cut and damaged (may take 6 months or more to repair/rebuild)

Bridges would be closed, inspection needed before opening, may need repairs

Rail lines would be closed while inundated (may take 6 months or more to repair/rebuild)

Telecommunications would be severely disrupted (may take 6 months or more to repair/rebuild)

Gas supplies would be disrupted

All electricity supply to the flooded area would be shut down with substantial power disruption (may take 6 months or more to repair/rebuild)

Water supply pumping would need to be shut off due to the loss of electricity (may take 6 months or more to repair/rebuild)

Where communities still have water, **household sewer systems** will function but most sewage treatment plants will be inoperable. Raw sewage will discharge into the river

Shops and commercial areas would be inundated, and depending on insurance, personal circumstances and other issues may take some time to recover. Research from the US and other floods indicates that around 30% of business can fail after a major natural disaster. This would impact on the local economy and wider community

Large numbers of homes inundated or would collapse with significant costs to recover.

Potential risk to life from flooding

As part of the development of the Flood Strategy, the flood risk for both the existing population and the currently planned future population was considered. The development of the Flood Strategy considered future population projections from both the Department and local councils.

The *NSW SES Hawkesbury-Nepean Flood Plan* (the state emergency plan for flooding in the Hawkesbury-Nepean Valley) states that due to the extensive and prolonged flooding in the Hawkesbury-Nepean Valley from large riverine flood events, the large number of people at risk and limited flood free public transport options, mass self-evacuation by private vehicles would be the primary method to minimise flood risk to life. Also, from a 1 in 100 chance per year flood event onwards a very large number of people would be directed to evacuate to reduce flood risk to life.



Around 134,000 people currently live and work on the floodplain, and around 60,000 would require evacuation in a 1 in 100 chance per year flood. The population at risk of life and injury is based on:



People unable or unwilling to evacuate.



Current constraints on the capacity of existing and planned future evacuation roads.



The 8-15 hour warning time from the Bureau of Meteorology to trigger an evacuation, and that it can take over 20 hours to evacuate in some areas.

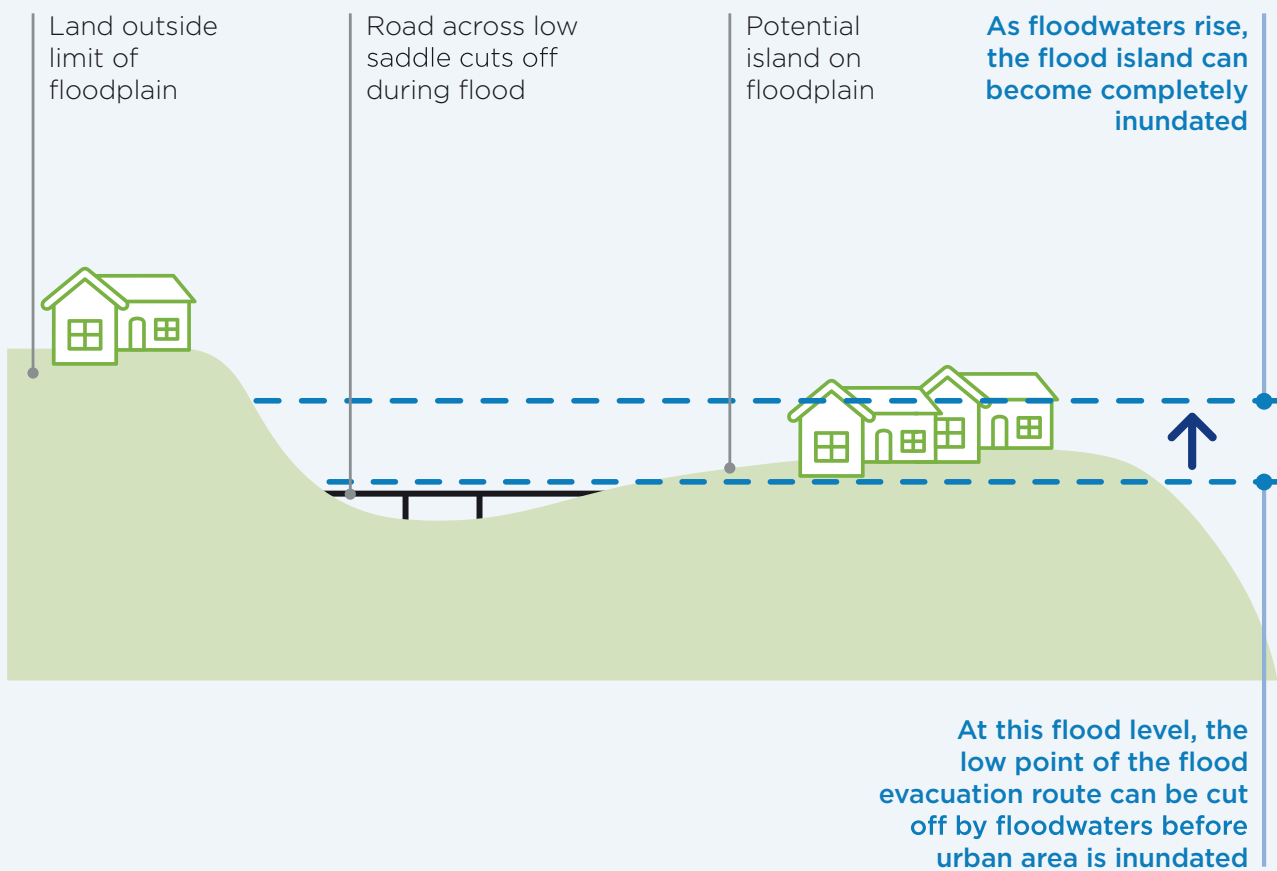


The large flood depths above the 1 in 100 chance per year.



Areas that become isolated by floodwaters initially and then become inundated by rising floodwater in larger flood event (Figure 4).

Figure 4: How a flood island can be isolated then fully submerged



Source: *Resilient Valley, Resilient Communities: Hawkesbury-Nepean Valley Flood Risk Management Strategy, 2017, p20.*

Understanding the flood risk and the land use planning response

Managing flood risk involves addressing the combination of the likelihood (or exposure) to flooding and the vulnerability of the community and its elements to flood risk for the full range of flood events. Knowledge and consideration of the full range of likelihood and consequences enables communities to be more resilient to floods.

The current land use planning system in the Hawkesbury-Nepean Valley is generally based on the default flood planning levels of the 1 in 100 chance per year. In isolation, this is not able to effectively address:

- The significant range of flood depths and behaviour above the 1 in 100 chance per year flood level in the Valley.
- The significant and varied emergency response challenges of the Valley.
- The significant impacts that filling may place on flooding in the Valley.
- The cumulative impacts of exposure to flooding and the vulnerability to the existing and future community.

The dynamic nature of flood risk exposure, vulnerability and tolerance across the Valley means that an approach more intrinsically tied to settlement location, visioning, zoning and community acceptability to flood risk is required.

Best practice does not support a single 'one-size-fits-all' approach to flood risk management. A varied approach is needed for the Hawkesbury- Nepean Valley.

Risk based land use planning can support community resilience as part of a broader suite of measures. However, this cannot be done on an

application by application basis. Areas with more flood related constraints when considering flood behaviour, flood hazard, flood function, evacuation capacity, emergency response and recovery or other related constraints are generally less suitable for development.

Existing consideration of flood risk in land use planning in the Hawkesbury-Nepean Valley

In NSW, flood risk in land use planning is typically addressed through to use of flood related development controls and requirements which often relate to the flood planning level. It has become common to adopt the 1 in 100 chance per year flood to derive a flood planning level (minimum flood level control), particularly for residential development in urban areas.

The application of the 'Guideline for Residential Development on Low Flood Risk Land' issued in 2007 as part of a Ministerial Direction has resulted in a focus on the 1 in 100 chance per year flood + freeboard for land use planning. However, given the large variation in flood depths between the 1 in 100 chance per year flood and PMF in the Hawkesbury- Nepean Valley, it is considered that the focus on the area below the planning level does not adequately address flood risk particularly relating to issues of regional evacuation and reduction of flood damage.

The dynamic nature of flood risk exposure, vulnerability and tolerance across the Valley means that an approach more intrinsically tied to settlement location, visioning, zoning and community acceptability to flood risk is required. There is also a need to reconsider the one size fits all approach to flood planning.

Improving resilience through land use planning in the Valley

Land use planning that considers the full range of flood events plays an important role in setting community growth directions – by managing the flood risk, communities are able to become more flood resilient into the future.

Land use planning is perhaps the most potent policy lever for influencing the level of future disaster risk¹.

Decisions about land use and the built environment (particularly location and density) leave the longest legacy for the community and can be an important element in making the community more flood resilient.

To be more resilient, communities need to have information and the ability to use this information in managing their exposure and vulnerability to flood risk. Key components that support community resilience may include:

- Available knowledge (through flood studies) of the full range of flood risks so this can inform decisions.
- Using planning controls to avoid the high flood risk areas and to increase the flood resilience of buildings.
- Sustainable plans to manage risk to the existing community and to support flood warning to the community (flood risk management).
- Sustainable plans to respond to flood emergencies (flood emergency management planning).
- Sustainable infrastructure plans that improve the resilience of infrastructure to disasters.
- Plans to support commercial areas to ‘bounce back’ following a major flood, to ensure the on-going vitality of the area and provision of services and opportunities that the community enjoys at present and in the future.
- Support to individuals in the recovery from a flood event (community and health services).

District and local plans such as the Western City District Plan, local environmental plans and development control plans can include flood related development controls that place restrictions and requirements on developments located on flood prone land.

1 Productivity Commission Report into Natural Disaster Funding, 2015

Next steps

As part of the development of the framework, the Department of Planning, Industry and Environment will be seeking input from councils in the Valley and other key stakeholders including government agencies on consideration of flood risk for future development in the Valley. Key elements that will be considered when developing the framework, include:

- Considering the full scale of flood risk and associated consequences
- How flood evacuation and flood related constraints on land vary across the floodplain.
- How development may impact upon flood behaviour and risk.
- Building in flood resilience such as improving business continuity and appropriate building standards.
- Minimising flood impacts on the social and economic welfare of the community.

Taking a settlement approach to risk in consideration of flood related constraints on land enables a more strategic vision of settlement evolution and change over time. A framework based upon settlements can assist in focusing development in areas where risks can be more readily managed to support community resilience. It needs to utilise the best available flood information and evacuation planning work and considers infrastructure planning and best practice.

The Flood Strategy has identified the preparation of a Regional Land Use Planning Framework as a critical component of managing the unique characteristics of the Valley in terms of variation in flood hazard, flood function, future population pressures, evacuation capacity/ capability, and existing settlement patterns. This Regional Land Use Planning Framework requires a coordinated, strategic approach that considers the varying flood constraints across the Valley supported by appropriate regulatory controls to manage flood risk for future urban development.

THE REGIONAL LAND USE PLANNING FRAMEWORK WOULD ENCOMPASS CONSIDERATION OF MEASURES TO:



Allow the floodplain to function so that impacts of flooding are not exacerbated.



Control vulnerable uses and development within the floodplain.



Lower densities in higher flood risk areas.



Identify the costs and benefits of raising or widening evacuation roads and potential future funding mechanisms.

The 1 in 100 chance per year flood extent can change as a result of updated modelling, building of major flood mitigation infrastructure (such as dam raising), significant cut and fill altering the floodplain and climate change. If the proposed 14 metre dam raising is approved, then the modelled 1 in 100 chance per year flood level will significantly change. As stated in the Flood Strategy, the Regional Land Use Planning Framework will also encompass measures to ensure that the existing land subject to flood-related development controls based on the current pre-dam raising 1 in 100 chance per year flood level will continue to be subject to these controls. Future developments on flood prone land will also be subject to flood related development controls.

The Regional Land Use Framework would integrate district planning, flood risk management considerations, flood related constraints on land, road evacuation planning and evacuation capacity/ capability together with the ability to recover into a coordinated approach.



WORKING TOGETHER TO IMPROVE OUTCOMES FOR THE COMMUNITY

Successful implementation of the Regional Land Use Planning Framework is reliant on a supportive statutory framework that facilitates and calibrates the implementation of the Regional Land Use Planning Framework over time through the available environmental planning instruments.

A framework for considering flood risk is provided by the Floodplain Development Manual, however the Guideline on Development Controls on Low Flood Risk Areas deters a more risk-based approach to planning residential development.

The other key aspect is the work required to develop a settlement strategy that considers the variation on flood related development constraints, the associated risks and appropriate risk management strategies (including evacuation) across the Valley. This work requires a collaborative effort between land use planners, emergency managers, flood risk managers and infrastructure providers to better inform decision making about land use in the valley. Working together across the responsible agencies, alongside local councils, is needed to provide clarity and direction for a more resilient Valley.

Appendices

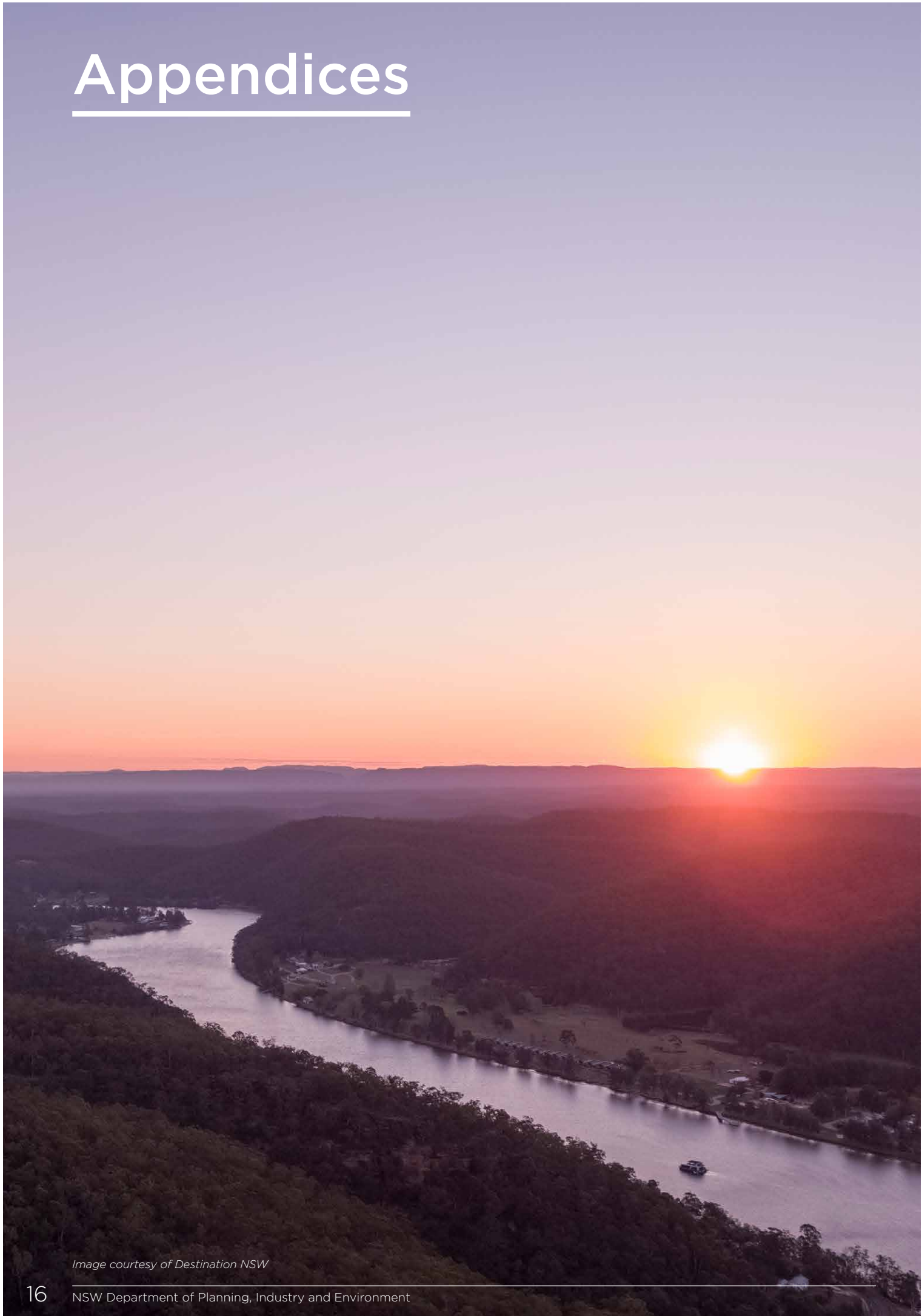


Image courtesy of Destination NSW

Appendix A

Risk considerations

The following information is provided as background information only:

The policy and regulatory context for examining flood risk in the Hawkesbury-Nepean Valley necessitates a focus on resilience – whether that be resilience of urban systems, government, community and/or the individual.

In that context, it is important to unpack the risk aspect of consequence and likelihood into its component parts of exposure, vulnerability and tolerability. These components are tied to broader considerations, such as the economic cost of social impact over time. Examining these components would provide better insights compared to an approach that solely looks at flood damage and risk to life considerations.

Low levels of flood risk awareness, the urbanisation of the floodplain, an expanding Sydney, and a continually changing community increase the vulnerability and exposure of the community and result in high flood risk.

Previous investigations by the Hawkesbury-Nepean Flood Risk Management Taskforce note that current levels of flood risk awareness in the Hawkesbury-Nepean Valley are low, with only a third of Valley residents considering flood to be a risk.

Community awareness of and behavioural response to the flood risk in the Valley have a significant impact on risk to life, the economy and social amenity.

The economic cost of the social impact of natural disasters is becoming a larger consideration when applying resilience models to flood risk reduction, and is a factor that must be accounted for when calculating the 'true-cost' of a disaster.

A recent report into this subject² identifies and quantifies the social impacts of natural disasters, including those on health and wellbeing, education, employment and community networks. The report demonstrates that the social costs of natural disasters equal the more traditionally defined economic costs and are sometimes even higher. It is clear in the report, that a greater effort should be invested in the preparedness of individuals and communities, in particular long-term economic and psychosocial recovery. This would include community development programs and support for areas such as health and wellbeing, employment and education.

Exposure to flood is taken to relate to both existing buildings/properties as well as land zoned for certain purposes, particularly urban purposes. Therefore, land exposed to flood that is subject to existing urban development or zoned to enable future urban development is considered to be more exposed than areas of non-urban use.

Further, flood exposure also involves consideration of flood severity, such that land exposed to higher flood hazard and higher likelihood is more exposed than land at lower flood hazard and lower likelihood.

² The economic cost of the social impact of natural disasters, Australian Business Roundtable for Disaster Resilience and Safer Communities (2017)

Appendix B

Land Use Planning Direction for the Valley

The following information is provided as background information only:

Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act 1979 (as amended) (the EP&A Act) provides the legislative basis for planning in NSW and the statutory framework for the consideration of flooding.

The objects of the EP&A Act most relevant to flood resilience are paraphrased here, and include to:

- (a) to promote the social and economic welfare of the community
- (b) to promote the orderly and economic use and development of land
- (c) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants
- (d) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State
- (e) to provide increased opportunity for community participation in environmental planning and assessment.

The EP&A Act has also recently been updated to make it easier to navigate and understand, and aims to achieve four underlying objectives:

- to enhance community participation
- to promote strategic planning
- to increase probity and accountability in decision-making
- to promote simpler, faster processes for all participants.

These objectives place an additional or renewed emphasis on a more strategic approach to land use planning and requiring more community participation.

Section 9.1 (formerly S117) of the EP&A Act

Section 9.1 (formerly section 117) of the Environmental Planning and Assessment Act 1979 (as amended) (EP&A Act) gives the Minister power to direct councils to ensure Local Environmental Plans are prepared or modified

in accordance with the principles specified in a Direction. These directions include a range of planning topics, including hazard and risk.

Section 4.3 Flood Prone Land (of the Ministerial Direction) – provides guidance to councils when they are preparing a draft Local Environmental Plan (LEP) or amendment to an LEP that creates, removes or alters a zone or a provision that affects flood prone land.

The objectives of the direction are:

- *to ensure that development of flood prone land is consistent with the NSW Government's Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005, and*
- *to ensure that the provisions of an LEP on flood prone land is commensurate with flood hazard and includes consideration of the potential flood impacts both on and off the subject land.*

Although the Policy and Manual recognise the need to consider events greater than the 1 in 100 chance per year up to the Probable Maximum Flood (PMF), the Guideline inhibits the adequate incorporation of these events into the statutory land use planning framework across the valley, by requiring councils to obtain government approval.

The Ministerial Direction and associated planning circular 'Guideline for Residential Development on Low Flood Risk Land' issued in 2007 recommends the application of flood related controls for residential development to land below the Flood Planning Level (FPL), based upon the 1 in 100 chance per year flood level (plus a freeboard). This has resulted in some residential development occurring on the floodplain, above the 1 in 100 chance per year flood, but below the PMF, with limited or no flood related development controls. Development has also occurred without effective consideration of the potential scale of emergency evacuations in a severe to extreme flood events, and other consequences on risk to life, property and social and economic impacts of a large flood.

Hawkesbury-Nepean Specific Advice – Western City District Plan

The *Western City District Plan* has now been approved and has statutory effect. The District Plan provides direction for how the District should be developed over the next 20 years. Part of that vision includes sustainability considerations and one of the planning priorities includes adapting to the impacts of urban and natural hazards and climate change.

In relation to flooding in the Hawkesbury-Nepean Valley, the Plan states that given the scale of the severity and regional-scale of the risk, more stringent consideration is warranted for areas affected up to the Probable Maximum Flood (PMF) as well as the 1 in 100 chance per year flood. Whilst the Department of Planning and Environment is leading work to develop a planning framework to address flood risk in the Hawkesbury-Nepean Valley, the following planning principles will be applied to both local strategic planning and development decisions:

PLANNING PRINCIPLES

Avoiding intensification and new urban development on land below the current 1 in 100 chance per year flood event.

Applying flood related development controls on land between the 1 in 100 chance per year flood level and the PMF level.

Providing for less intensive development or avoiding certain urban uses in areas of higher risk and allowing more intensive development in areas of lower flood risk, subject to an assessment of the cumulative impact of urban growth on regional evacuation road capacity and operational complexity of emergency management.

Balancing desired development outcomes in strategic centres with appropriate flood risk management outcomes.

Avoiding alterations to flood storage capacity of the floodplain and flood behaviour through filling and excavation ('cut and fill') or other earthworks.

Applying more flood-compatible building techniques and subdivision design for greater resilience to flooding.

Controlling sensitive activities on the floodplain

The NSW Local Environmental Plan standard instrument provides a 'template' that all NSW councils must use as the basis for preparing a new LEP, using standard zones (including standard zone objectives and mandated permitted or prohibited uses), definitions, clauses, and format.

Clauses relating to bushfire risk are compulsory, as are a range of principal development standards and miscellaneous provisions (Part 5 of the LEP template). In addition, Part 6 of most LEPs include "*additional local provisions-generally*", on topics such as acid sulfate soils, earthworks, flooding and some others specifically important to that local area.

There are two different approaches taken by councils across NSW regarding flood risk in the LEPs. The first is to include a flood planning provision that restricts development below the FPL (generally 1% Annual Exceedance Probability (AEP) flood plus freeboard) in accordance with the Guideline for Residential Development on Low Flood Risk Land unless the development is compatible with flood function, flood hazard and flood risk and results in no significant impacts from that development.

The other approach requires NSW Government approval under the Guideline. This has taken those provisions further and included a second clause for "Floodplain Risk Management". This states that development consent must not be granted for a range of sensitive activities unless the consent authority is satisfied that the development will not affect the safe occupation and evacuation in the event of a flood above the FPL of 1% AEP plus 0.5m freeboard. The list of sensitive activities varies between councils.

Appendix C

Floodplain Risk Management Documents

The following information is provided as background information only:

The floodplain risk management process has been in place since 1986. Risk-based land use planning is supported by the *Floodplain Development Manual* (Manual) and the *NSW Flood Prone Land Policy* (Policy).

The Manual, including the policy, is gazetted under s733 of the Local Government Act 1993. This provides councils with some indemnity for information provided and decisions made in accordance with the principles of the Manual.

NSW Flood Prone Land Policy

The Policy states that the management of flood prone land is, primarily, the responsibility of councils. The role of the NSW Government includes:

- providing technical, financial and policy support to local councils for developing and implementing floodplain risk management plans and more broadly across government
- flood combat
- developing regional strategies and plans that Councils need to be cognisant of in their land use planning.

The primary objective of the Policy is to reduce the impacts of flooding and flood liability on individual owners and occupiers of flood prone property, and to reduce the private and public losses from floods, utilising ecologically positive methods wherever possible. The policy operates in consideration that:

- *flood prone land is a valuable resource that should not be sterilised by unnecessarily precluding its development; and*
- *if all development applications and proposals for rezoning of flood prone land are assessed according to rigid and prescriptive criteria, some appropriate proposals may be unreasonably disallowed or restricted, and equally, quite inappropriate proposals may be approved.*

This highlights the importance of approaches that consider the varying flood risk in consideration of the full range of flood events and the limitations of rigid approaches that exclude development based on a single flood event.

Floodplain Development Manual

The Manual supports the implementation of the Policy. It provides a risk management framework that enables councils to develop sustainable strategies for managing risks by understanding the full range of flood behaviour, assessing management options, and articulating and implementing decisions on managing flood risk. It supports community involvement in developing management plans and a hierarchy of avoidance, minimisation and mitigation works.

The Manual includes specific advice regarding Flood Planning Levels (FPLs) that indicates that FPLs do not ensure that development is located in areas where it will not have significant adverse impacts on flooding and do not address risk to life issues. Those issues are to be considered strategically in studies and managed through appropriate land use strategies and emergency response planning.

The Manual states that: *In general, the FPL (minimum floor level) for standard residential development would be the 1 in 100 chance per year flood event plus freeboard (typically 0.5m) with minimum fill levels at the 1 in 100 chance per year flood level. Higher FPLs may be necessary for aged care facilities and other types of developments with particular evacuation or emergency response issues. Consideration should also be given to using the PMF as the FPL when siting and developing emergency response facilities such as police stations, hospitals, SES headquarters and critical infrastructure, such as major telephone exchanges, if possible.*

The NSW Government is currently reviewing the Manual and Flood Prone Land Policy with the aim of clarifying state roles and responsibilities, flood risk management principles, and considering national best practice and lessons learnt from recent flood events.

National Best Practice AIDR Handbook 7 and Guidelines

Since the Manual was updated in 2005, the Australian Institute of Disaster Resilience (AIDR) has released *Handbook 7: Managing the Floodplain: a guide to best practice in flood risk management in Australia* (AIDR Handbook 7) in 2017. Since 2005 a range of associated guidelines have been developed to be consistent with the National Strategy for Disaster Resilience. This series seeks to develop best practice in flood risk management in Australia. The approach outlined in this handbook is consistent with nationally agreed emergency risk assessment guidelines, the NERAG and *AS/NZS ISO31000:2009 Risk Management - Principles and Guidelines*. The range of supporting guidelines includes Guideline

7.5 Flood Information to Support Land Use Planning and Practice Note 7.7 Considering Flood Risk in Land Use Planning Activities.

The Handbook and these guidelines provide advice on considering the full range of flood risk and the variation in flood behaviour and flood emergency response difficulties across the floodplain in managing flood risk. This enables this information and the flood related constraints on land it identifies to be considered in strategic land use planning decisions and to inform systems for managing development.

Knowing the spatial variations in constraints allows for informed decisions on community growth on a spatially varied basis, such as the settlement context, which can also consider prevailing socio-economic characteristics and future economic opportunities. Best practice requires consideration of all these factors and does not support – a single, ‘one-size-fits- all’ approach to all flood risk management.



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