



## When Sydney becomes an inland sea, we'll need the pool

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Large parts of Sydney are built on a floodplain - a fact that many Sydneysiders don't want to know and don't want to hear. Flood experts, hydrologists, the SES and others have been warning for years that a major flood in Sydney is a disaster waiting to happen.

Last week as we watched scenes of devastation in Wagga Wagga and the Riverina, it's easy to think that this cannot happen here. We're in a major capital city. We're safe. Surely housing for tens of thousands of Sydneysiders would not have been built on a flood plain. Would it? This is exactly what has happened in Sydney in recent decades of development.

So what is the problem, and what should we be doing about it?

### A major flood can and will happen in Sydney

A search of publicly available material about Sydney and flood risk paints a sobering picture.

The Hawkesbury-Nepean River is one of the major river systems in NSW, and the unique topography of the 22,000km catchment area (from Goulburn in the south and almost to Singleton in the north west with only one outlet at Broken Bay) means that water flows into the valley at a far higher rate than it can flow out. An East Coast Low Pressure System over Sydney (like last week) with exceptionally heavy rain over several days can lead to severe, and very deep, flooding. Hydrologists tell us that:

*"The narrowing of the valley downstream at Castlereagh controls the flow of water between the wide floodplain at Penrith and the even larger floodplain at North Richmond and Wilberforce. The flow of water is restricted by the narrow gorges downstream of Wilberforce which act like a bottleneck and result in backing up of floodwater producing flooding much deeper than on a typical coastal river in NSW."*<sup>1</sup>

The SES Emergency plan<sup>2</sup> says the primary floodplain is mostly located within the Penrith, Hawkesbury, Blacktown and Baulkham Hills local government areas. It goes on to say that the main area of urban development in the Hawkesbury-Nepean Valley is in the primary floodplain, with distinct sub-floodplain areas in Camden, Wallacia, Emu Plains/Castlereagh and the largest at Richmond/Windsor/Wilberforce.

So at some point we are likely to experience a major flood in Sydney. It will be deep, and it will affect a very built-up area.

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<sup>1</sup> Reconciling development with flood risks: the Hawkesbury-Nepean dilemma, by Catherine Gillespie, Paul Grech & Drew Bewsher, Australian Journal of Emergency Management, Autumn 2002.

<sup>2</sup> NSW SES, 2005. Hawkesbury/Nepean Flood Emergency Sub Plan, 2005. Hawkesbury/Nepean Flood Emergency Sub Plan, NSW State Disaster Plan (State DISPLAN).

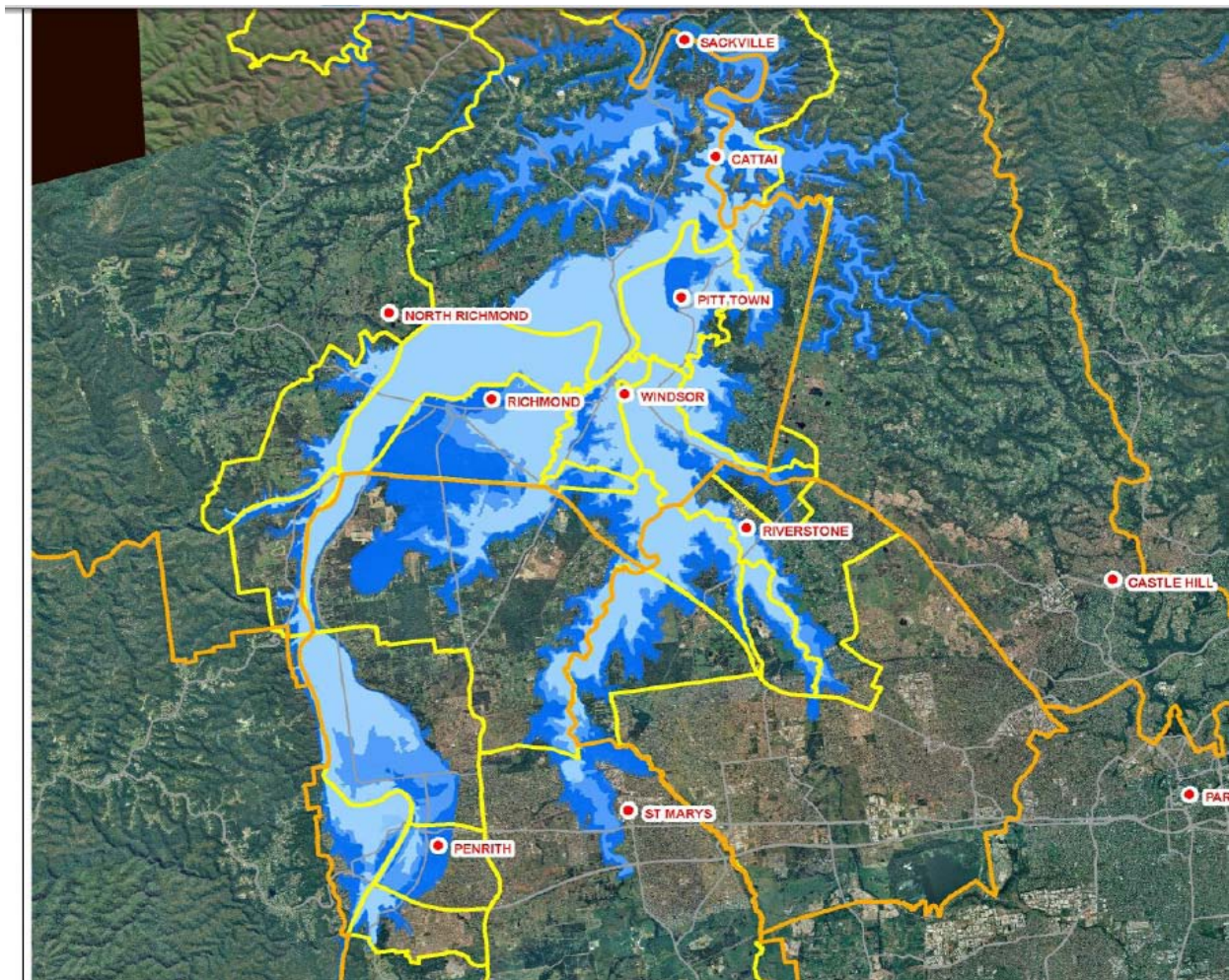


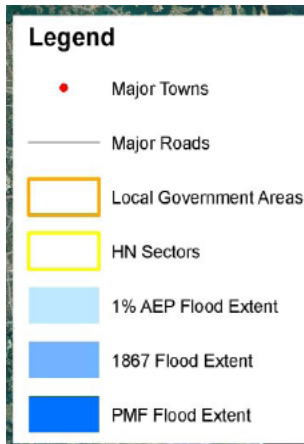
Several of the most severe floods experienced on the Hawkesbury-Nepean River have resulted from East Coast Low Pressure Systems. Among these was the highest recorded flood of June 1867. This flood was also the worst in terms of lives lost and the destruction of property and livestock.

The Sydney Morning Herald published on 24 June 1867 reported:

*"The flood in this district is said to be by far the highest which has occurred since its settlement by Europeans. The town of Windsor itself is almost entirely submerged, and the country for miles around is under water. The expanse of flood is so great, that everybody is astonished at the tremendous accumulation of water, and it will seem incredible to all who have not actually seen it. Places which since the settlement of the colony, have never known to be flooded are now lost to view. The plain on which Windsor is partly situated unites with South Creek and Eastern Creek to form a vast inland sea over the surface of which when the wind has been high the broken crested billows roll with as much force and volume as they do during moderately squally weather in Sydney Harbour. A boat may now be taken through deep water from Riverstone to the Blue Mountains - a distance of about 15 miles; and from Hall's at Pitt Town to the Kurrajong - some twenty miles."*

The mid blue section on this map shows the 1867 flood:





Source: NSW SES, 2005. Hawkesbury/Nepean Flood Emergency Sub Plan, 2005. Hawkesbury/Nepean Flood Emergency Sub Plan, NSW State Disaster Plan (State DISPLAN).

But what about Warragamba dam, built in 1960 – won't it save us from a major flood? The Sydney catchment Authority website says:

*"Some believe that Warragamba Dam...protects the Hawkesbury-Nepean Valley from flooding. In fact, Warragamba was never designed as a flood mitigation dam... it can only mitigate floods to a limited extent."*<sup>3</sup>

In fact the second and third highest recorded floods for river were experienced just after Warragamba was built in November 1961 and June 1964. In the 141 years from 1867 to 2005 there were 11 major floods – an average of 1 every 13 years.

Major Floods in the Valley: Year	Height at Windsor (m AHD)
1867	19.20
1961	15.00
1964	14.60
1864	14.40
1978	14.30
1956	13.61
1870	13.49
1990	13.36
1879	12.98
1988	12.65
1873	12.50
1949	11.96

Source: NSW SES, 2005, Hawkesbury/Nepean Flood Emergency Sub Plan, NSW State Disaster Plan (State DISPLAN).

<sup>3</sup> <http://www.sca.nsw.gov.au/dams-and-water/major-sca-dams/warragamba-dam/warragamba-a-dam-full-of-myths>

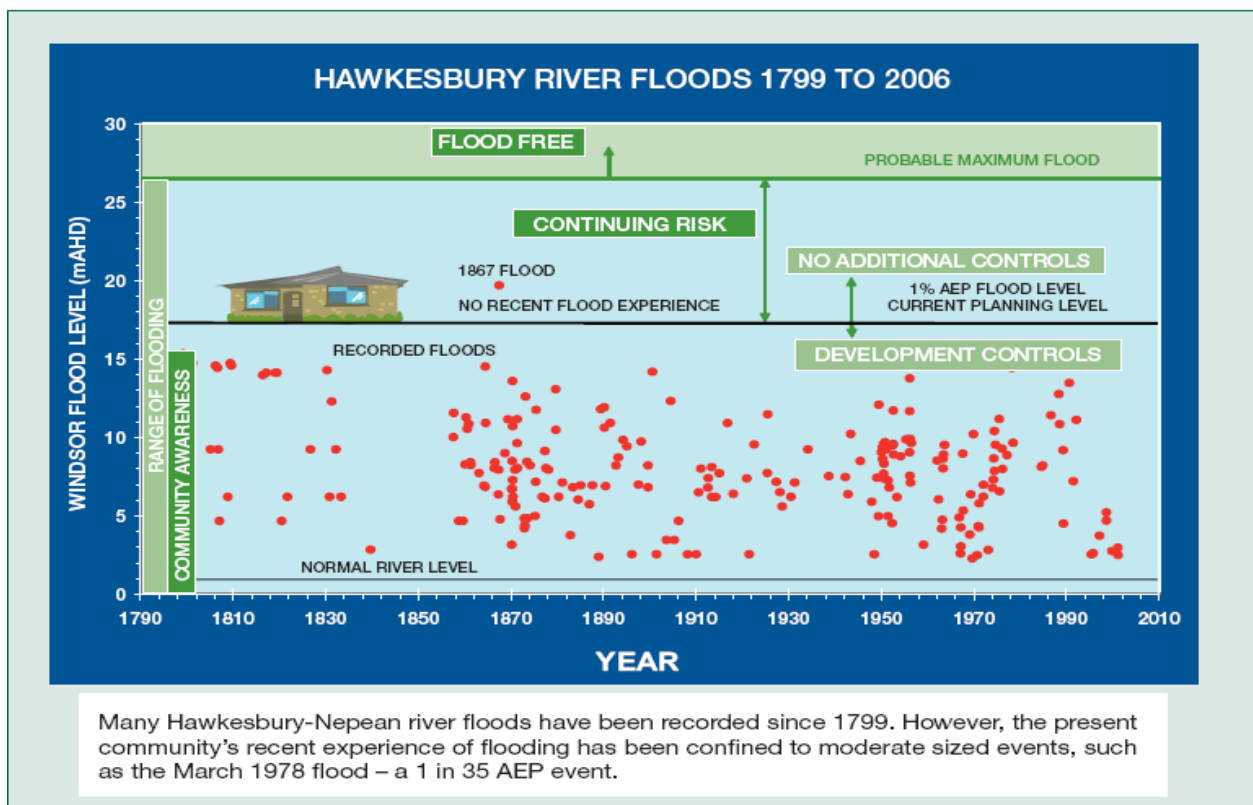


So for western Sydney:

Table 2 - Flood Frequency Probability	Wallacia Flood Level (at Blaxland Bridge) m AHD	Penrith Flood Level (at Victoria Bridge) m AHD	Windsor Flood Level (at Windsor Bridge) m AHD
1 in 5 years = 20%	36.8	20.1	11.1
1 in 20 years = 5%	42.5	23.4	13.7
1 in 100 years = 1%	45.8	26.1	17.3
The 1867 flood, now estimated probability of 1 in 170 = 0.4%		26.1-26.9	19.2

Source: NSW SES, 2005. Hawkesbury/Nepean Flood Emergency Sub Plan, 2005. Hawkesbury/Nepean Flood Emergency Sub Plan, NSW State Disaster Plan (State DISPLAN).

Local Councils plan their development around the 1 in 100 year flood level – they use a depth of 17.3m at Windsor, and 26.1m at Penrith. Below this level, development controls are put in place, as can be seen in this diagram for Windsor, which also shows as red dots all the recorded floods:



Source: Managing Flood Risk Through Planning Opportunities - Guidance on Land Use Planning In Flood Prone Areas, prepared for the Hawkesbury-Nepean Floodplain Management Steering Committee, June 2006.



The problem, as stated by flood risk consultants, is that *“Above the 100 year level, it is assumed, wrongly, by the general community that the land is ‘flood free’.”*<sup>4</sup> Most Councils do not have development controls above the 100 year flood level, although as shown above there is continuing risk above this level.

The paper goes on to say that:

*“Windsor and Richmond are now thriving urban centres... Expansion in the 1980's and 1990's with the new suburb of Bligh Park has resulted in a total population of 35,000 in Windsor, Richmond South Windsor and Bligh Park. Parts of Penrith, Emu Plains and Riverstone are all major urban areas with growing populations. All are vulnerable to Hawkesbury-Nepean flooding.”*

This problem is not confined to Sydney – it's national. There are examples of inappropriate development all over Australia. For example, the Insurance Council of Australia states that *“many thousands of residential properties on Queensland's Gold Coast have been authorised and constructed in locations that place them at extreme risk of catastrophic flooding and coastal inundation.”*<sup>5</sup>

The highest risk properties are uninsurable for flood – for this 2-3% of dwellings it's not a possibility that they will be flooded, it's a certainty. It is best to let the insurance market operate freely where it can, but insurance doesn't work in these circumstances because the cost to insure these properties is unaffordable. If these properties go uninsured, the next time there is a major flood, the damage will be extensive and the problem of how to pay for that damage will come up once again.

The cost of insuring flood prone properties must be brought down to an affordable level and a national problem requires a national solution. Most commentators (including the Actuaries Institute) believe that the long term focus needs to be the mitigation of flood risk. However in the short term a solution is required to the cost of insuring high risk properties. The Insurance Council of Australia wants the Government to pay direct amounts to householders and business owners in flood-prone areas to subsidise their insurance premiums. The Actuaries Institute believes that a national funding pool should be set up temporarily to subsidise the cost of insuring high risk properties.

### **A temporary national pool**

The underlying cause of potential flood losses, inappropriate development, needs to be addressed as a priority. The Government needs to mitigate the risk of flood through measures such as revising current building codes, building or improving dams and levees, re-location of high risk properties, and renovations to existing buildings and infrastructure. Every dollar spent in mitigation can save many dollars in future loss payments.

Even if mitigation action starts immediately, it will take 10-15 years to fully implement and become effective. In the interim, the Actuaries Institute recommends government intervention in the market via a temporary national pool for high risk properties, which will facilitate government subsidy of insurance premiums for those in high risk areas. Currently these high risk

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<sup>4</sup> Reconciling development with flood risks: the Hawkesbury-Nepean dilemma, by Catherine Gillespie, Paul Grech & Drew Bewsher, Australian Journal of Emergency Management, Autumn 2002.

<sup>5</sup> “Improving Community Resilience to Extreme Weather Events”, Insurance Council of Australia, April 2008.



property owners or tenants either cannot obtain home and contents cover for flood at all, or such cover is prohibitively expensive.

In order for these flood mitigation solutions to be successful, local Councils and State Governments must be encouraged to, and rewarded for, undertaking flood mitigation. Councils and Governments need to have “skin in the game” – to have a vested interest in the outcome. The pool can help achieve this.

The Natural Disaster Insurance Review Inquiry into flood insurance recommended in its report last September that *“an agency sponsored by the Commonwealth Government be created to manage the national coordination of flood risk management and to operate a system of premium discounts and a flood risk reinsurance facility, supported by a funding guarantee from the Commonwealth.”* The Federal Government will be consulting on this recommendation later this year.

The Actuaries Institute believes that a funding pool will be more successful than direct premiums subsidies from the Government for a number of reasons.

1. The pool encourages actions to reduce risk – the pool would subsidise premiums but it would only do so for homes in areas where the local Council and State Government is carrying out flood mitigation measures. This is the key – tying premium subsidies to incentives to reduce the flood risk in future.
2. A national pool can do more than just reduce premiums – any leftover funds can also provide funding to help State Governments and Councils pay for risk mitigation activities which are otherwise very expensive.
3. When floods occur, the pool can pay out the owners of affected properties where the flood risk is so high that the properties are effectively uninsurable. Having the pool pay out those high risk properties when floods happen rather than trying to insure them, means that insurance premiums will be less expensive, because the insurer is no longer covering those extreme risks.
4. A direct premium subsidy will only make payments to people who are currently insured. But many people are not insured, perhaps because insurance has already become too expensive. A pool would also pay out to uninsured people in high risk properties.

There are lots of options to create funding for such a pool, some of which were explored after Cyclone Tracy. For example funding could come from a combination of a small levy on property premiums, a small levy on local Councils, perhaps payments from property developers, and some Government support. Ideally the pool would be self-funding, and provide funds for mitigation which will decrease future losses.

Over time as the number of high risk properties is reduced, the need for a Government pool will also be reduced. The Actuaries Institute advocates that the pool be wound down over time as the insurance market is able to operate effectively.



Australians also need better information on flood risks, and a pool can also provide funds for national flood mapping. It's encouraging to see that the Government has committed<sup>6</sup> to providing access to existing flood mapping data through Geoscience Australia. Whilst much more work is required to beef up flood mapping data, this is a step in the right direction.

Lastly, Sydneysiders need information on the flood risk of our properties. Once better information is available, simple risk classifications can be assigned - either Extreme, High, Medium or Low risk. Insurers will be able to provide all policyholders with a one-page flood risk fact sheet specific to the insured's property. For those without insurance, this information can be provided by their Council in their rates notices.

Maybe the one good thing to come out of the devastating flood events of the last two summers will be increased awareness of flood risk, and a willingness by householders, town planners, local, State and Federal Governments to do more to address it.

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## Appendix 1

### How is the chance of flood measured?

The probability of floods occurring is measured as a 1 in 5, 1 in 50 or 1 in 100 year flood. However this does not mean that a 1 in 100 year flood will only happen once every 100 years. This measure is simply the chance each year of having a particular level of flooding e.g. 1 in 100 means one chance in hundred each year on average, or a 1% chance of such a flood occurring each year. Each probability of flood has a depth of water associated with it, expressed in AHD (Australian Height Datum) which represents metres above the low flow level of the river, i.e. the water level of the river after a long dry spell.

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<sup>6</sup> "Reforming flood insurance, A proposal to improve availability and transparency", Federal Government Consultation paper, November 2011