REDEVELOPMENT IN URBAN AREAS WITH LOW EXISTING FLOOD STANDARDS

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Abstract

A common feature of older development is construction to what is now regarded as an unacceptable flood standard. A challenge for flood managers is to find a balance between the flood risk exposure and the reasonable economic use of this land.

In recent times flood managers have sought to encourage reconstruction in order to meet current flood standards. In some instances redevelopment has been approved to a standard below that which is considered acceptable by modern standards on the basis that it represents a significant reduction in the risk to human life and property when compared to the pre existing development.

Due care should be exercised before adopting such an approach to ensure that strategic issues beyond the individual development are considered and that underlying assumptions of this approach are clearly examined. This paper outlines common assumptions as well as the broader floodplain risk management implications of this type of strategy covering topics such as cumulative impacts, community tolerance of risk, financial, social and planning considerations.

These considerations are presented in the context of flooding within the Randwick local government area located approximately 6km south east of the Sydney CBD. Randwick forms part of the older urban areas of Sydney characterised by higher development densities and older infrastructure thus providing a relevant illustration of the floodplain management implications of redevelopment.

Risk management approach

It is commonly recognised that best practice for the management of natural hazards, including flooding, is by the application of a risk management approach. Australian and international standards identify the fundamental elements of the risk management process as including the identification, analysis and evaluation of risks and the consideration of potential measures to improve the likelihood and consequence of the situation. [1]

While risk management principles recognise that there will always be uncertainty, a key component of these principles is quantifying the risk and analysing the impacts of treatment measures.

In NSW, flooding is managed in accordance with the NSW Government's Floodplain Development Manual.[2] Appendix B of this manual establishes a risk management framework for the management of flood hazard in NSW and refers to Australian Standards as providing further detailed guidance on risk management.

A common management measure is the use of appropriate flood planning levels. Guidance on the selection of appropriate flood planning levels is provided in Appendix K of the manual. There are several key aspects discussed in Section K3 of Appendix K and the relevant aspects to this paper are summarised by the following excerpts.

> *"….decisions on FPLs are based upon a detailed understanding of flood behaviour across the full range of floods, their likelihood of occurrence and the associated consequences in terms of danger to personal safety and social, economic, environmental and cultural issues."*
>
> *"FPLs for new residential development will generally be based upon the 1% AEP flood. While there is potential to vary this, it should only occur where it can be demonstrated that the situation is exceptional"*

The objective of the manual is not to sterilise land however the manual does require any variation from the commonly accepted residential flood planning level, higher or lower, to demonstrate "exceptional circumstances".

This aspect should not be forgotten when developing strategies that enable redevelopment of flood prone properties on the basis that it represents a "significant reduction" in the risk to human life and property when compared to the pre existing development.

There needs to be a logical and quantifiable basis for the selection of appropriate controls. This is critical where controls vary from normally accepted standards.

Flood risk at Randwick

To date Randwick City Council has undertaken Flood Studies and is commencing Floodplain Risk Management Studies in four catchments covering approximately 34% of the Randwick local government area. These studies are as follows:

- West Kensington Floodplain Risk Management Plan – 0.9km^2
- Kensington – Centennial Park Flood Study – 9.7km^2
- Coogee Bay Flood Study – 2.8km^2
- Maroubra Bay Flood Study – 2.4km^2

The predominant land uses within each of these catchments is residential with each catchment having a commercial precinct. The Kensington – Centennial Park catchment also contains significant recreational areas including Centennial Park and Randwick Racecourse as well as the University of NSW.

The catchment areas were largely developed from the 1880s onwards and were fully urbanised by the 1930s except for the Maroubra Bay catchment where development lagged by approximately 30 years.

Flooding and flood risk within these catchments is characterised by two key features as follows.

1. Waterways within the catchment have generally been piped with development immediately above or adjacent to the pipes. Trunk drainage typically has the capacity to convey the 5yr ARI or less. When the capacity of the piped network is exceeded, flooding

occurs generally along the alignment of the former watercourses through urbanised areas, down streets and through parks.

Traditional distinctions between Mainstream and Local Overland flooding are of little benefit in Randwick as they relate to the time period in which an area was developed rather than the nature of flooding risk at the location. Randwick was developed in a time where waterways were typically modified by piping rather than open channels.

2. The Randwick local government area is characterised by sandy soils with a topography containing sand dunes. This has created a significant number of large trapped low points where outflow is via infiltration into the underlying sand with no overland flow path. In some cases, piped drainage was constructed during the initial development of the locality, however this drainage typically has a capacity less than the 5yr ARI.

The natural catchment features and historic development within the catchment have resulted in dwellings subject to frequent inundation above floor level. In the worst instances, this inundation begins in storms as frequent as the 2yr ARI and 5yr ARI.

Redevelopment of existing properties

The proximity to the Sydney CBD combined with its beachside locale has made Randwick a highly sought after residential area with the average price of a dwelling exceeding $1M. Accordingly, redevelopment of existing dwellings is a common form of development in Randwick. This typically includes the addition of a second storey to the existing masonry dwelling and renovation of the ground floor.

This type of development effectively results in the construction of an entirely new dwelling. This is of particular concern where the ground floor of the dwelling is subject to flooding in smaller more frequent storms such as the 5yr ARI or less.

The remainder of this paper will focus on the implications of various management options including:

- Permit a second storey on the existing dwelling
- Require the existing ground floor to be raise prior to adding a second storey
- Prohibiting any further development of those properties at inappropriate locations such as high hazard areas or floodways.

Personal safety implications

Where a second storey is added to an existing dwelling there is an argument that this can provide safe refuge during flooding where the floor level of the second storey is above the Probable Maximum Flood and the structure can withstand the flooding. This is particularly important in locations where flooding occurs too quickly to effect an evacuation of the locality.

There is uncertainty in the above argument as human behaviour is complex and persons may attempt to enter the lower floor during flooding to rescue goods or for another reason. The uncertainty lies in that the hazard posed by the existing ground floor has not been addressed. The additional floor space in the redeveloped dwelling may result in additional

persons residing within the home and those persons potentially being exposed to the risk posed by the ground floor.

The option of raising the ground floor prior to construction of the second storey is perceived as eliminating the hazard posed by the existing ground floor. This option has the benefit of addressing the existing hazard however the perceived negative is the additional cost and the burden this places on the community.

The option of not permitting further development may prevent additional people from exposure to the hazard however the hazard to existing people remains unchanged.

Property damage implications

Where a second storey is added to an existing dwelling there is the perceived benefit that the second storey provides opportunity to reduce damage by moving goods to the higher floor during flooding. There is uncertainty as to whether the property owners will have time or the capacity during a flood event to move goods to higher ground.

Furthermore, when a second storey is added to a dwelling the bedrooms are often moved to the second storey and the ground floor is subsequently used for other living spaces such as entertainment rooms. This may result in higher value goods being stored at ground level and combined with the renovated ground floor may cause the monetary value of property damage to increase.

The option of raising the ground floor prior to construction of the second storey may significantly reduce the exposure to property damage but again the greatest perceived negative is the additional cost and the burden this places on the community. The financial capacity of the property owners to accommodate the additional costs should not be underestimated. If property owners do not have the financial capacity to undertake the additional works then the properties will not be redeveloped and the outcome would ultimately be the same as adopting the approach of prohibiting further development.

Community tolerance of flooding

Community tolerance of flooding can be a governed by a variety of factors and may include social, financial and economic aspects beyond the control of the development consent authority. There are several issues commonly identified by residents in Randwick when dealing with flooding complaints and development proposals that relate to tolerance of flooding risk.

In the case where existing dwellings have been renovated there appears to be a perception by purchasers that the dwelling is modern and therefore complies with modern flood standards. This is particularly problematic where the existing ground floor is inundated by small frequent storms such as the 5yr ARI thus highlighting to the property owner the difference between expectation and reality.

The above problem may be compounded by owners who have entered into significant debt to purchase a dwelling and have little financial capacity to recover from flood damage.

A new emerging aspect to community tolerance of flooding is the issue of insurance. Flooding insurance is progressively becoming available in Australia. As a result the financial impact of flooding is being realised on a regular basis through premiums rather than subsequent to the occurrence of actual floods. This may alter the community tolerance for flooding risk.

Significant increases in premiums may be experienced by property owners where a dwelling is subject to frequent inundation. This inundation may be classified as either flooding or storm damage by insurance companies and owners may not be given the option to exclude cover for this risk.

In consideration of the three redevelopment management options, the addition of the second storey may not improve the exposure of the community and their ability to tolerate the effect of floods.

The elimination of existing sub standard floor space may reduce community exposure to flooding risk and have benefits in reduced damages and insurance premiums. However, this also comes at a cost and is borne by property owners during development. This may also be reflected in the price at which prospective developers are willing to pay for the acquisition of the property.

Prohibiting further development of those properties at inappropriate locations such as high hazard areas or floodways may limit further exposure. However, this limits the ability of existing property owners to take action that reduces their exposure to the risk.

Cumulative impacts

In developing strategies for redevelopment of properties it is important to look beyond the individual property and consider cumulative impacts. In describing the need for appropriate management measures, the NSW Floodplain Development Manual states

> *"Case-by- case decision making cannot account for the cumulative impacts on flood behaviour and risks, caused by individual developments or works. This form of ad hoc assessment contravenes the principles of the manual" [3]*

This is particularly important where it is proposed to construct a second storey on an existing home. Would the cumulative impact of this option lead to a reduction of risk to people and property or would it simply expose more people and property to the flood hazard. The ultimate answer to this question may lie in human behaviour and may be difficult to predict.

The option of removing the existing sub standard floor spaces has the distinct advantage that the reduction of sub standard floor spaces can be quantified and can be used as an indicator of exposure to hazard. However this option also relies on establishing a link between floor space, number of occupants and human behaviour.

When considering cumulative impact another important factor to consider is lost opportunity. If a dwelling is renovated and a second storey is added without addressing the hazard to the existing floor area, the dwelling may remain in this state for many decades until the dwelling reaches the end of its life.

Conclusion

The challenge for flood managers is to develop and document appropriate techniques to support strategies for redevelopment of urban areas.

As outlined above, strategies for redevelopment of existing areas can be difficult to assess due to a variety of complex interdependent factors. When developing such strategies, a level of certainty is required that the desired outcome will be achieved.

Development of techniques to assist flood managers to assess the impact of various strategies would be beneficial in the decision making process. These techniques may focus on making better use of existing tools such as flood damage assessments and GIS outputs. Alternatively, this may require the development of new tools.

The focus on development of tools should consider the largest stakeholders in the flood risk management process, being the residents. Their ability to accept risk is largely controlled by their comprehension of their exposure. Tools that enable the establishment of good policies that also allow individuals to understand their exposure will add value to the process of decision making in build up urban areas.

References:

1. Section 5; AS/NZS ISO 31000:2009 Risk management – Principles and gidelines; Standards Australia/Standards New Zealand; 2009; ISBN 0 7337 9289 8
2. Floodplain Development Manual the management of flood liable land; NSW Government; April 2005; ISBN 0 7347 5476 0
3. Section 1.6; Floodplain Development Manual the management of flood liable land; NSW Government; April 2005; ISBN 0 7347 5476 0