



Hawkesbury Floodplain Risk Management Study & Plan



Drawing of night-time rescues during the 1867 Hawkesbury River flood (Source: Illustrated Sydney News, June 1867)

Volume 2 – Planning Issues Revised Draft for Public Exhibition

July 2012

Report of Hawkesbury City Council's Floodplain Management Committee



Hawkesbury

Floodplain Risk Management Study & Plan

Planning Issues



Prepared for
Hawkesbury City Council

July 2012
Project No 10011

Centennial Planning Pty Ltd
ABN 23 061 998 543
Trading as Grech Planners

Level 10, 66 King Street Sydney NSW 2000
GPO Box 5013 Sydney NSW 2001

P [02] 8031 6031	E info@grechplanners.com.au
F [02] 8031 6001	W grechplanners.com.au



Note: as at 1 July 2012, Grech Planners merged to form GLN Planning Pty Ltd. The commission to prepare this report was completed by Grech Planners. The contact details for Grech Planners remain as above. Further details for GLN Planning Pty Ltd can be obtained at www.glnplanning.com.au.

Date of Final Issue: 24 July 2012
File Path & Name: C:\Drew\JOBS\J1921 Hawkesbury\Revisions to July 2012 Report\J1921_Vol2_R3.doc
Project Manager: P Grech
Client: Hawkesbury CC C/-Bewsher Consulting
Project Number: 10011

The purpose for which this report may be used and relied upon is limited for that which it was commissioned. Copyright in the whole and every part of this document belongs to Grech Planners and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person without the prior written consent of Grech Planners.

Document history and status

Version	Issued To	Qty	Date	Prepared by:	Reviewed by:
Working Draft	D Bewsher S Yeo	1-e	05/05/11	PG	
2 nd Draft	D Bewsher	1-e	26/05/11	PG	DB
Draft	D Bewsher	1-e	30/05/11	-	PG
Revised Draft	D Bewsher	1-e	21/06/11	PG	DB/MO/PP
2 nd Revised Draft	D Bewsher	1-e	22/06/11	PG	
3 rd Revised Draft		1-e	19/07/11	DB/PG	
Corrected Page 61	D Bewsher	1-e	16/08/11	PG	
Draft for FMAC	D Bewsher	1-e	09/07/12		PG
Rev'd Draft for Exhib'n	HCC	1-e	24/07/12	DB	

Table of Contents

1.0	Introduction	1
1.1	Commission	1
1.2	Background	1
1.3	Purpose of this Report	1
1.4	Study Area	2
1.5	Investigations Undertaken	4
2.0	NSW Flood Risk Management (FRM) Framework	4
2.1	Overview	4
2.2	NSW FRM Policy and Guidelines	4
2.3	Current FRM Practice	5
2.4	THE FRMP Relationship with EPA Legislation	6
3.0	EPA Act Statutory FRM Framework and Guidelines	7
3.1	Departmental Guidelines	7
3.2	Ministerial Directions	8
3.3	Section 149 Certificates	9
3.4	Climate Change Considerations	12
3.5	Standard Instrument LEPs	13
3.6	Developer Contributions	14
4.0	Review of Flood Related Controls Applying to Hawkesbury	15
4.1	General	15
4.2	SEPPs	15
4.2.1	SEPP (Housing for Seniors or People with a Disability) 2004	15
4.2.2	SEPP No 30 - Intensive Agriculture	15
4.2.3	SEPP No 55 - Remediation of Land	15
4.2.4	SEPP (Sydney Region Growth Centres) 2006	15
4.2.5	SEPP (Exempt and Complying Development Codes) 2008	17
4.2.6	Sydney REP No 20—Hawkesbury-Nepean River	19
4.3	Existing Local Environmental Plan (LEP)	19
4.4	Draft Local Environmental Plan	22
4.5	Development Controls Plans (DCPs)	24

5.0	Existing and Projected Population and Development	25
5.1	Existing Population & Development Patterns in Floodplain	25
5.2	Population and Workforce Targets & Projections	27
5.2.1	Sydney Metropolitan Context	27
5.2.2	Hawkesbury LGA Context	32
5.3	Future Employment Lands	37
5.4	Summary of Projected Development	38
5.5	Estimate of Vehicles required to Evacuate	39
6.0	Discussion of Planning Issues & Options	39
6.1	Role for Planning	39
6.2	Flood Risks within Existing Areas	40
6.3	Suitability of New Releases and Expanded Urban Areas	40
6.4	Existing and Pending Flood Related Planning Controls	44
6.4.1	LEP Provisions	44
6.4.2	DCP Provisions	47
6.4.3	Communicating Flood Risk	52
6.4.4	Exempt and Complying Development	53
6.4.5	Application for Exceptional Circumstances	53
7.0	Summary & Conclusion	56
8.0	Glossary	64
9.0	References	68

Figures

- 1 Study Area
- 2 NSW FRM Process
- 3 Growth Centres SEPP Development Control Map
- 4 Application of Housing Code SEPP to Study
- 5 Flood Risk Constraints in the Hawkesbury LGA
- 6 Location of Bligh Park Stage 2
- 7 Pitt Town Masterplan
- 8 Vineyard and adjacent Precincts in the Northwest Growth Centre
- 9 Richmond Investigation Area
- 10 North Richmond Investigation Area
- 11 Windsor ("Corridor") Investigation Area
- 12 Wilberforce Investigation Area
- 13 Glossodia Investigation Area
- 14 Sample Flood Planning Matrix
- 15 Flood Risk Categories for Mapping Purposes
- 16 Draft Flood Risk Precincts Map

Appendices

- A Draft Model Flood Clause for Standard LEPs
- B Estimates of Vehicles to Evacuate SES Sectors in an Extreme Flood
- C Recommended Draft DCP Flood Risk Management Provisions

1.0 Introduction

1.1 Commission

Grech Planners forms part of the consultant team (as a subconsultant to Bewsher Consulting) engaged by Hawkesbury City Council to prepare the Hawkesbury Floodplain Risk Management Study (FRMS) and Floodplain Risk Management Plan (FRMP), addressing in particular planning-related issues.

1.2 Background

The Hawkesbury River Floodplain is situated at the western edge of the Sydney Metropolitan Region, and consequently is subject to a number of competing land use management pressures. These pressures include the need to facilitate growth and change in historical urban settlements, provide for continued growth in employment-generating development, conservation of the rural and historic character of the area, provide a continued source of local agricultural produce for the Sydney market, and to contribute to the future housing needs of the Sydney Metropolitan Region. Consistent with the planning approach and policy structures that apply generally across NSW, the role of town planning is to continually assess the opportunities and constraints within the region and to provide for the management of these land use issues through a hierarchy of strategies and non-statutory and statutory planning policies. In the case of the study area, a key constraint that must be properly understood and factored into this planning process, is the risk to property and people associated from periodic flooding of the Hawkesbury River.

A significant amount of information and assessment has already been undertaken to understand the flood risk within the Hawkesbury River Floodplain and appropriate risk management responses. In particular, this study is preceded by the Hawkesbury-Nepean Floodplain Management Strategy (HNFMS) prepared by the Hawkesbury-Nepean Flood Management Advisory Committee (November 1997), and various documents prepared in accordance with the recommendations of that strategy, provide a substantive foundation for the preparation of the planning component of the Hawkesbury FRMP. The existence of this background information is recognised within the study brief which specifies that *“the study is to build on the existing information rather than redoing work already completed”*.

The understanding of the flood risk in the study area, and the general recommended approach to land use planning and development control measures contained within the HNFMS will be drawn upon in the context of contemporary planning issues and both local and metropolitan growth targets and development control issues, to ultimately provide a suite of recommended planning controls and policies that respond to the specific flood risk issues of this study area.

1.3 Purpose of this Report

This report forms one of a number of discussion papers which will collectively inform the final Hawkesbury FRMS and FRMP being prepared by Bewsher Consulting. The specific objectives of this report are to:

- Review the current population and dwelling characteristics of the Hawkesbury Local Government Area (LGA) and study area, particularly since the preparation of the HNFMS;
- Investigate and report on potential population and dwelling growth within the study area, based on both Council and Department of Planning and Infrastructure (DPI) targets and projections;
- Review existing and available draft local and state planning policies and identify where they may be inconsistent with flood risk management (FRM) objectives and where opportunities are available to improve FRM outcomes; and
- Provide recommendations for incorporation within planning strategies and policies and addressing FRM objectives.

Review of projected population and dwelling growth is also intended to provide input for the Evacuation Capability Assessment outlined in the separate Volume 1 FRMS report prepared by Bewsher Consulting. This separate report is intended to provide an analysis of emergency evacuation issues and capabilities.

It is recognised that FRM is one issue that needs to be addressed in combination with a suite of issues normally addressed as part of a planning process. Consistent with the merits-based approach that underpins the Floodplain Development Manual (FDM, NSW Government, 2005), the review of planning issues will draw upon the substantive assessment of economic, social and environmental issues relevant to the specific study area, prepared as part of the HNFMS. This will enable the production of FRM considerations that can provide input to strategic planning and more detailed recommendations for development controls to be applied at the development application stage.

1.4 Study Area

The study area, as defined within the brief, comprises all of the Hawkesbury River and its immediate surrounds located within the Hawkesbury LGA (refer to **Figure 1**). The primary area of concern for which detail recommendations are required is the Probable Maximum Flood (PMF) inundation extent between Wilberforce in the north and Agnes Banks in the south-west, with the areas outside of this section of the river being dealt with in a generalised fashion.

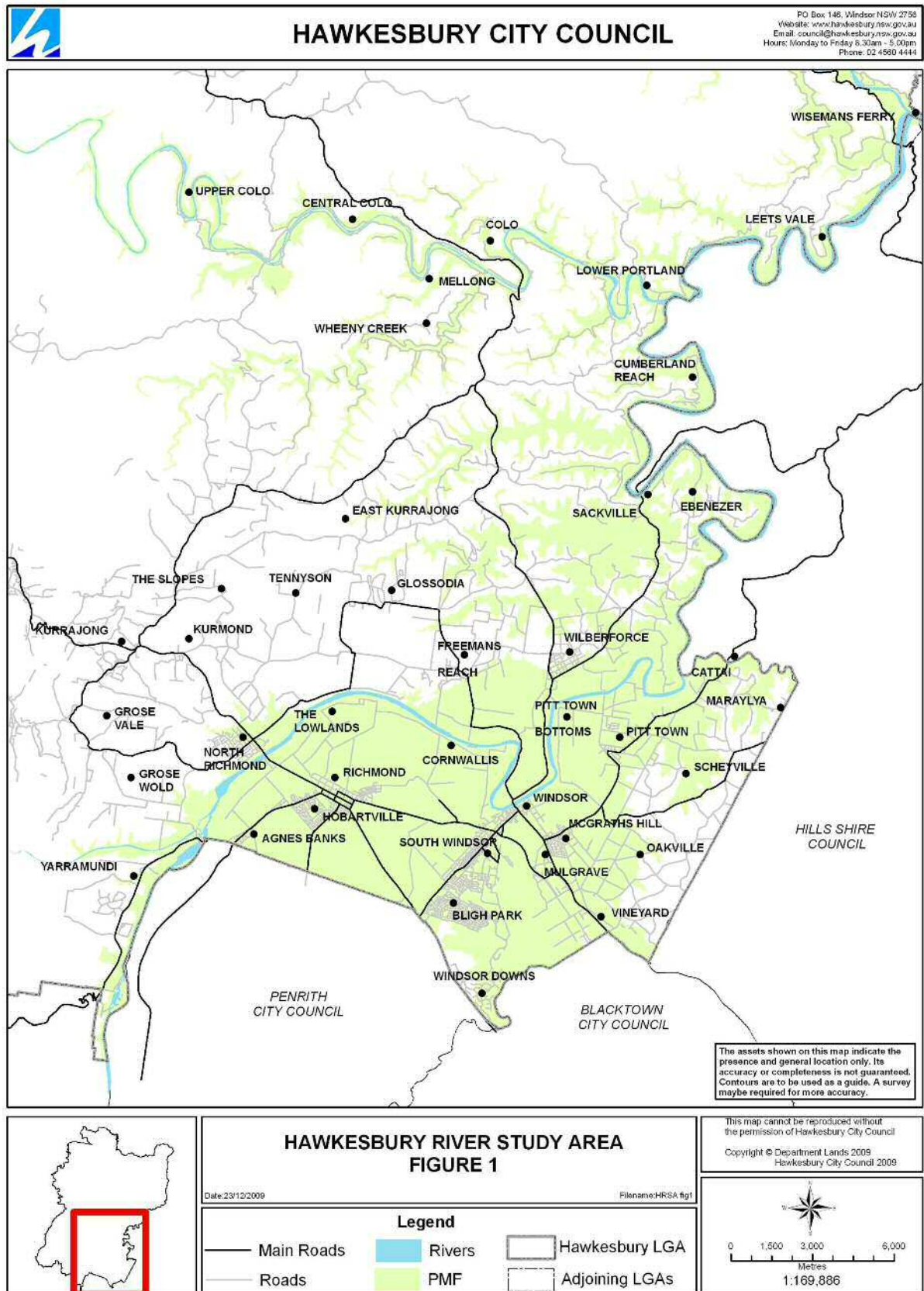


Figure 1: Study Area

1.5 Investigations Undertaken

For the purposes of preparing our report we have undertaken the following tasks:

- Meetings and discussions with Council's planning officers, Mr Matthew Owens, Director City Planning, and Mr Philip Pleffer, Strategic Planning Coordinator;
- Discussions with officers of Department of Premiers and Cabinet (DPC);
- Discussions with officers of Department of Planning and Infrastructure (DPI)
- Review of Council and Department of Planning studies and strategic planning documents (as referenced later within this report);
- Analysis of existing planning controls, policies and strategies adopted at the local council and state government levels.
- Review of ABS Census data; and
- Review of the HNFMS, background studies and related documents, as relevant.

2.0 NSW Flood Risk Management (FRM) Framework

2.1 Overview

The formulation and implementation of FRMPs is the cornerstone of the NSW Government's Flood Prone Land Policy. As with other local planning processes, the preparation of FRMPs is a Council responsibility. The planning recommendations ultimately incorporated within the FRMP and adopted by Council will subsequently require implementation through the separate planning processes, principally governed by the *Environmental Planning and Assessment Act, 1979*.

2.2 NSW FRM Policy and Guidelines

The FRM requires the level of flood risk acceptable to the community be determined through a process overseen by a committee comprised of local elected representatives, community members, and state and local government officials (including the SES). This process is shown in **Figure 2**.

Within the scope of this report, the relevance of the above objective is to ensure that future development within the study area does not lead to increased flood risks beyond that which individuals and the community are capable and willing to accept.

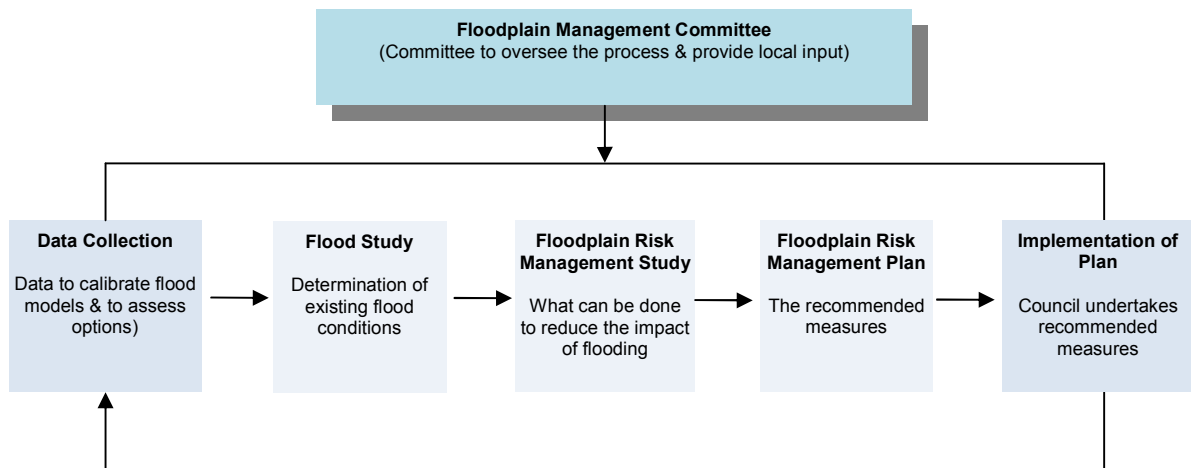


Figure 2 NSW FRM Process (Adapted from FDM 2005, pg.6)

As noted above, it is emphasised that the planning recommendations that are to be contained within the FRMP will be required to be separately implemented through the planning process principally governed by the *Environmental Planning and Assessment Act, 1979*. The planning recommendations of the FRMP will also provide guidance as to the manner in which to address flood risk, as part of Council's ongoing strategic planning.

2.3 Current FRM Practice

Since the introduction of the initial version of the current NSW Flood Prone Land Policy in 1984 and the first version of the FDM in 1986, there has not been a specific FRMP prepared for the Hawkesbury LGA. Council has adopted a number of planning policies which generally reflect a more simplistic approach of restricting development within a portion of the floodplain typically reflected by what was known as the 100-year flood extent at various times. The introduction of the merits-based approach with the Flood Prone Land Policy in 1984 was accompanied by a formal statement deleting the application of the 100-year flood as the NSW standard. As outlined above, the FRM process provided for by the FDM now requires a risk management approach that considers all flood-related risks within a floodplain.

The HNFMS and Background Planning Report (Don Fox Planning and Bewsher Consulting, October 1997) provided a detailed review of the manner in which planning policy dealt with FRM issues at that time, and a recommended approach to the preparation of future planning and development control measures. The HNFMS adopted the recommendation for the application of a "planning matrix approach" to floodplain planning (HNFMAC, 1997 – the "1997 HNFMAC Strategy"). Using this approach, a matrix of development controls, based on flood hazard and land use, can be developed which balances the risk exposure across the floodplain. This approach has now been applied to over 30 LGAs across NSW.

In accordance with the HNFMS, the application of the "planning matrix" approach was to be supported by the production of best practice guidelines which have now been completed. These guidelines, prepared for the Hawkesbury-Nepean Floodplain Management Steering Committee, were published in April 2009, being:

- *"Designing Safer Subdivisions – Guidance on Subdivision Design in Flood Prone Areas"*;

- *“Managing Flood Risks Through Planning Opportunities – Guidance on Land Use Planning in Flood Prone Areas”*; and
- *“Reducing Vulnerability of Buildings to Flood Damage – Guidance on Building in Flood Prone Areas”*.

This accumulated body of knowledge provides a substantial and sound basis for the preparation of the planning components of the Hawkesbury FRMP.

2.4 THE FRMP Relationship with EPA Legislation

The FRMP is a plan adopted by Council in accordance with a process set out in the FDM. The FDM is a manual published by the NSW Government to assist Council in implementing the NSW Flood Prone Lands Policy. This Policy is required to be implemented in the following manner¹:

- local government is primarily responsible for the management of flood prone land;
- NSW Government agencies will provide specialist technical assistance;
- the FDM is provided to assist the preparation of FRMPs;
- the establishment of FRM committees by Council can assist the community in communicating their “aspirations”; and
- the state government will subsidise FRM works and measures.

Those provisions of the Flood Prone Lands Policy of primary relevance to planning issues for the study area include²:

- a “flexible merits based approach” to be followed generally and in the selection of flood planning levels (FPLs);
- *“councils to be responsible for the determination of appropriate planning and development controls, including FPLs, to manage future flood risk to an acceptable level based on social, economic and ecological, as well as flooding considerations.”*
- FRMPs should have an integrated mix of management measures that address *existing, future and continuing risk*; and
- Recognition of the link between the emergency management responsibilities of the SES and *continuing flood risk*.

The principal planning legislation in NSW is contained with the Environmental Planning and Assessment Act, 1979 (EPA Act) and associated Acts and Regulations. Ultimately the planning recommendations of the FRMP will need to be reflected in planning instruments and policies brought into force in accordance with the EPA Act. Accordingly the FRMP can provide appropriate input to the EPA Act planning processes in 3 ways:

¹ FDM, 2005, at pages 1 – 2, outlines the NSW Flood Prone Lands Policy.

² FDM, 2005. Pg.2.

- Providing direction at a local and state strategic planning level in addressing FRM (e.g. where new urban areas should be located and the distribution of land uses therein);
- Recommendation of development controls to be incorporated in appropriate planning instruments (e.g. LEPs and DCPs) to mitigate the risk to development where permitted in the floodplain; and
- Ensuring that the planning controls and associated documents (e.g. S149 Planning Certificates) contribute to ensuring the community is appropriately informed about the flood risk.

To understand how these outcomes may be best achieved, it is important to consider the existing EPA Act framework and guidelines that relate to FRM.

3.0 EPA Act Statutory FRM Framework and Guidelines

3.1 Departmental Guidelines

On January 31, 2007 the Planning Minister announced a Guideline for development control on floodplains, accompanied by a Department of Planning Circular dated January 31, 2007 (PS 07-003). This Flood Planning Guideline (“the 2007 Guideline”) issued by the Minister relates to a package of directions and changes to the EPA Act, Regulation and amends the FDM. The Guideline includes directions in regard to Section 117 Directions, the content of the DCPs and the Section 149 Planning Certificates.

The 2007 Guideline states that unless there are “exceptional circumstances”, Councils are to adopt the 100 year flood (plus freeboard) as the flood planning level (FPL) for residential development, with the exception of some sensitive forms of development such as seniors living housing. Controls on residential development above the 100 year flood (plus freeboard) may be imposed subject to an “exceptional circumstances” justification being agreed to by the Department of Natural Resources (now Department of Premiers and Cabinet – DPC) and the Department of Planning (now Department of Planning and Infrastructure DPI) prior to the exhibition of a Draft LEP or Draft DCP.

The 2007 Guideline provides various potentially conflicting statements in regard to what is the Residential FPL for the purposes of applying the directions in the Guideline. The DPI have advised that the reference to the default residential FPL is a reference to both the 100 year flood plus freeboard (typically 0.5 metres). It is also unspecified as to what aspect of residential development the FPL is to be applied, that is to land where residential development is proposed, habitable floor levels, non-habitable floor levels, evacuation routes, or other element directly or indirectly related to residential development.

In terms of duty of care, it can be argued that Council must directly determine that there are no exceptional circumstances that would warrant a variation to the 2007 Planning Guideline as opposed to automatically accepting the default residential FPL of the 100 year flood (plus freeboard). Flood behaviour in the study area (as discussed within other reports contributing to the FRMP) does impose potential evacuation difficulties, and extraordinary potential for property damage due to flood depths, in some existing areas and areas subject to potential future development. In this regard the imposition of planning controls above the 100 year flood level (plus freeboard) and the limitation of development within the floodplain above the 100 year flood level are valid options to

consider to address evacuation and risk to life issues as well as widespread and significant property losses. Indeed, the recommendations of the 1997 HNFMAC Strategy require a broader risk management approach to FRM across the whole of the Hawkesbury River floodplain.

3.2 Ministerial Directions

Ministerial directions pursuant to Section 117(2) of the EPA Act specify matters which local councils must take into consideration in the preparation of LEPs. Direction 4.3, as currently applies, deals specifically with flood [liable] prone land and has the following two objectives:

- “(a) To ensure that the 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.*
- (b) 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”.*

The direction applies to all councils that contain flood prone land when an LEP proposes to *“create, remove or alter a zone or provision that affects flood prone land”*. In such cases, the direction requires draft LEPs to ensure the following:

- Consistency with the principles of the FDM (including the 2007 Guideline);
- Do not rezone flood prone land zoned special use areas, recreation, rural or environmental protection to a residential, business, industrial or special use area zone;
- Do not permit development in floodways that would result in significant flood impacts on others, permit a significant increase in development on the floodplain, require substantial government spending on flood mitigation, or allow development without consent except for agriculture or flood mitigation works;
- That flood related development controls are not imposed on residential development above the “residential flood planning level” unless adequate justification to the satisfaction of the DPI [and DPC] is provided;
- Flood planning levels must be consistent with the FDM as amended by the 2007 Flood Planning Guideline.

Clause (6) of the Direction specifies circumstances which must be satisfied in order for the Director-General or nominee to allow for a variation to the Direction, as follows:

“(6) A draft LEP may be inconsistent with this Direction only if council can satisfy the Director-General (or an officer of the Department nominated by the Director-General) that any particular provision or area should be varied or excluded having regard to the provisions of section 5 of the Environmental Planning and Assessment Act, and

- (a) the rezoning is in accordance with a floodplain risk management plan prepared in accordance with the principles and guidelines of the Floodplain Development Manual, 2005, or*

- (b) *the rezoning, in the opinion of the Director-General (or an officer of the Department nominated by the Director-General) or minor significance.”*

While Section 117 Directions are not relevant to DCPs, the 2007 Guideline does indicate the approval of the DPI is required prior to the exhibition of a draft DCP that varies from the Guideline.

3.3 Section 149 Certificates

A Section 149 Planning Certificate is basically a zoning certificate issued under the provisions of the EPA Act that is generally available to any person on request and must be attached to a contract prepared for the sale of property. The matters to be contained within the Section 149(2) Certificate are prescribed within Schedule 4 of the Environmental Planning and Assessment Regulation, 2000 and generally relate to whether planning controls [and not necessarily flood related risks] apply to a property.

A Section 149(5) Certificate, being a more complete but more expensive certificate, requires councils to advise of “*other relevant matters affecting the land of which it may be aware*”. These more complete certificates are not mandatory for inclusion with property sale contracts – a Section 149(2) Certificate being the minimum required. Where a Section 149(5) Certificate is obtained, this could require a council to notify of all flood risks of which it is aware.

It is recognised that S149 certificates should not be solely relied upon as community education tools as they have only limited circulation. The majority of flood-affected properties would not be reached in a given year. However, information on a S149 Certificate can reflect information that may be provided to people making general enquiries, and together are important sources of information for the community that influence what is the understood (or perceived) flood risk of property that a person owns and/or occupies or operates a business from. With the existing system of notifications on S149(2) certificates, if no notification appears, then it is often misunderstood to mean that property is “flood free” rather than there are no flood related development controls. For the purposes of FRM, S149 certificates should not confuse or mislead those people who have access to them, with regard to understanding whether there are any risks of floods affecting a particular property.

Schedule 4 of the Regulation was amended, commencing on February 16, 2007, to specify flood related information that can be shown on Section 149(2) Certificates. The amendment provisions require the following

“7A Flood related development controls information

(1) *Whether or not development on that land or part of the land for the purposes of dwelling houses, dual occupancies, multi dwelling housing or residential flat buildings (not including development for the purposes of group homes or seniors housing) is subject to flood related development controls.*

(2) *Whether or not development on that land or part of the land for any other purpose is subject to flood related development controls.*

(3) Words and expressions in this clause have the same meanings as in the instrument set out in the Schedule to the Standard Instrument (Local Environmental Plans) Order 2006.”

As stated in the 2007 Guideline, the new Clause 7(A)(1) of Schedule 4 of the Regulation means that Council should not include a notation for residential development on Section 149(2) Certificates in “low risk areas” if no flood related development controls apply to the land. Under Clause 7(A)(2) Council can include a notation for critical infrastructure or more flood sensitive development on Section 149(2) Certificates in low flood risk areas if flood related development controls apply. “Low flood risk” areas are undefined, but in the context of the Circular dated 31 January 2007 it is assumed to be a reference to that part of the floodplain between the 100 year flood (plus freeboard) and the PMF.

These provisions require council to distinguish between the situation where there are flood related development controls on nominated types of “residential development” and all other development. More sensitive land uses such as group homes or seniors living is excluded from the limitation of notations for residential development. Importantly, a S149(2) Certificate must identify where any flood related development controls apply to any form of development, including residential development on land between the 100 year FPL and PMF if existing prior to the 2007 Guideline or if exceptional circumstances dispensation has been granted.

The FDM defines flood liable land as all land potentially affected by inundation during a flood, up to the PMF. This includes both riverine flooding and flooding from major overland flow paths. Flood mapping will identify the areas subject to major flooding in the study area. However this typically does not extend to the top end of contributing local catchments where watercourses and overland flow paths are located within pipes or narrowly formed channels or are not evident except during major storms.

In our experience of current practice in NSW, Councils may have additional detailed flood mapping for the top catchment areas, some have maps or local knowledge of these affected areas (e.g. through a history of complaints) and some have no specific documented knowledge of potentially affected areas. Whilst it is desirable, we would expect that Council will never be able to unequivocally confirm that they have mapped all areas subject to potential flooding (mainly due to the unreasonable resources that would be required to map all overland flow paths), although Council may be able to say that they confidently believe they have identified the majority of properties affected by significant flooding.

Council has advised that Section 149(2) Certificates may currently include the following standard notifications (depending on the circumstances of the individual property) as required by clause 7A of Schedule 4 of the Regulation:

- (1) ***Whether or not development on that land or part of the land for the purposes of dwelling houses, dual occupancies, multi dwelling housing or residential flat buildings (not including development for the purposes of group homes or seniors housing) is subject to flood related development controls.***

Hawkesbury River (including Grose River) responses

The land is subject to flood related development controls

or

The land is above the 1 in 100 year flood level and therefore is not subject to flood related development controls for flood events up to the 1 in 100 year flood level

The land may be subject to flood related development controls for events greater than the 1 in 100 year flood level

or

The land is not subject to flood related development controls

or

The information available to Council is not sufficient to enable Council to state with certainty whether or not the whole or any part of the land is subject to flood related development controls.

Colo River responses

(Note Council does not hold information for floods greater than the 1 in 100 event)

The land is subject to flood related development controls

or

The land is not subject to flood related development controls

or

The information available to Council is not sufficient to enable Council to state with certainty whether or not the whole or any part of the land is subject to flood related development controls.

MacDonald River responses

Council records indicate that the extreme flood event for this area may be as high as INSERT NUMBER AHD. The 1 in 100 year flood level may be as high as INSERT NUMBER AHD. Please check the level of the land.

Any part of the land at or below the 1 in 100 year flood level is subject to flood related development controls.

The land may be subject to flood related development controls for flood events greater than the 1 in 100 year flood level.

or

The information available to Council is not sufficient to enable Council to state with certainty whether or not the whole or any part of the land is subject to flood related development controls.

- (2) ***Whether or not development on that land or part of the land for any other purpose is subject to flood related development controls.***

Same response as for (1) above.

No additional information in regard to flood risk is identified on a S149(5) Certificate other than for certain land within the Agnes Banks locality. In regard to S149(5) Certificates issued for certain land in Agnes Banks the following advice is included:

"A flood study in relation to flows from culverts on the Driftway is required prior to any development"

The specific notifications for Agnes Banks and the MacDonald Valley are understood to have originated in accordance with resolutions of Council associated with historical issues. These should be reviewed with the overall rationalisation of S149 notifications as discussed later.

Section 149 Certificates have a limited circulation and purpose but are one important component of information which contributes to the public's overall knowledge of flood risks and should not be conflicting or misinforming (by omission).

While there may be some concern about property owners having such a notation, there is an expectation by prospective purchasers that it would be provided, as indicated by the FDM. Investigations into the effect on property values of full notification of flood risks (i.e. of floods up to the PMF) on S149 Certificates (Egan National Valuers, 2000, pg.35) concluded that the effect would be indiscernible from other influences upon the value of the property. This conclusion was reached with regard to the Hawkesbury LGA, but was similar to the findings reached to all LGAs within the Hawkesbury-Nepean River floodplain investigated in the study.

Further, it should be recognised that information regarding flood risk provided with a Section 149 Certificate, would not in itself lead to any alteration to the permissibility of development but is more directed towards providing factual information (important due to liability issues) and increasing awareness of the potential flood risks known to Council (for FRM purposes).

3.4 Climate Change Considerations

Climate change is expected to have adverse impacts upon sea levels and rainfall intensities, both of which may have a significant influence on flood behaviour at specific locations. Rainfall intensities will have a wide influence on flooding while sea level rise will have diminished effect as the distance from the tidal influences of coastal waters increases. In regard to the study area sea level rise is not expected to have any measurable consequences, but changes in rainfall intensities might.

Scientific data regarding the effect of climate change on rainfall intensities is not sufficiently advanced to provide specific guidance for the assessment of flood risk. No relevant planning benchmarks have been adopted by Government related to rainfall intensity changes. However the State Government guidelines recommend the undertaking of a sensitivity analysis which assumes nominal increases in rainfall intensities. Such analysis will generally occur as flood studies are undertaken and updated into the future. Due to the substantial range in the depth of flooding between a 100 year flood and the PMF that will need to be addressed when considering what planning controls to adopt, the consideration of a sensitivity analysis for possible

climate change effects on rainfall intensities, is unlikely to result in alternate planning controls.

As noted in the State Government Guidelines, climate change considerations will need to be factored into strategic land use planning and development assessment over time. At this stage this is not an issue that requires to be specifically addressed in planning controls.

3.5 Standard Instrument LEPs

The EPA Act was amended to facilitate the reproduction of planning instruments into a standardised format, commonly referred to as the “*LEP template*”. Section 33A of the EPA Act deals with the prescribing of a “standard instrument” for LEPs. The LEP template came into effect on 31 March, 2006 with the gazettal of the *Standard Instrument (Local Environmental Plans) Order*, last amended on 16 November 2011.

The template contains no compulsory clauses or map requirements specifically relevant to addressing flood hazards. However, the DPI have adopted a model local clause in regard to flooding (refer to **Appendix A**). A model local clause is one which has been settled by Parliamentary Counsel as acceptable and the DPI encourage that it is used as is. However, such a clause may be varied with justification to suit local circumstances.

Pertinent comments in regard to the model local flood risk clause are:

- The FDM definition of flood liable land (i.e. all land potentially flooded up to the PMF) is not used.
- The clause applies to the flood planning area (i.e. the area within an adopted flood planning level that is mapped as part of the LEP) and not necessarily flood liable land as defined by the FDM.
- The flood planning area is to be shown on a map (flood planning map) where information is available. The clause will also apply to all land lower than the FPL even if not mapped, but where not mapped the FPL is defined as the 100 year flood plus a freeboard level that can be nominated in the LEP.
- The LEP flood maps are implicitly related to the FPL for habitable residential floors as per the 2007 Guideline (i.e. 100 year flood plus freeboard). That is the maps would not depict flood planning areas that relate to other land uses (including sensitive residential land uses) that could be adopted by Council in compliance with the 2007 Guideline without requiring an exceptional circumstances dispensation.
- The matters required to be considered when assessing a proposed development on flood liable land relate to broad FRM principles but are appropriate for an LEP.
- Clauses (4) and (5) relating to climate change are intended to be used to identify land above the existing FPL(s) that, as a result of sea level rise, may become part of the flood planning area in the future. These future areas are to be also shown on the Flood Planning LEP Map. The DPI briefing note, states the following:

“The additional subclause requires the consent authority to take into account the same considerations as development located in the flood planning area, in certain circumstances depending on:

1. *proximity of the development to the flood planning area (e.g. immediately adjoining the current flood planning area);*
2. *intended design life of the development (e.g. major long-term infrastructure);*
3. *scale of the development (e.g. large subdivisions);*
4. *sensitivity of the development in relation to future safe evacuation requirements (e.g. aged-care, schools and other buildings with vulnerable occupants or evacuation challenges).*

These four factors above may justify the application of “exceptional circumstances” in the context that the flood planning area may cover a far greater area in the future (as a result of sea level rise) and it will be of greater concern in those four instances listed above. If Council considers it may be able to make a case for exceptional circumstances, Council must follow the requirements of section 117 Direction 4.3(7) in this regard.”

Prior to the adoption of the above model local clause, Council had been developing a new LGA comprehensive LEP in the Template format, which accordingly adopted alternate provisions at that stage, as discussed further below.

3.6 Developer Contributions

Section 94 Contributions Plans under the EPA Act provide a basis for the levying of development contributions to construct drainage and flood mitigation works required as a result of future development. Standard Section 94 contributions can only be applied to fund works with a direct nexus to the new development and cannot be applied for the purposes of rectifying past inadequacies. Section 94A Contributions Plans are an alternative where no nexus is required but the quantum of the contribution is capped at 1% of development costs, unless otherwise approved by the Minister for Planning.

Future Section 94 schemes will also require consideration of the various Ministerial Directions and advisory documents issued by the DPI. Consideration should also be given to statutory changes contained within the EPA Act amendments and awaiting further legislation prior to commencement (Part 5B as included in the Environmental Planning and Assessment Amendment Act 2008). These Directions, advices and changes are ostensibly intended to limit costs to development imposed through development levies.

Contribution Plans could be established within the study area, where it is necessary or appropriate to fund flood risk mitigation works through such plans. This would be mostly relevant in new greenfield release areas or substantial urban renewal areas where such works are required to ensure the acceptability of the development (e.g. for the upgrading of evacuation routes to cater for increased population densities). The Plans cannot be used to rectify existing problems in established areas.

Nevertheless for any Contribution Plans to be acceptable in greenfield or existing areas, the costs to development would need to be reasonable and not cost-prohibitive. Further, caps on S94 levies apply in certain circumstances based on Ministerial Directions.

4.0 Review of Flood Related Controls Applying to Hawkesbury

4.1 General

There are a number of policies and planning instruments that apply to the study area which restrict development on the floodplain, place controls on development to minimise the flood related risks to property or persons or provide information (including definitions) which communicates an understanding of what land is subject to flood related risks. The following sections of this report outline and discuss pertinent provisions.

4.2 SEPPs

A State Environmental Planning Policy (SEPP) is a planning document prepared in accordance with the Environmental Planning & Assessment Act 1979 (EPA Act) by the DPI and eventually approved by the Minister, which deals with matters of significance for environmental planning for the State. No SEPP has been prepared dealing specifically with the issue of flooding, but some regulate development in response to potential flood risks.

Regional Environmental Plans (REPs) no longer form part of the statutory planning framework in NSW but existing REPs are now deemed SEPPs.

4.2.1 SEPP (Housing for Seniors or People with a Disability) 2004

State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004 (Seniors Living SEPP) applies to urban land or land adjoining urban land where dwellings, hospitals and similar uses are permissible. Seniors Living SEPP would apply to parts of the study area, and would effectively override Council's planning controls to permit residential development for older and disabled persons to a scale permitted by the SEPP. Notwithstanding, Clause 4 (6)(a) and Schedule 1 of the SEPP restricts its application if land is identified as "floodway" or "high flooding hazard" in Council's LEP.

4.2.2 SEPP No 30 - Intensive Agriculture

SEPP 30 has limited relevance to FRM but is identified by Council as one trigger for the purposes of S149 notifications. Clause 6(2)(b) exempts the need for consent for cattle feed lots and piggeries otherwise required by the SEPP where only for the purpose of *"feeding or housing arrangements during or immediately following a drought, flood..."*

4.2.3 SEPP No 55 - Remediation of Land

This SEPP is also of limited relevance to FRM but is identified by Council as one trigger for the purposes of S149 notifications. Clause 9(e)(vi) specifies that remediation of contaminated land is defined as Category 1 remediation work needing consent under the SEPP, where proposed on land identified as a "floodway" under an environmental planning instrument.

4.2.4 SEPP (Sydney Region Growth Centres) 2006

The "Growth Centres SEPP" applies to the Northwest and Southwest Growth Centres of the Sydney Region and is generally aimed at coordinating the progressive release of land for urban development within defined precincts. The Vineyard precinct in the Northwest Growth Centre is located in the Hawkesbury LGA and the study area.

The SEPP provides a series of maps, including “Development Controls Maps” that show flood extents for the Vineyard precinct as depicted by **Figure 3**. The flood extent map appears to reflect the 100 year floodplain. The maps include the following notation:

Notes on Flood Prone Land:

The maps are based on information provided by relevant local councils and State agencies. The extent of flooding on the land shown as flood prone and major creeks is an estimate only. Inquiries should be made with relevant local councils to determine the extent of flood affection. The extent of flooding is subject to review in the precinct planning process relating to the land concerned.

Clause 19 of the SEPP provides controls for development on “flood prone and major creeks land” as shown on the Map. The controls effectively require consideration of flood related risks to property and persons, as well as effects on the environment, associated with a proposed development. The clause also refers specifically to impacts on a floodway.

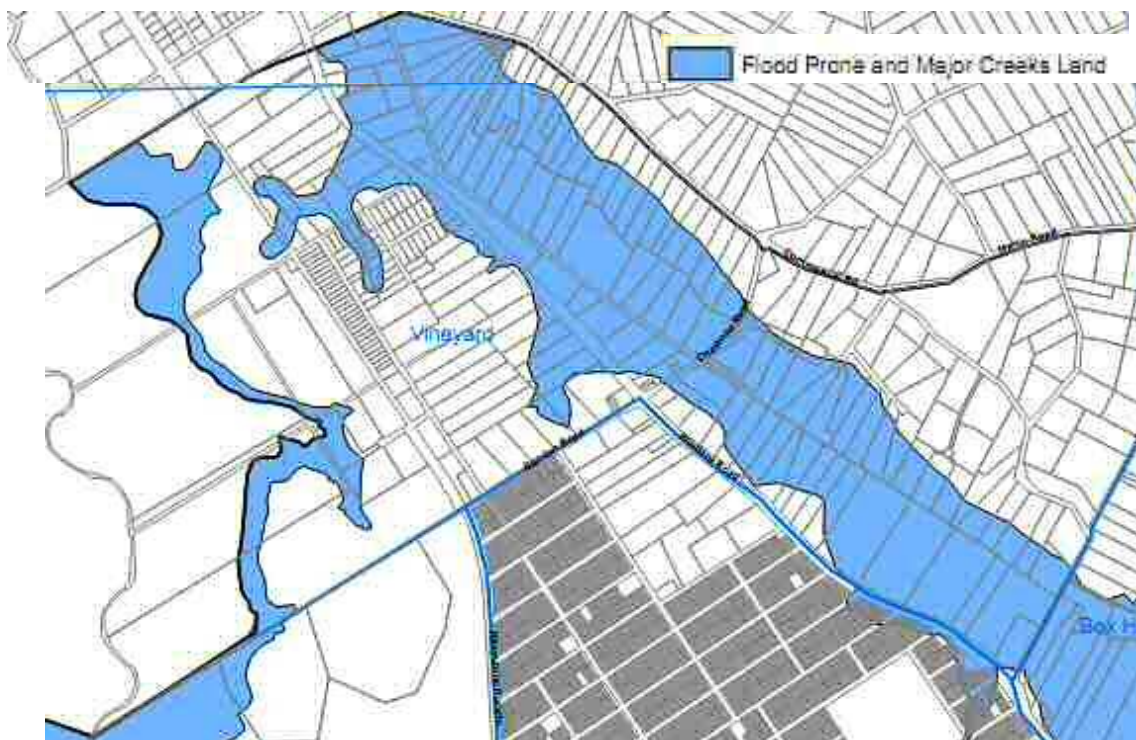


Figure 3: Growth Centres SEPP Development Control Map (Extract from Maps 003 and 004)

The Dictionary to the SEPP defines “flood prone and major creeks land” as that area shown on the Map, without explaining how the mapped extent was derived. The Dictionary provides no definition of floodway.

4.2.5 SEPP (Exempt and Complying Development Codes) 2008

The aim of this SEPP is to specify low impact development that can be undertaken without development consent or by obtaining a complying development certificate (“CDC”) from Council or private certifier. A CDC must be automatically issued if the qualification criteria are met, but may be subject to compliance with specified standards.

The SEPP is divided into a number of “Codes” that deal with exempt development and different types of complying development. Those Codes of specific relevance to the Study are the Exempt Development Codes (Part 2), the General Housing Code (Part 3) and the Rural Housing Code (Part 3A).

The SEPP provides the following relevant definitions:

flood control lot means a lot to which flood related development controls apply in respect of development for the purposes of dwelling houses, dual occupancies, multi dwelling housing or residential flat buildings (other than development for the purposes of group homes or seniors housing).

Note. This information is a prescribed matter for the purpose of a certificate under section 149 (2) of the Act.

The SEPP provides a number of exclusions to what can be considered exempt development, including:

- earthworks and retaining walls on a flood control lot are excluded (clause 2.29);
- a fence or gate behind the building line on a flood control lot in urban areas are excluded (clause 2.33);
- a fence or gate forward of the building line on a flood control lot in urban areas are excluded (clause 2.35); and
- must not “redirect or interrupt the flow of surface water” at any time (clause 2.36).

The General Housing and Rural Housing Codes also provides a number of exclusions and criteria (within clauses 3.36C and 3A.38 respectively) which in summary include:

- excludes development on a flood control lot unless specified to not be a:
 - flood storage area,
 - floodway area,
 - flow path,
 - high hazard area,
 - high risk area.
- Must satisfy certain standards such as:
 - The floor level standard set by Council and use of flood compatible materials below that level;
 - Car parking to be at the 20 year flood level or higher;

- Structural soundness;
- Not increase flood affects elsewhere; and
- Driveway between car parking spaces and the connecting public roadway to not be inundated by a depth of water greater than 0.3m during a 100 year flood

High hazard and high risk areas are defined (clause 3.36C (6)) to be as identified in council's flood study or FRMS.

In summary, **Figure 4** depicts the manner in which the Housing Codes can apply to flood prone land in the study area.

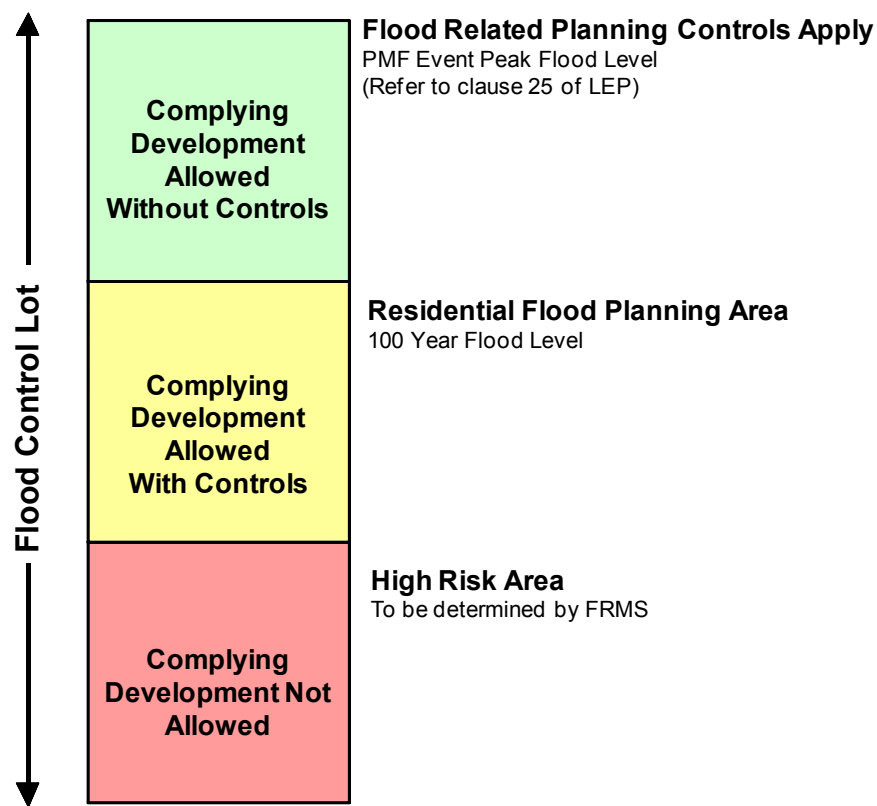


Figure 4: Application of Housing Code SEPP to Study

The important outcomes of the FRMS, in regard to establishing rules for housing development that could be approved as complying development (that is without the necessity for the full development consent process) is the defining of high hazard and high risk areas (where complying development is excluded) and setting of the residential floor level. The objective should be to ensure that future housing development does not lead to increased flood risk to property and persons as a consequence of the application of the CDC process, in comparison to outcomes otherwise likely to be achieved through the DA process.

4.2.6 Sydney REP No 20—Hawkesbury-Nepean River

Sydney Regional Environmental Plan No 20—Hawkesbury-Nepean River (No 2—1997) applies to the study area. The REP does not include any substantive provisions that relate directly to FRM. However, there are a number of provisions that require the environmental and engineered mitigation aspects of flooding to be considered (e.g. clause 6(6) – flooding of wetlands, clause 11(5) – dredging works for flood mitigation, clause 11(8) and (11) the prohibition of hazardous and intensive animal industries in floodways and various clauses requiring the consideration or additional considerations for specified development located on “flood prone land” or the “floodplain”). For the purposes of the REP, Schedule 3 (Dictionary) introduces a number of pertinent definitions:

floodplain means the floodplain level nominated in a local environmental plan or those areas inundated as a result of a 1 in 100 flood event, if no such level has been nominated.

flood prone land means land susceptible to inundation by the probable maximum flood event.

floodway means those areas of a floodplain where a significant discharge of water occurs during floods. Floodways are areas which, even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood levels.

While the REP does not provide any guidance in regard to how FRM should be considered in determining strategic planning outcomes or the assessment of development applications it does introduce terminology that indirectly contributes to the public understanding of flood risk. Ideally such terminology needs to be accurate and consistent across all planning policies applying in the study area.

4.3 Existing Local Environmental Plan (LEP)

Hawkesbury Local Environmental Plan 1989, (the LEP) currently applies to the LGA.

Clause 5 of the LEP provides the following definition that communicates how flood affected land is identified.

1-in-100 year flood level for an area of land means the height above Australian Height Datum to which the Council has determined that a 1-in-100 year flood is likely to rise on that land.

The above is the definition of a particular flood level – not what flood prone land is. Various other clauses of the LEP as quoted below provide criteria on how development will be determined where affected by a flood risk. These other clauses apply to different parts of flood prone land, potentially up to and including the PMF.

A development site at a level lower than 1.2m below the 100 year flood prevents a proposal from being complying development and where lower than 3.0m below the 100 year flood new dwelling houses are generally restricted. Pertinent existing clauses are:

9C Complying development

(1) Development listed in the Table to this clause is complying development, except as provided by subclauses (2) and (3).

3) Development is not complying development if it is carried out on land that...

(e) is lower than 1.2 metres below the 1-in-100 year flood frequency, or...

11 Rural subdivision—general provisions

(6) Consent must not be granted to a subdivision of land in Zone No 7 (d) or in the Mixed Agriculture, Rural Living, Rural Housing, Environmental Protection—Agriculture Protection (Scenic) or Environmental Protection—Mixed Agriculture (Scenic) zone that creates an allotment (otherwise than for use for a public purpose) unless the Council is satisfied that there is an area of land above the 1-in-100 year flood level on the allotment that is:

(a) sufficient for the erection of a dwelling-house, and

(b) at natural surface level or at a level achieved by filling carried out with the consent of the Council.

25 Development of flood liable land

(1) In this clause:

commencement day means the day on which Hawkesbury Local Environmental Plan 1989 (Amendment No 86) commenced.

flood compatible materials means building materials and surface finishes capable of withstanding prolonged immersion in water.

floodway means the channel of a river or stream and those portions of the floodplain adjoining the channel which constitute the main flow path for floodwaters.

(2) A building shall not be erected on any land lying at a level lower than 3 metres below the 1-in-100 year flood level for the area in which the land is situated, except as provided by subclauses (4), (6) and (8).

(3) Each habitable room in a building situated on any land to which this plan applies shall have a floor level no lower than the 1-in-100 year flood level for the area in which the land is located.

(4) Notwithstanding subclauses (2), (3), (10) and (11), a building that was lawfully situated on any land at 30 June 1997 may, with the consent of the Council, be extended, altered, added to or replaced if the floor level of the building, after the building work has been carried out, is not more than 3 metres below the floor height standard for the land immediately before the commencement day.

(5) The Council shall, in the assessment of a development application, consider the flood liability of access to the land and, if the land is within a floodway, the effect of isolation of the land by flooding, notwithstanding whether other aspects of this clause have been satisfied.

(6) Minor structures such as outbuildings, sheds and garages may be erected on land below the 1-in-100 year flood level, with the consent of the Council. The Council shall, in the assessment of a development application for such a structure, consider the likely frequency of flooding, the potential flood damage and measures to be taken for the evacuation of the property.

(7) Any part of a building below the 1-in-100 year flood level is to be constructed of flood compatible materials.

(8) Notwithstanding subclauses (2) and (3), a dwelling or other building may, with the consent of the Council, be erected on an area of land which has a level not less than 3 metres below the floor height standard for the land immediately before the commencement day. However, the Council shall not grant consent for development pursuant to this subclause after 30 June 2002.

(9) In subclause (8) area of land means an area of land at natural surface level or an area of land that has been filled with the consent of the Council.

(10) Despite subclauses (2) and (3) but subject to subclause (4), a dwelling must not be erected on land lying below the 1-in-100 year flood level if the allotment of land on which it is to be erected was created by a subdivision approved under clause 11 on or after the commencement day.

(11) Despite subclauses (2) and (3) but subject to subclause (4), a dwelling must not be erected on land lying below the floor height standard for the land immediately before the commencement day if the allotment of land on which it is to be erected was created by a subdivision approved under clause 11 before the commencement day.

[Note: habitable room means a room used for normal domestic activities and:

(a) includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room and sunroom, but

(b) does not include a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes-drying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods.]

44 Intensive agriculture

(1) This clause applies to land in Zone No 7 (d) or in the Rural Living, Consolidated Land Holdings, Environmental Protection—Agriculture Protection (Scenic) or Environmental Protection—Mixed Agriculture (Scenic) zone...

(4) The council, in determining an application for consent required by this clause shall take into consideration the following matters:..

(e) the need to limit the impact of development on flood liable land.

Clause 25 provides the substantive provisions that address flood risk associated with new development. This clause is potentially confusing and does not clearly communicate where flood risks may exist and how they are to be considered when determining the acceptability of development. Notwithstanding, this LEP is soon to be replaced and accordingly the relevance of reviewing its provisions is mainly to understand the base upon which new LEP provisions can be compared. For this purpose the following moot observations are made:

- A definition of flood prone land (or flood liable land) is not provided. While a definition of the 100 year flood level is provided this does not imply that this is the extent of potential flooding or that it is the singular flood planning area.

- Subject to a number of qualified situations, the FPL for land upon which any building may be erected is 3m below the 100 year flood level.
- Subject to a number of qualified situations, the FPL for “habitable” residential floors is the 100 year flood level.
- There is no freeboard provision.
- There is no stated FPL for the level of non-habitable residential uses or non-residential uses including commercial and industrial development (other than the land must first be no lower than 3m below the 100 year flood level).
- Any part of any building below the 100 year flood level is to be constructed of flood compatible materials.
- Sub-clause (5) arguably requires an assessment in the case of all development that might be considered to have “*flood liability of access to the land*”. In principle this can apply to all flood liable land up to the PMF (consistent with the common meaning of flood liable as defined in the FDM). Separately, the sub-clause requires a consideration of the effect of isolation if the subject development site is in a floodway.

The last matter is of particular relevance in the case of the Hawkesbury River floodplain due to the significant flood risk to life. The controls on buildings are also arguably disproportionate to the risk of damages. These LEP controls will be reviewed as part of the new Draft LEP (as discussed below) and augmented with DCP controls to reflect the recommendations of the FRMP.

4.4 Draft Local Environmental Plan

Council has prepared a draft local environmental plan (“Draft LEP 2011”) in accordance with the NSW Government’s Standard Instrument (Local Environmental Plans) Order 2006 (as amended). The draft plan was publically exhibited during the period Friday 5 February 2010 to Monday 12 April 2010. The Draft LEP with minor amendments was adopted by Council on 7 June 2011, and was subsequently forwarded to the DPI for finalisation and making.

Pertinent provisions contained in Draft LEP 2011, are noted as follows.

Requirements for rural, environment protection and large lot residential zones

Clause 4.1A (6) applies certain FRM criteria to large residential and non-urban lots to be considered in addition to the minimum lot size standard, being

“(6) Consent must not be granted to a subdivision of land in the RU1, RU2, RU4, R5 or E4 zones that creates an allotment (otherwise than for use for a public purpose or in accordance with Clause 4.2) unless the Council is satisfied that there is an area of land above the 1-in-100 year flood level on the allotment that is:

(a) sufficient for the erection of a dwelling-house, and

(b) at natural surface level or at a level achieved by filling carried out with the consent of the Council.”

Clause 4.2A applies to land zoned R5, RU1, RU2, RU4, RU5, E3 and E4 and requires the following:

“(3) Development consent must not be granted for the erection of a dwelling house on a lot that was created by a subdivision for the purpose of agriculture prior to 27th June 2003.

Note: 27 June 2003 was the date of the gazettal of HLEP 1989 Amendment 136. This amendment removed a provision in the then HLEP 1989 which allowed land below the 1 in 100 year flood level to be subdivided for ‘agricultural purposes’.”

Flood Planning Provisions

Clause 6.6 provides the principal FRM provisions, being:

“(1) The objectives of this clause are:

- (a) to maintain the existing flood regime and flow conveyance capacity; and*
- (b) to enable safe occupation and evacuation of land in a flood event; and*
- (c) to avoid significant adverse impacts upon flood behaviour; and*
- (d) to avoid significant adverse effects on the environment that would cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of the river bank/watercourse; and*
- (e) to limit uses to those compatible with flow conveyance function and flood hazard.*

(2) This clause applies to land subject to the discharge of a 1:100 ARI (average recurrent interval) flood event.

(3) Consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the development:

- (a) will not adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties; and*
- (b) will not significantly alter flow distributions and velocities to the detriment of other properties or the environment; and*
- (c) will enable safe occupation and evacuation of the land; and*
- (d) will not significantly detrimentally affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of the river bank/watercourse; and*
- (e) will not be likely to result in unsustainable social and economic costs to the flood affected community or general community as a consequence of flooding; and*
- (f) if located in a floodway,*
 - (i) is compatible with the flow conveyance function of the floodway; and*
 - (ii) is compatible with the flood hazard within the floodway.*

(4) In this clause, floodway has the same meaning as it has in the Floodplain Development Manual 2005.”

The Draft LEP provides no separate definition of flood liable land.

Schedule 3 Complying Development Part 1 Types of Development

These provisions provide that complying development cannot be carried out for boundary adjustments or industrial development on land:

“lower than 1.2 metres below the 1 in 100 year flood level for the locality...”

Due to the significant FRM issues particular to the study area, the limitation of consideration of FRM issues to the 100 year flood affected component of the floodplain would not be consistent with the 1997 HNFMAC Strategy, best practice or anticipated recommendations for the FRMP. While the standard local provisions identify appropriate matters for consideration these need to be applied to development across the whole of the floodplain as discussed further below.

The above clause was prepared prior to the current standard local provision for the LEP Template, and does not conform to it. The resolution of Council on 7 June 2011 does provide delegated authority to the General Manager to allow for refinement of the LEP in consultation with the DPI. However, given the significance of the issues and the stage which the Draft LEP has progressed, it is later recommended that amendments to the LEP flood clause proceed after the gazettal of the LEP and the adoption of the FRMP.

4.5 Development Controls Plans (DCPs)

Hawkesbury Development Control Plan 2002 (“the DCP”) is a comprehensive DCP that applies to all forms of development within the whole LGA. The provisions of the DCP of relevance to FRM are outlined and discussed below.

Information Requirements

Applicants are requested to include the following information in statements of environmental effects to accompany a DA for subdivision [bolding is our emphasis]:

For subdivision

*Risk analysis of the proposed subdivision including reference to **flooding**, drainage, landslip, erosion, mine subsidence, bush fire and any other risks.*

Where an Effluent Disposal Feasibility Study is required

*mapping of **flood risk contours** and setbacks from waterways or other sensitive areas;*

In the case of major earthworks

*waterway capacities and **flood levels**;*

Similar requirements are reiterated in Appendix B of the DCP.

Specific Development

Clause 3.6 of Part D (Chapter 3 Subdivision) of the DCP provides some provisions relating FRM for subdivision development (in addition to landslip and contamination issues). The relevant aims, objectives and controls ('rules') are:

Aims

- (d) Subdivision proposals should be designed to minimise the risk to life and/or property from flooding, landslip and contaminated land.*

Objectives

- *Subdivision of flood prone land should not result in increased risk to life or property both on the subject land and adjoining lands*

Rules

- (a) Compliance with clause 25 of Hawkesbury Local Environmental Plan 1989.*
(b) Access to the subdivision shall be located above the 1% AEP flood level.

Clause 3.8.1 applies to rural and rural residential subdivision and includes an aim and objective to ensure flooding is considered but no specific "rules."

Part D, Chapters 6 and 7 of the DCP relate to dam construction and land fill. Flood related controls in these sections generally address impacts on floodways and flood behaviour.

Part D, Chapter 8 relates to rural sheds and requires any part below the 100 year flood level is to be constructed of flood compatible materials

Definitions

The DCP contains the following definitions:

Floodplain means the floodplain level nominated in a LEP or those areas below the 1 in 100 flood event if no level has been nominated.

Floodway means flood liable land where a significant volume of water flows during floods and if even partially blocked may cause a significant redistribution of flood flows.

The above provisions do not address the FRM issues as identified in the FRMS, in particular risk to life and extraordinary building damage risks from significant depths occurring in floods greater than the 100 year flood. In order to implement the anticipated provisions of the FRMP, an amendment to the DCP is proposed that will introduce an additional chapter within Part C of the DCP to address FRM issues. This would have a parallel purpose to the existing chapter 5 in Part C that addresses bushfire hazards.

5.0 Existing and Projected Population and Development

5.1 Existing Population & Development Patterns in Floodplain

Various methodologies can be pursued to estimate the current dwelling and population characteristics within the study area and the appropriate methodology will vary

depending on the purpose for which this information is intended to be used. Bewsher Consulting have utilised rates information and other GIS data provided by Council for the purposes of estimating flood damages. The National Exposure Information System (NEXIS) information commissioned by the SES for the purposes of evacuation planning is not solely applied. We propose to use Census data as this allows for more detail analysis of the characteristics of the population of the floodplain and allows comparison with the data compiled for the HNFM Strategy Report (Don Fox Planning & Bewsher Consulting October 1997) which looked at 1986, 1991 and 1996 Census data. Further we note that the NEXIS information does not capture the total population within the study area floodplain as this was not relevant to the evaluation assessment required to be undertaken.

The limitations with the use of Census data include:

- Census collector districts (being the smallest unit area for which census data is compiled) do not correlate with the boundary of the floodplain. In both the 1997 Study and this study some manual adjustments are made to census collector districts which fall partly within and outside of the floodplain (PMF extent) to account for this issue.
- The latest census data is current to June 2006 and is therefore out of date.
- Depending on the information extracted, the data may refer to the Census Count (being only the people present in the dwelling at the time of the Census) as opposed to being an adjusted figure reflecting place of usual residence.

Notwithstanding the above limitations the use of Census data is considered to provide a useful insight into the near current and changing characteristics of the population of the floodplain that compliments the information obtained from other sources.

Table 5.1: Key Census Data for Study Area

Characteristic	1986	1996	2006
Total Persons	23,215	30,681	40,321 (39,909)
Total Occupied Dwellings	7,132	10,292	14,880
Person Aged 65 and Over	1,532	2,359	4,078
% of Floodplain population aged 65 and Over	7.0%	7.7%	10.1%
Average Number of Vehicles	1.54	NA	1.56
Has need for assistance with core activity. (4)	NA	NA	1,474

Notes

- 1 Assumed that 1986 and 1996 census data (taken from Bewsher and Don Fox Planning Oct 1997) is as counted. 2006 Census data is compiled on the same basis.
2. Numbers in brackets refer to Census count adjusted for usual place of residence.

3. NA means not available.

4. The 2006 Census was the first Census to have the variable Core Activity Need for Assistance to measure the number of people with a profound or severe disability. The Census of Population and Housing defines the profound or severe disability population as *'those people needing help or assistance in one or more of the three core activity areas of self-care, mobility and communication, because of a long-term health condition (lasting six months or more), a disability (lasting six months or more), or old age'*. (ABS Census Dictionary 2901.1, 2006 Reissue).

Consistent with trends in the general community the proportion of elderly people in the floodplain are increasing. Approximately 10% of the population (about 4,000 persons) of the study area are aged 65 or over. In parallel with this trend the number of persons with disabilities (consequently requiring assistance with core activities) was counted in the study area to be about 1,500 at the 2006 census. This sector of the community presents particular challenges when providing for evacuation during major floods.

While the average number of vehicles per occupied dwelling has remained relatively constant there remained at the 2006 Census approximately 1020 dwellings with no vehicle. This group is particularly vulnerable where self evacuation out of the floodplain is required. This will need to be addressed as part of the more detailed SES evacuation plans.

At the 2006 Census there were approximately 160 persons (counted as the location on Census night) located in approximately 120 occupied dwellings categorised as structures inclusive of *caravan, cabin, houseboat, improvised home, tent or sleep out*. These forms of housing are highly susceptible to flood damage due to type of construction and the likelihood of being located at natural ground level.

As at the earlier census the proportion of the population which were poor English speakers remained below 1% at the 2006 Census. In comparison to other areas of Sydney the need to target the non-English speaking community within flood awareness campaigns is not significant.

The census data also confirms that both the number of dwellings and population within the floodplain has progressively increased. Over a 20 year period the number of people in the floodplain has increased by about 17,000 persons (almost a doubling). Recognition of the severity of flood risks by the 1997 HNFMAC Strategy resulted in the curtailment of any further substantial growth, as reflected in planned growth targets discussed below.

5.2 Population and Workforce Targets & Projections

5.2.1 Sydney Metropolitan Context

By 2031 the State Government is planning for over 250,000 potential dwellings in new release areas including 131,057 within the Metropolitan Development Program (MDP) area, the 111,920 remaining in the NW and SW Structure Plans and 11,500 in North Wyong. (DOP Feb 2010, pg.1).

The *North West Subregion Draft Subregional Strategy* (the "Subregional Strategy" DoP 2007) provides an intermediate step in translating the Metropolitan Strategy to the local level. The North West subregion is made up of five local government areas: The Hills, Blacktown; Blue Mountains; Hawkesbury; and Penrith.

The Subregional Strategy recognises that there are significant areas constrained from development due to flood risk (see DoP 2007, pg.82). The Strategy states that while land within the floodplain (defined as up to the PMF) above the 100 year flood extent may generally be suitable for housing development, such areas may be further constrained where evacuation in major flood events is substantially constrained. Having regard to the situation as known at the time of preparing the Subregional Strategy, the following policy position is stated for growth expectations in the Hawkesbury LGA:

The areas of Hawkesbury local government area to the north of the Hawkesbury River are predominantly above the Probable Maximum flood level and are therefore not flood affected in the same manner as areas south of the river. There is however, a risk of services, including water and electricity, and access to jobs and schools being cut off during flood events. Evacuation is required when water and electricity are cut for long periods of time, however these areas can evacuate to the north.

In view of the above, the dwelling target for Hawkesbury local government area assumes that growth will occur:

- *within the capacity of the existing LEP; and*
- *north of the Hawkesbury river*

Any growth north of the Hawkesbury River would need to be associated with existing local centres.

If further growth is to occur south of the Hawkesbury River, in order to meet the Sustainability Criteria, it would be necessary to demonstrate that flood evacuation measures are in place to the satisfaction of the State Emergency Services.

The Subregional Strategy sets a housing target to be reached by 2031 of an additional 140,000 dwellings for the Subregion, of which the target component for the Hawkesbury LGA is 5,000 dwellings³ (DoP 2007, pg.78). **Figure 5** is extract from the Subregional Strategy that sets out the main centres in the subregions together with flood risk constraints.

³ Council officers indicate that this target is exclusive of the housing potential in Vineyard within the Northwest Growth Centre.

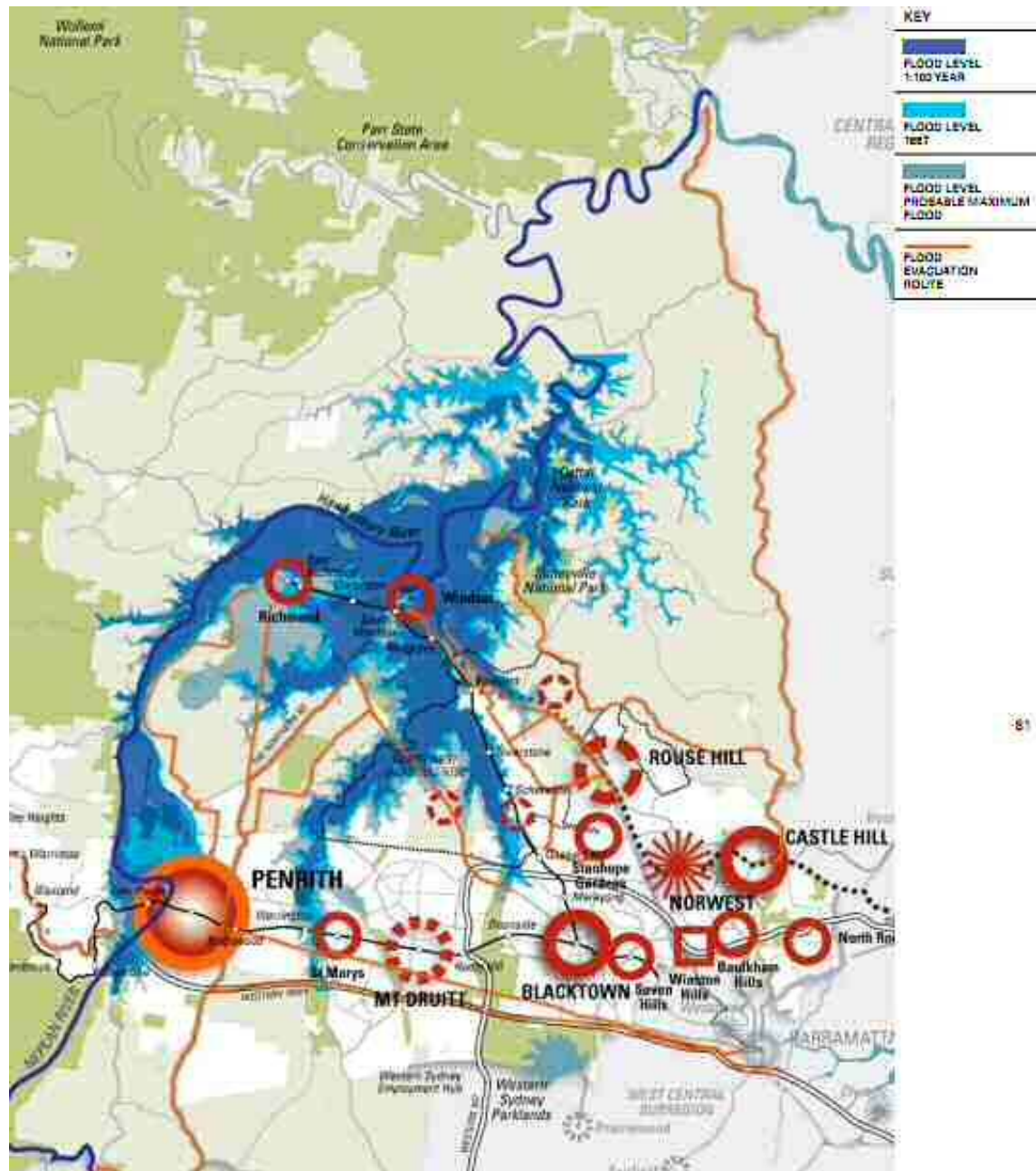


Figure 5: Flood Risk Constraints in the Hawkesbury LGA (DoP 2007, pg.81)

In the Hawkesbury LGA the current MDP has identified only the Bligh Park Stage 2 Release with a potential of 800 lots. The timing for the development of these lots is within the more than 5 years horizon and is generally understood to be dependent on the resolution of FRM issues. The location of Bligh Park stage 2 in the context of the main urban centres in the LGA is depicted on **Figure 6**.

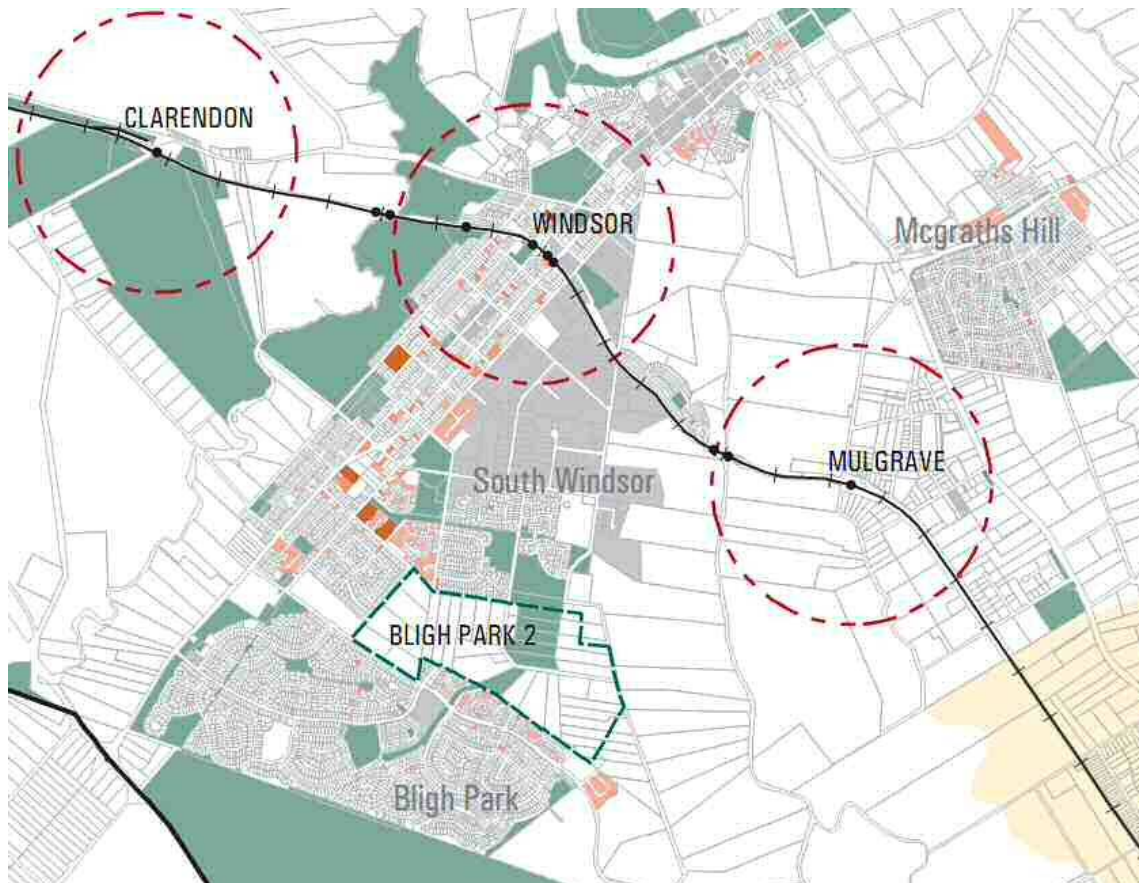


Figure 6: Location of Bligh Park Stage 2 (DOP Feb 2010, Map 2)

A Planning Proposal to rezone Bligh Park Stage 2 for urban purposes was submitted to Council during June 2010. Council considered this Proposal at its meeting of 10 August 2010 with a recommendation from Council officers not to proceed until such time as the FRMS and FRMP were complete, due to unresolved evacuation issues. The Proposal was forwarded to the DPI for consideration as part of the LEP “Gateway Process”, who concurred with the Council officers’ recommendation. The Gateway Determination (dated 24 September 2010) was that the rezoning should not proceed due the need to address flood risk issues pending the outcome of the FRMS and FRMP, at which time the views of the SES should be obtained.

Major sites are generally the key redevelopment sites in the existing urban areas. Over the last five years, 41 per cent of the net dwelling production in the existing urban areas in the MDP came from major sites. The only major site for the Hawkesbury LGA is Pitt Town, as discussed further below.

Pitt Town

On 12 October 2007 the Minister for Planning declared that the Pitt Town Residential Precinct is a Major Project under Part 3A of the Environmental Planning and Assessment Act 1979, and authorised the submission of a concept plan for the site. On 10 January 2008, the Johnson Property Group (JPG, being the proponent) submitted a Concept Plan application for the Pitt Town Residential Precinct in response to the Director-General’s Environmental Assessment Requirements issued on 15 November 2007.

The JPG concept plan proposes a total of 659 lots (or 647 net additional lots excluding existing lots), on land owned or controlled by JPG, comprising 390 residential lots and 269 rural lots. The Concept Plan was approved by the Minister on 10 July 2008 and relates to various sectors of land adjacent the original township as depicted on **Figure 7**. The development is currently underway.

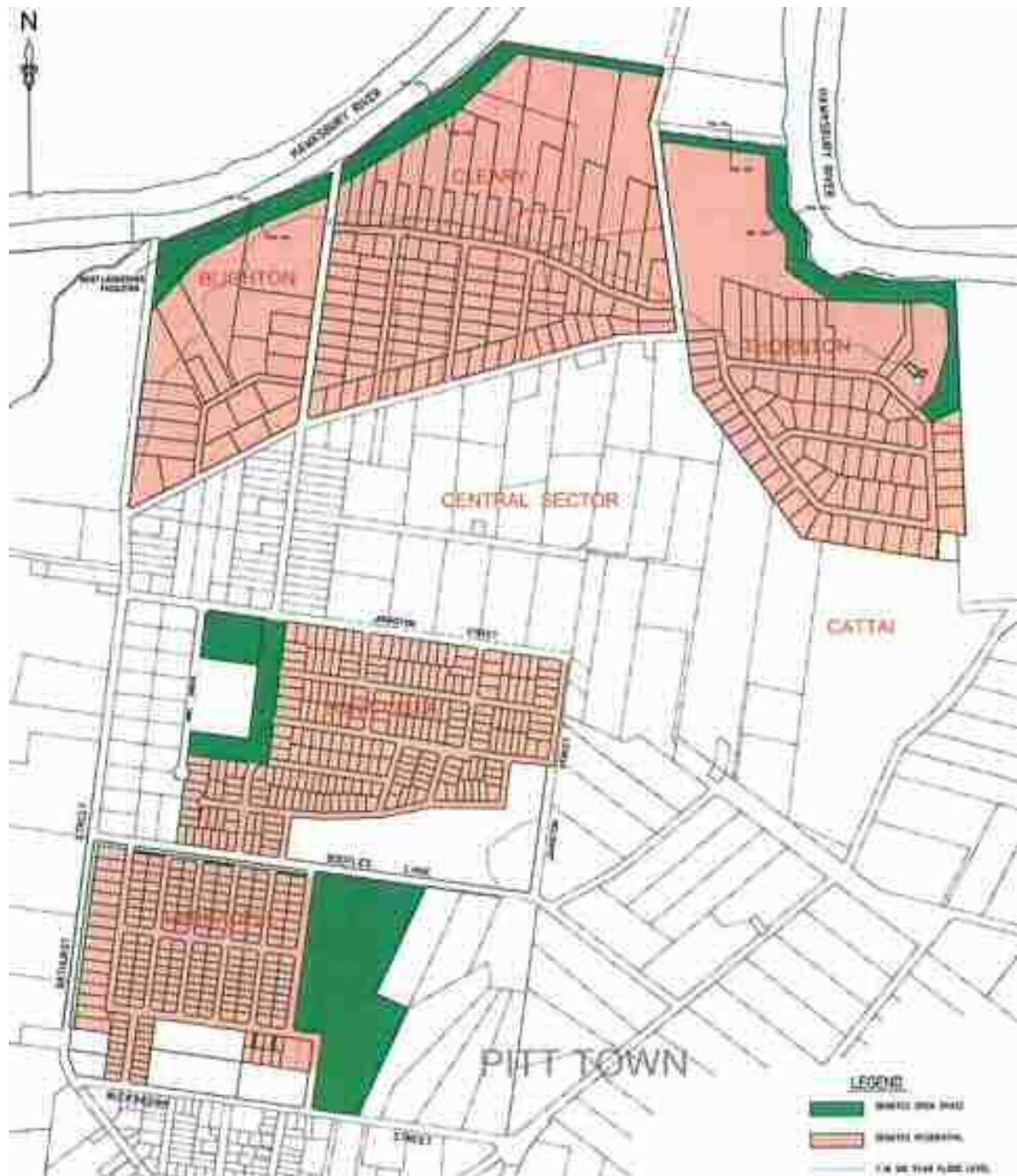


Figure 7: Pitt Town Masterplan (prepared by Brown Consulting as sourced from DoP register of approved Concept Plans)

The Sydney MDP (2008-09) shows an estimated potential for an additional 893 dwellings in Pitt Town over the next 10 years.

Vineyard

Vineyard is a precinct within the Northwest Growth Centre of the Sydney Region. It has not yet been released for urban development. Preliminary structure planning indicates a potential for approximately 2500 dwellings housing a population of 7000 centred around 2-3 neighbourhood centres, plus employment lands. The location of the Vineyard precinct within the Northwest Growth Centre showing the extent of the 100 year flood is depicted on **Figure 8**.

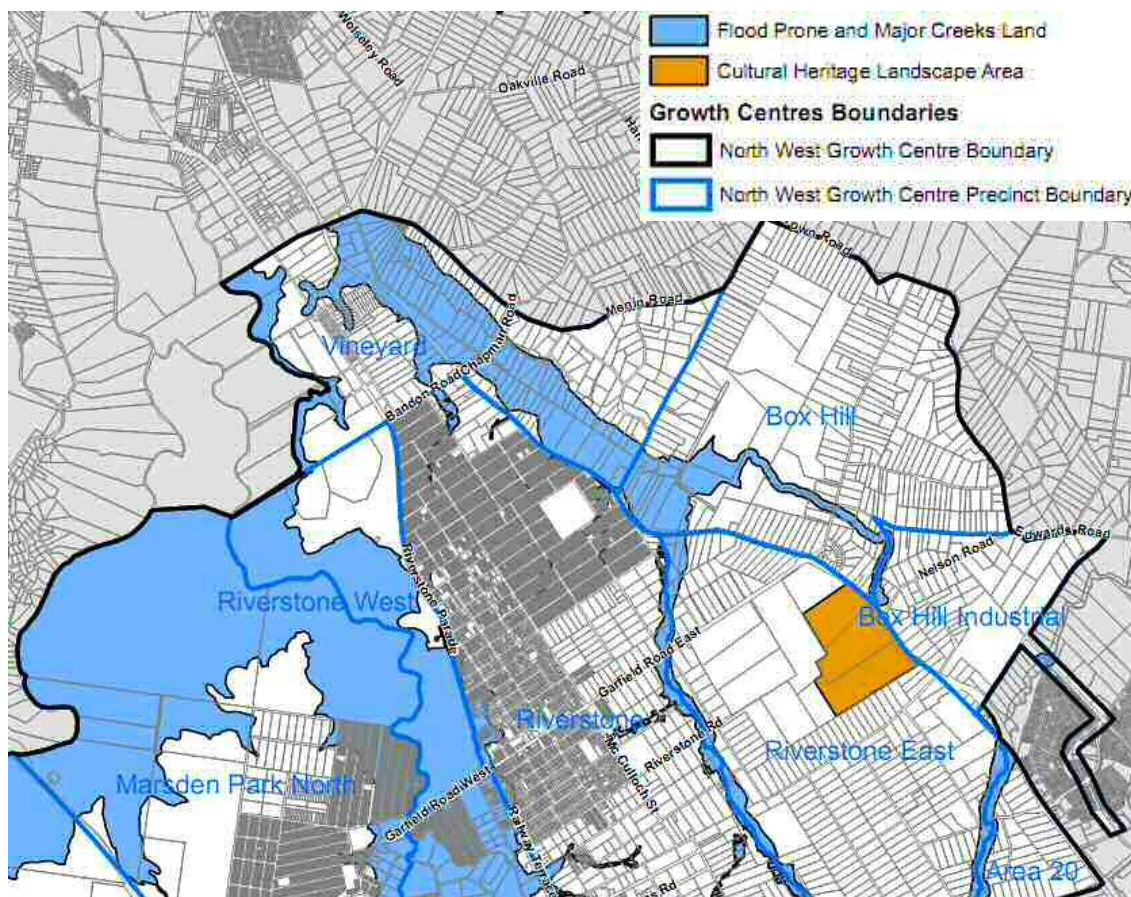


Figure 8: Vineyard and adjacent Precincts in the Northwest Growth Centre (DoP NW Growth Centre Development Control Map – Edition 4).

5.2.2 Hawkesbury LGA Context

Council's Residential Lands Strategy (2011) identifies or provides residential land capable of accommodating approximately 5,000 to 6000 additional dwellings by 2031, primarily within or adjacent to the existing urban areas, as prescribed by the North West Subregional strategy. The Strategy was approached on the basis of maximising the potential for future housing in and around existing centres. Accordingly it is intended that the majority of future dwellings will be located in existing urban areas⁴ to maximise use of existing services, facilities and infrastructure, while the remaining dwellings are to be located on the fringe of existing urban areas and rural villages.

⁴ This could occur within existing urban zoned land, urban land rezoned to facilitate higher density housing or relatively minor rezoning that expanded the urban centres.

A draft Strategy was prepared and reported to Council on 8 December 2009. The resolution, in part, of the 8 December 2009 meeting was that Council review and modify the draft strategy to:

“(d) Assign a greater negative weighting to flood prone land above the 1% level where that land is liable to isolation in larger floods than in areas where continuous uphill evacuation is available;...”

Various issues including the above were considered by staff and proposed amendments were incorporated into the draft Residential Lands Strategy reported back to Council on 28 September 2010 and following extensive consultation with the public was adopted by council on 10 May 2011.

Based on the opportunity and constraints analysis the following major areas were identified for further consideration:

- Richmond (Figure 9)
- North Richmond (Figure 10)
- Windsor (Figure 11)
- Wilberforce (Figure 12)
- Glossodia (Figure 13)

The maps provided below were those contained in the exhibited Draft Residential Lands Strategy, and pertinent changes in accordance with the adopted Strategy are noted.

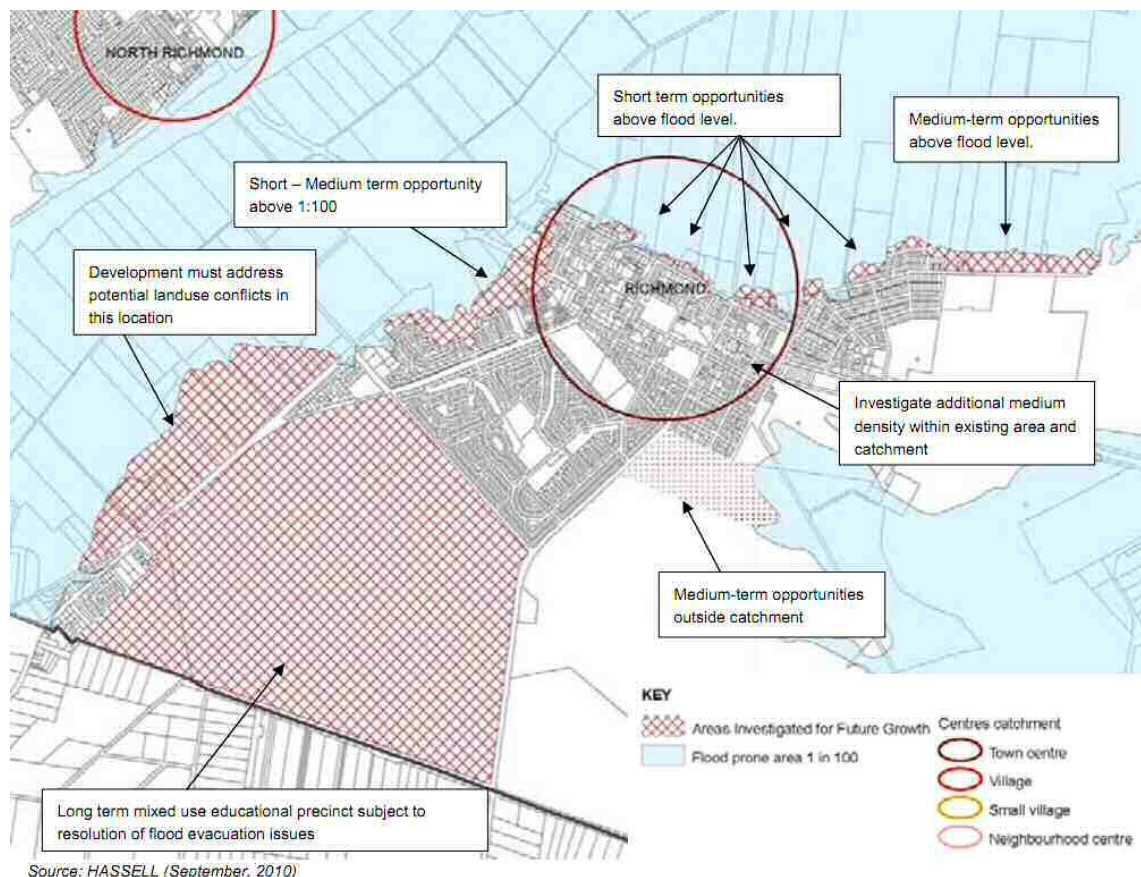
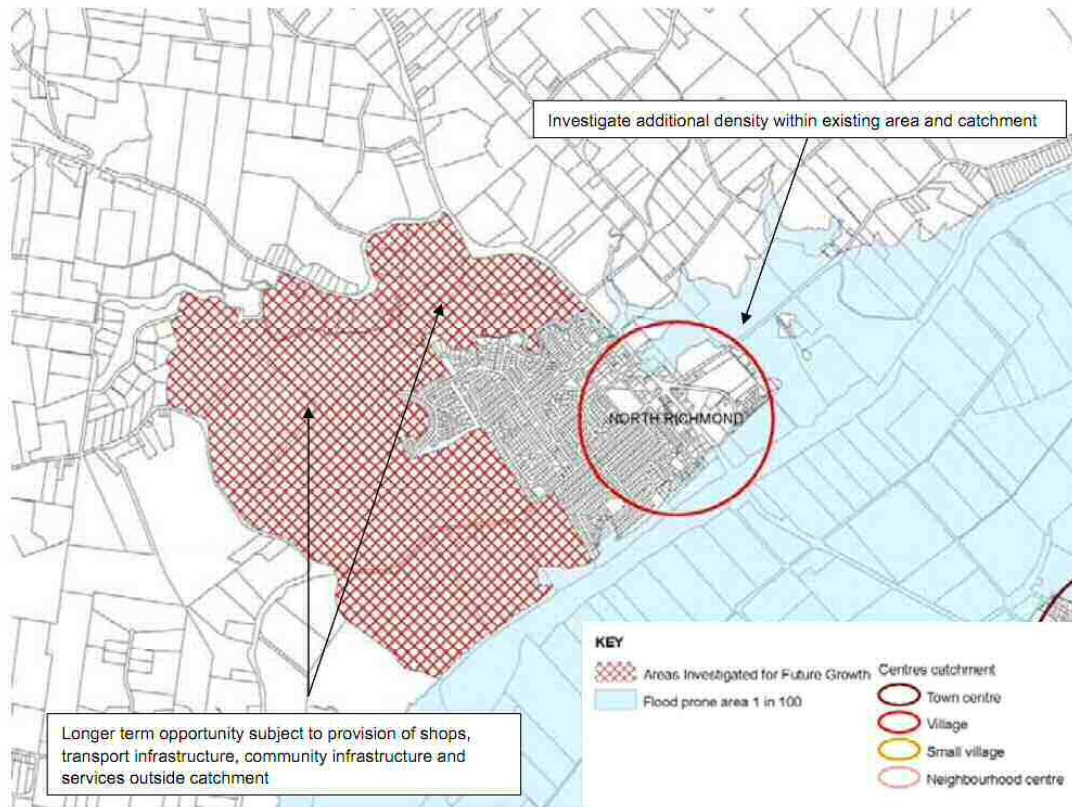
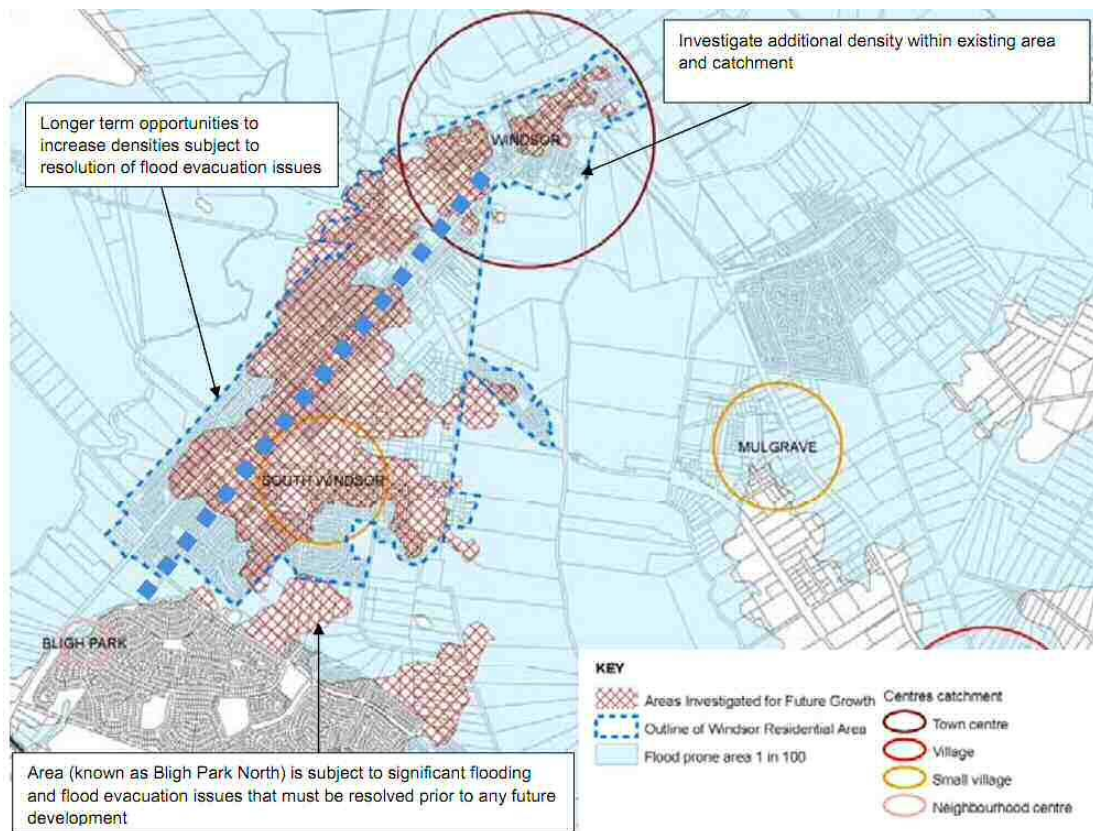


Figure 9: Richmond Investigation Area (Residential Lands Strategy 2010, Fig.6.6.1)



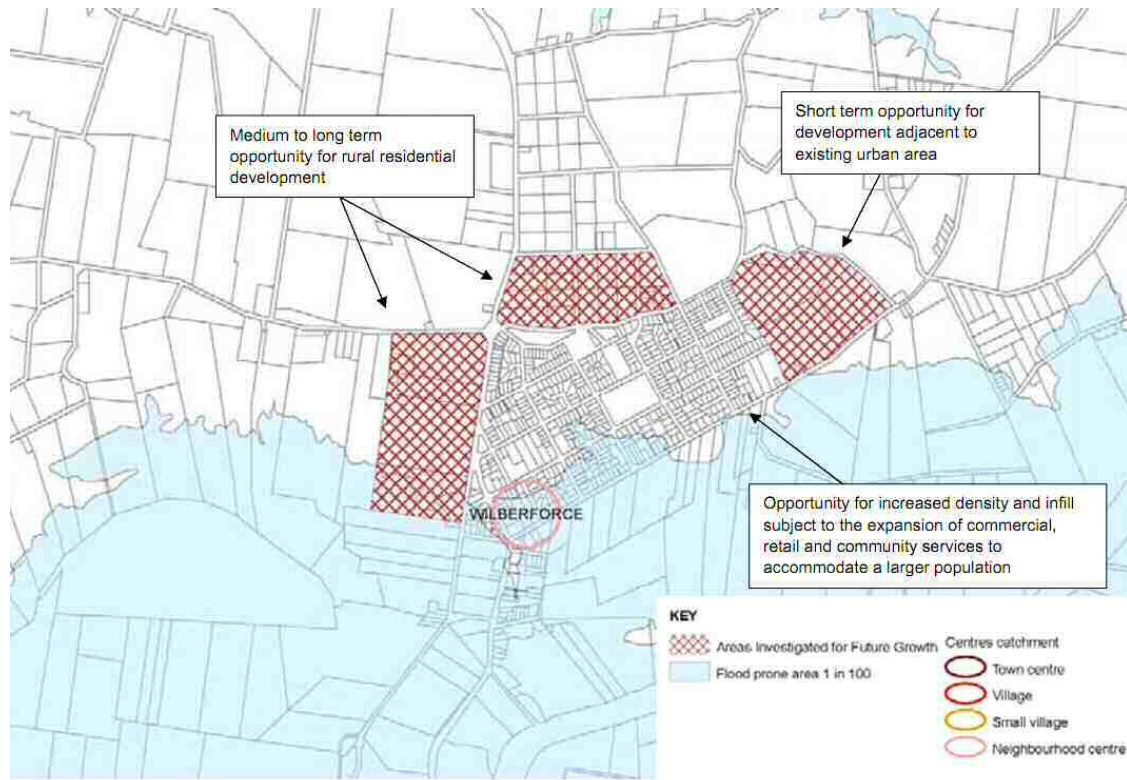
Source: HASSELL (September, 2010)

Figure 10: North Richmond Investigation Area (Residential Lands Strategy 2010, Fig.6.6.2)



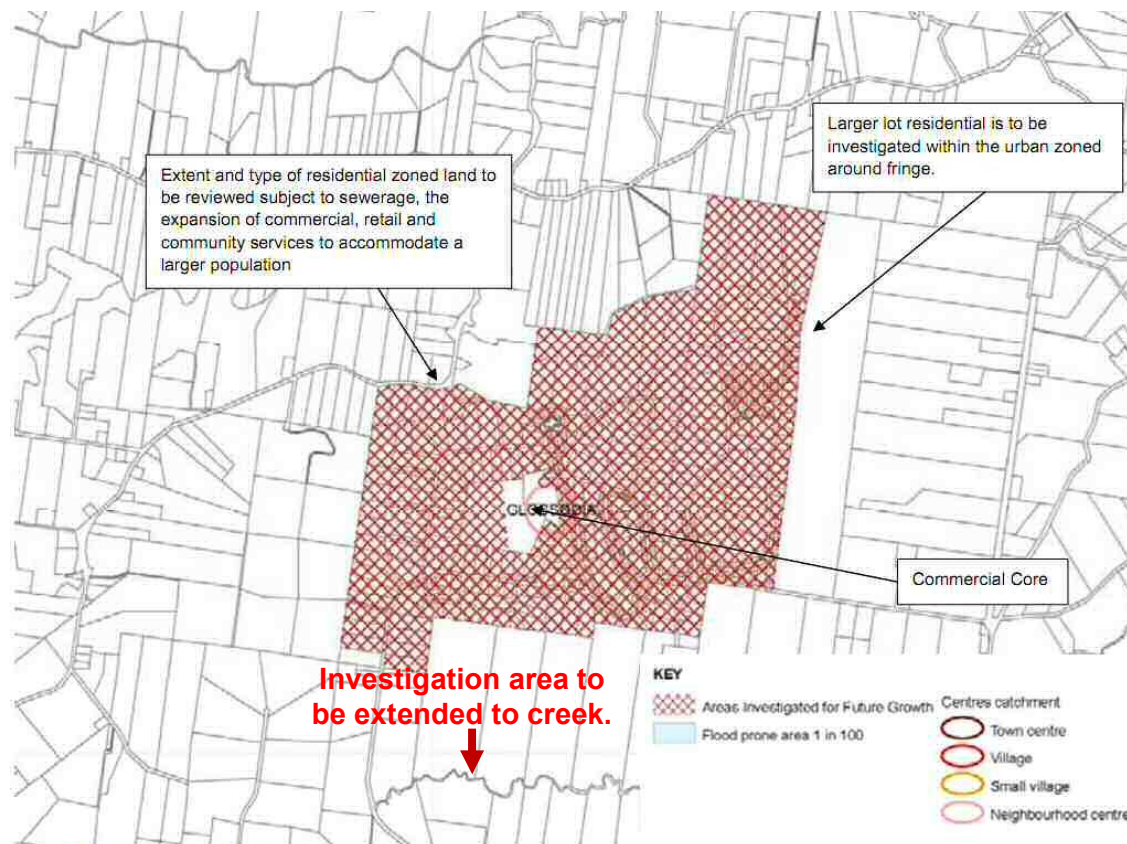
Source: HASSELL (October, 2009)

Figure 11: Windsor ('Corridor') Investigation Area (Residential Lands Strategy 2010, Fig.6.6.5)



Source: HASSELL (September, 2010)

Figure 12: Wilberforce Investigation Area (Residential Lands Strategy 2010, Fig.6.6.3)



Source: HASSELL (September, 2010)

Figure 13: Glossodia Investigation Area (Residential Lands Strategy 2010, Fig.6.6.4)

The Strategy's maps also contain site specific notations. An example is the map for Windsor which qualifies that further investigation is subject to:

“resolution of flood evacuation; Timely and appropriate provision of infrastructure; and detailed structure planning of town centre and investigation areas but only in areas not affected by the 1:100 flood”.

While potential development in rural areas has not been mapped, the Strategy notes some scope surrounding rural villages and smaller settlements subject to the specified sustainability criteria.

Council's records show that between 2006 and 2010 there have been a total of 866 residential lots created in the LGA. This equates to an average of approximately 220 lots per year. The creation of additional lots can be part of the process of facilitating the development of additional housing, but there is not necessarily a direct correlation particularly where additional housing is creating by infill development in the form of multi-unit housing in existing urban areas.

The DPI Housing target for the Hawkesbury LGA for the next 20 years requires an average production of 250 dwellings per year. It is broadly estimated by Council planners that existing zoned land (inclusive of Pitt Town) could accommodate approximately 60% of the growth target. This would leave only in the order of an additional 2000 dwellings required to be accommodated within the above Metropolitan (MDP) sites and local investigations areas.

Accordingly, to meet DPI housing targets the Hawkesbury Residential Land Strategy is required to identify new opportunities to cater for relatively modest additional growth of an average of 100 dwellings per year over the next 20 years. The exact location for this growth has not yet been determined but is expected to be within the above local investigation areas. The Strategy allows for the required additional dwellings to be provided as either within new urban release areas or the redevelopment of existing areas to higher densities and/or the expansion of existing urban centres.

The Strategy states that the following areas have not been considered for future investigation for the specified reasons:

Clarendon

Clarendon has been identified in the Employment Land Strategy 2008 for more non-residential uses. There are also significant flooding constraints to residential development in the Clarendon locality.

Mulgrave/McGraths Hill

This area is not considered suitable for future residential expansion due to unacceptable flooding and evacuation impacts.

South Windsor/North Bligh Park

This locality may have limited potential for increased infill density or additional expansion. However, this is only possible if the significant flooding and evacuation problems can be suitably addressed. While this land remains identified as a potential future urban area on the MDP, the land is not critical to the requirements of Council's Residential Land Strategy and if the problems for this area cannot be readily addressed then the area could be removed from further consideration.

Non-urban Flood Prone Land

All currently non-urban zoned land that is affected by the 1:100 year flood event is not considered suitable for intensification of residential development.

The Strategy also identifies the proposed residential areas of Vineyard (which is located within the Northwest Growth Centre) and Pitt Town (which is subject to approvals under the Part 3A Process of the EPA Act) that are under the control of the DPI, which are discussed above.

5.3 Future Employment Lands

In 2008 Council adopted an Employment Lands Strategy (SGS December 2008). This Strategy broadly seeks to *"provide a planning framework to support and enhance the economic competitiveness of the Hawkesbury region."* The study focuses on the areas in the southern part of the LGA including:

- industrial areas at North Richmond, Richmond, South Windsor, Mulgrave, McGraths Hill and Wilberforce;
- the Richmond RAAF base and UWS campus; and
- retail and commercial centres of North Richmond, Richmond and Windsor/South Windsor, and smaller neighbourhood centres.

The Strategy identifies a significant supply of vacant industrial land exists but that there is a mismatch between the type of land available and the nature of land desired for industrial and business activities. However, analysis of this land indicates that it often significantly constrained.

A number of strategies are identified to address the issues that would constrain the achievement of the overall aim of increasing the economic competitiveness of the LGA. Those strategies of particular relevance to the FRMS include:

5. Investigate additional industrial land supply to address future employment growth.

- *Mulgrave (south of Park Road and on the western side of the rail line).*
- *South Windsor (the areas east of Fairey Road not currently zoned industrial).*
- *North Richmond (near the corner of Terrace Road and Bells Line of Road for service industry currently on Bells Line of Rd).*

The Strategy requires the above areas to be investigated generally within a 5 to 10 year period.

The NSW Transport Data Centre "Travel Zone Employment Forecasts" (October 2009 Release) use the 2006 Census data and a detailed forecast model to project the increase in the employment population. The 2006 data represents the actual employment population based on the 2006 census. The forecasts of employment numbers within the Hawkesbury LGA at 2006, 2011 and 2031 are 25486, 25,998 and 30,556 respectively. The Employment Lands Strategy (SGS, 2008, pg.29) notes that in the Hawkesbury LGA around 80 percent of local jobs are filled by residents and over 50 percent of the resident workforce work locally.

While the distribution of this growth may vary into the future, the current and projected employment numbers represent a factor to be considered in the assessment of persons that may be required to evacuate during a flood.

5.4 Summary of Projected Development

Having regard to the above, **Table 5.1** summarises the projected development potential for the Hawkesbury LGA.

Table 5.1: Projected Development Potential in Hawkesbury LGA

Location of Projected Additional Dwellings	Number of Additional Dwellings/ Development over Next 20 Years (2010-2030)	Comments
Residential Land Strategy		
Richmond	2000 (approximate combined total for all investigation areas)	These areas identified by the Hawkesbury Residential Land Strategy need to be rezoned to accommodate the balance of the housing growth target after deducting for anticipated development on existing zoned land and sites included within the MDP (excluding Vineyard).
Windsor		
North Richmond		
Wilberforce		
Glossodia Windsor/Bligh Pk Corridor		
Development within Existing Zoned Land		
Various Locations throughout LGA	2100	This approximates an estimate derived from Council officers based on a preliminary analysis of existing areas.
Metropolitan Development Program (MDP)		
Bligh Park Stage 2	0	MDP indicates a potential for 800 lots subject to approval.
Pitt Town	893	As per MDP
Vineyard	NA	Noted as having the potential for 750 lots as per Growth Centres Commission publications
TOTAL RESIDENTIAL DEVELOPMENT	5000 (7500 including Vineyard)	The housing target assigned to Hawkesbury LGA is 5000 additional dwellings between 2010 -2031, excluding the Vineyard precinct which is located in the Southwest Growth Centre
TOTAL EMPLOYMENT DEVELOPMENT	Investigate potential for additional Industrial development in: • Mulgrave; • South Windsor; and • North Richmond	Existing industrial and commercial land contains capacity for growth. Additional industrial land is to be investigated to provide more land with fewer constraints in more ideal locations.

5.5 Estimate of Vehicles required to Evacuate

In order to provide input to the assessment of evacuation capability (as discussed further below) the above information regarding existing and future resident and worker population, together with other data sources, were used to estimate vehicle numbers that could be required to evacuate from the floodplain during severe floods. The estimates were prepared from data compiled for the 3 critical SES Sectors, generally described as:

- Windsor;
- Bligh Park and Windsor Down; and
- Richmond and Richmond Lowlands.

The estimates are prepared for the years 2006, 2010 and 2031 for each of the above 3 sectors. The 2006 data is based on 2006 Census data, for which a reasonable precise correlation between Census collector district boundaries and SES sectors was available. The estimates also include an allowance for non-private vehicles. The overall estimates, data sources and detailed assumptions are presented in **Appendix B**.

6.0 Discussion of Planning Issues & Options

6.1 Role for Planning

The Floodplain Development Manual classifies the measures to manage flood risk into three groups in the following order of importance:

- **property modification measures** — these comprise controls on future development of property and community infrastructure. Planning and development controls can generally be implemented for minimal cost and would ensure that the potential for flood damage does not increase in the future;
- **response modification measures** — these modify people's response to flooding and usually include measures that provide additional warning of flooding, improved public awareness of the flood risk and improvements to emergency management during floods; and
- **flood modification measures** — being structural measures such as the construction of levees and detention basins, channel widening/deepening, etc.

Planning has a role in the implementation of property modification measures whilst a discussion of the other measures is provided elsewhere in the FRMS reports.

In relation to the Hawkesbury floodplain, the property modification measures relate specifically to:

- directing Council's strategic planning as it relates to flood risk management;
- reviewing Council's flood risk management planning controls (in particular the LEP and DCP) that apply in the assessment of development applications; and
- ensuring that planning controls and associated documentation such as flood maps and S149 Planning Certificates communicate flood risks in a responsible

manner, to allow the community to make informed decisions where discretion exists and to compliment emergency management education and preparedness.

The following sections of this report discuss and outline recommendations in regard to the above, drawing on the analysis of the existing situation and flood risk factors provided by preceding documents and other reports prepared for this FRMS.

6.2 Flood Risks within Existing Areas

Flood risks to persons and property within existing developed areas are addressed within other components of the FRMS. Planning by its nature can not reduce risks in these areas, except where redevelopment occurs. The encouragement of redevelopment to provide for development which is more compatible with the flood hazard is a legitimate approach to achieving the NSW Flood Policy aim to *“to reduce private and public losses resulting from floods”* (NSW Government FDM, pg.1) provided it coincides with what is otherwise an appropriate planning strategy. The Hawkesbury Residential Land Strategy, discussed above, does provide for a substantial component of future housing development to occur within and around existing urban centres.

Accordingly, redevelopment of existing flood prone areas will occur and an opportunity exists for the establishment of planning controls to reduce flood risks through planning controls that provide for more flood compatible buildings. New development will vary in scale and form to include development such as new rural dwellings, alterations and additions to single dwellings, demolition of single dwellings to provide for infill multi-unit housing, change of use of shops and commercial premises and new industrial development on existing vacant industrially zoned land. In comparison to greenfield release areas, the planning controls need to be formulated to ensure that new development can reasonably integrate with existing established areas, to be acceptable with regard to considerations such consistency with the character of an area and amenity impacts. Such planning controls will appropriately be incorporated into Council’s DCP (as discussed further below) and will need to achieve a balance between FRM and amenity planning objectives.

While planning controls can manage flood risks to property and persons to some extent, the specific nature of the flood hazard in the study area is such that an overriding consideration is whether an increase in the number of occupants of the floodplain would result in an unacceptable risk to life due to an inability to ensure the potential for the evacuation of the expanded population. This issue is discussed below, which includes a consideration of the expansion of existing urban centres.

6.3 Suitability of New Releases and Expanded Urban Areas

In assessing the suitability of potential new urban releases and expanded urban areas based on flood risk, an assessment of risk to life is the paramount consideration. This is effectively a determination as to whether the risk of loss of life due to an inability to safely evacuate away from the flood hazard, is within acceptable limits. An evacuation capability assessment (“ECA”) methodology to determine whether the evacuation constraints of individual areas are unacceptable is outlined with the main FRMS report prepared by Bewsher Consulting (i.e. Volume 1). Further Volume 1 provides a commentary on Volume 3 and includes additional ECA considerations.

The following sections of this report summarise the flood evacuation risks associated with each of the areas previously described that could possibly accommodate additional housing development based on the abovementioned evaluation methodology. The bulk of the flood risk assessment has concentrated on the evacuation risks noting that other components of flood risks have been addressed elsewhere in the FRMS.

As these large scale development projects are all in the feasibility or planning phases, considerations relating to FRM are only part of many issues that planners and the consent authorities (i.e. Council or the Minister for Planning) will need to consider, when deciding whether the proposed developments should proceed or not.

It is normal practice when considering evacuation risks in evacuation constrained areas to carry out an ECA, utilising "timeline procedures." However as outlined in the main FRMS report, the prediction of both the time required for evacuation and the time available, is particularly complex and of necessity the ECA must make a number of assumptions concerning key parameters, to deal with the unpredictability of meteorological and human behaviour. This situation parallels how the planning process considers risks to life associated with numerous different natural and man-made hazards (fire, flood, land stability, acid sulphate soils, salinity, earthquakes, cyclones, traffic and pedestrian accidents, crime related assaults, damages and theft, hazardous industry related fire and explosions, etc). All such risks, including flood related risks, need to be considered together in the planning process with other issues, to determine what on balance an appropriate planning outcome is. In order to provide advice to planners so that relative flood risk to life issues can be considered in the strategic planning process, a system of categorising such risks (similar to what is done for other hazards such as bushfire) is appropriate.

The main FRMS report prepared by Bewsher Consulting outlines an approach to grade the advice to be provided to planners and the consent authorities into four classes (Evacuation Risk Categories – "ERCs") as set out in **Table 6.1**. This advice could relate to a planning proposal with or without any mitigation measures that could be incorporated to minimise evacuation risks within the floodplain.

Table 6.1: *Evacuation Risk Categories (ERCs) to inform the Planning Process*

Class A	Risks are Minor – Limited Consideration is Required Whilst potential for inundation and/or isolation exists, there are no significant evacuation constraints.
Class B	Risks are Moderate – Detailed Consideration is Required Evacuation constraints exist although in most situations these are not so severe as to significantly influence the planning decision.
Class C	Risks are Serious – Very Detailed Consideration is Required Serious evacuation risks exist. These may be close to the limit of community acceptance. Careful consideration of these risks must be undertaken when evaluating the appropriateness of the development having regard to all social, economic and environmental issues.
Class D	Risks are Intolerable/Unacceptable – Development Should Not Proceed Evacuation risks are so serious that irrespective of other considerations, the development should not proceed.

Advice provided by the SES during the preparation of this study has confirmed that even in an existing area with evacuation constraints, the SES will initiate evacuation of the area in sufficient time to allow all residents to evacuate safely. In order to do this however the SES may need to call an evacuation in the initial stages of a major rainfall event at a time when the need for the evacuation cannot be predicted confidently.

Consequently in the evacuation constrained areas, evacuations may be called unnecessarily and so incur huge social and economic costs to the community.

A key factor is how far ahead flood levels can be confidently predicted. Within this report this is referred to as the limit of confident flood prediction (LCFP). Each ECA must make assumptions about the LCFP. In the past, ECAs conducted for the SES have utilised a 9 hour LCFP however based on recent advice from the Bureau of Meteorology it appears longer LCFPs can be used as the Bureau now makes greater use of rainfall predictions and other information and in preparing its forecasts.

As a consequence, two ECAs have been undertaken with differing assumptions for the LCFP as follows:

- More Conservative Evaluation using LCFP of 9 hours; and
- Less Conservative Evaluation using a LCFP of 15 hours.

The ERC of an area can be modified by the implementation of measures that increase evacuation capabilities. Such measures can include new or improved evacuation routes and improved warning systems. The planning process typically includes an assessment as to whether constraints to development can be ameliorated to acceptable levels with mitigating measures, particularly where this would result in more orderly and economic development and an overall superior planning outcome. This added dimension is also relevant to the assessment of flood risk constraints.

This assessment is not provided for the development of employment lands (commercial and industrial development) as it is considered that risks to life associated with these land uses is indirectly addressed. Employment development in the Hawkesbury LGA is not substantial and largely supports the population already residing in the LGA. The Employment Lands Strategy (SGS, 2008, pg.29) notes that in the Hawkesbury LGA around 80 percent of local jobs are filled by residents and over 50 percent of the resident workforce work locally.

Having regard to ECA and a review of the particular characteristics of the study area, the following **Table 6.2** provides a summary of the ECA results for areas identified for potential residential expansion and the consequent Evacuation Risk Category (ERC). This includes an outline of the outcome of implementing measures to improve the evacuation capability of an area. These measures are discussed in **Volume 1** and include establishment of the outbound lane capacity on the Jim Anderson Bridge and the construction of community refuges on the main flood islands within the LGA. (Note that consideration of the feasibility of such measures is beyond the scope of this report). The rationale for the assignment of the ERC is more fully discussed within the main FRMS report.

Table 6.2: Suitability of Areas Identified for Potential Residential Expansion

INVESTIGATION AREAS	Under Existing Situation (2010)				2031 with Measures to Improve Evacuation Capability			
	More Conservative Evaluation		Less Conservative Evaluation		More Conservative Evaluation		Less Conservative Evaluation	
	Evacuation within LCFP	ERC	Evacuation within LCFP	ERC	Evacuation within LCFP	ERC	Evacuation within LCFP	ERC
Residential Land Strategy plus Development within Existing Zoned Land								
Richmond	No	D	Yes	C	No	D	Yes	B
Windsor	No	D	Yes	C	Yes	C	Yes	B
N Richmond	Yes	B	Yes	B	Yes	B	Yes	B
Wilberforce	Yes	B	Yes	B	Yes	B	Yes	B
Glossodia	Yes	B	Yes	B	Yes	B	Yes	B
Windsor Downs/Bligh Pk	Yes	B	Yes	B	Yes	B	Yes	B
Metropolitan Development Program (MDP)								
Bligh Pk Stg.2	n.a.		n.a.		No	D	No	B
Pitt Town	Yes	B	Yes	B	No	B	No	B
Vineyard	Yes	B	Yes	B	No	B	No	B

The above assessment provides a method of evaluating the relative suitability of an area to accommodate additional housing based on flood risk, without and with ameliorative measures. This needs to form an input to the overall planning process to determine the suitability of area having regard to all planning considerations. For example, the costs and environmental impact of ameliorative works for a new area may result in a conclusion that this area is less desirable to meet housing targets in comparison to another.

6.4 Existing and Pending Flood Related Planning Controls

6.4.1 LEP Provisions

As Council has exhibited Draft LEP 2009 and resolved to adopt it as LEP 2011, any changes to the LEP will need to be made as part of a future revision. This will be a recommendation of the FRMP.

There are tight limitations imposed by the DPI in regard to the form of the flood planning clause that can be used in the LEP. However there are some matters that Council could still appropriately consider, e.g.:

- whether to adopt a flood planning clause or not;
- what flood planning level (FPL) or levels to be applied; and
- the extent of flood mapping that will be included in the LEP.

In principle, an appropriate FRMP determined by the FDM process should not necessarily be restrained to conform to standard planning policies such as the standard flood clauses in the LEP Template. The FDM imposes an imperative on Council, through its Flood Risk Management Committee, to determine a flood risk management strategy that reflects levels of risks acceptable to the community. Should the FDM process conclude with a strategy that conflicts with standard planning policies, then there are mechanisms such as an application to the State Government for an exceptional circumstances variation to resolve the conflict.

The potential role of an LEP in flood risk management can include the following:

- to provide objectives for the application of flood risk management principles in the assessment of development applications;
- to appropriately identify areas subject to flooding in order that development applications in such areas may be specially considered having regard to their flood risk. Council has a basis for notifying the public of the potential for flooding on individual parcels of land in accordance with Section 149 Certificates issued under the EP&A Act;
- to outline general matters for consideration with more detailed controls being the subject of a DCP in accordance with accepted practice;
- to clearly define terminology used in the LEP that relates to flood risk management;

- to ensure that the permissibility and prohibition of uses is consistent with the relevant FRMP, in order that flood sensitive land uses are clearly prohibited within areas subject to significant and hazardous levels of flooding. In this regard it is noted that the prohibition of land uses is a matter which must be clearly outlined within the LEP as this function cannot legally be implemented within a DCP.

Due to the significance of flooding as an environmental hazard and emergency management issue within the LGA, it is appropriate that some recognition of the hazard be provided at the LEP level. The inclusion of such a clause will also provide continuity from Council's existing LEP which includes references to flooding. The failure to include flood related provisions would inappropriately present to the public a perception of low importance of flood risk management in the LGA.

Flood related provisions can reinforce the significance of flooding in the assessment of development applications, identify key issues for consideration in development applications, provide definitions to establish parameters for dealing with development within the floodplain (e.g. specify what part of the floodplain might be exempt or complying development), establish a framework for Section 149 Certificates and provide consistency in regard to informing the public about flood risks.

It is understood that Council could proceed with the flood clause as contained in the exhibited Draft LEP 2009 or introduce the current standard local provision, as outlined above. In our view the current standard local provision provides a superior outline of heads of consideration, but has the following issues:

- reliance on a singular FPL based on a default residential floor level standard;
- the relevance of the climate change considerations;
- the definition of flood liable land; and
- the need to incorporate flood maps in the LEP.

Provided the above issues can be satisfactorily resolved, the inclusion of a flood related clause in the LEP, generally based on the current standard local provision, is clearly desirable. These issues are discussed below.

The DPI seeks to have the current standard local provision clause apply to the default FPL as outlined by the Flood Planning Guideline (100 year plus freeboard), where the "flood planning area" is not otherwise mapped. This would be inconsistent with the intent of the Guideline which provides the exceptional circumstances mechanism. There are substantial reasons why in the case of the Hawkesbury River floodplain, an exceptional circumstances dispensation should be granted (as discussed below). Further, as envisaged by the FDM, a FRMP (such as the Hawkesbury FRMP) may recommend a number of FPLs for different land uses in different locations within the floodplain. Accordingly, a single flood planning map could not deal with such variables, unless it encapsulated all flood liable land.

It may appear nonsensical to the community that the LEP clause excludes Council from considering the risk to life issues for standard residential development outside of the 100 year flood extent, particularly where this has been identified as a major issue in the 1997 HNFMAC Strategy and the 2007 DPI Draft Subregional Strategy.

It is appropriate for the LEP Flood Map to identify the PMF extent of the Hawkesbury River as the “flood Planning area” consistent with what is allowed for by the drafting instructions provided with standard local provision. Such mapping would be available for the main riverine flooding associated with the Hawkesbury River but not all flood liable land (as defined by the FDM) within the LGA. The default application of the clause to the 100 year flood extent⁵, would not be appropriate for the following reasons:

- similar evacuation issues may apply to “unmapped areas”;
- maintaining consistency with government policy as set out in the FDM, 1997 HNFMAC Strategy and the 2007 DPI Draft Subregional Strategy;
- avoiding confusing the public by inadvertently implying some areas are not subject to flood risk when in reality there is only an absence of flood mapping;
- allowing for flood risks associated with any development proposals to be considered when relevant;
- keeping it simple – to avoid misinterpretation and unnecessarily burdening the development assessment process; and
- supporting more detailed controls in a DCP.

As previously discussed climate change related flood risks are potentially relatively insignificant in the study area or definitive data is not currently available. Further, as the Hawkesbury is not a coastal council, subclauses (4) and (5) which address climate change flood risks can be excluded from the standard local provisions, consistent with the drafting instructions provided by the DPI.

A singular clause such as the standard model local provision (refer to Appendix A) is what the consultants would normally recommend, with the exception that its application should be to the whole of the floodplain (i.e. up to the PMF) as defined by the FDM. Generally, such a clause provides an appropriate balance between being overly restrictive and prohibiting development.

Accordingly the FRMP should recommend review of the flood provisions in the draft LEP 2009 and the adoption of the standard flood clause (excluding climate change subclauses (4) and (5)) with the default flood planning area (as referenced in clause (2)(b)) defined as all land up to the PMF. This would require resolution of an exceptional circumstances application as discussed below.

The Model LEP Flood Clause does not allow for introducing prohibitions on flood sensitive developments within certain parts of the floodplain (e.g. in a floodway). However, Council should consider the full risks of flooding when deciding upon appropriate land use zones for individual properties and if appropriate adopt restrictive zones available within the Template LEP.

⁵ This could include an additional allowance for freeboard but such is not currently allowed for in the Hawkesbury LGA and is not proposed as part of the FRMP to be introduced for reasons discussed elsewhere.

6.4.2 DCP Provisions

An important outcome of the Hawkesbury-Nepean Floodplain Management Strategy was the publication of the Land Use Guidelines (HNFMSC, 2006a), which builds on the principles espoused in the 1997 report. These guidelines aim to provide local councils with a regionally consistent approach to developing local policies, plans and development controls which address the hazards associated with the full range of flood events up to the PMF.

A starting point for managing risk through land use planning is to classify risks throughout the floodplain. The Guidelines present a methodology for mapping risk “bands” based on the likelihood and consequences of flooding, focussing especially on tangible residential flood damages. Consideration of evacuation constraints is a paramount consideration that provides another layer of input to the planning process, that provides an overriding criteria as to whether it is acceptable to increase the potential for more development through rezoning – and has been separately addressed above. The imposition of planning controls is aimed at managing flood risks of development that is permissible by current zoning controls, including redevelopment of existing flood affected property.

Mapping the risk provides a basis for a more effective approach to managing flood risk through the application of graduated controls. The planning matrix method shown in **Figure 14** is an effective way of presenting these graduated controls, recognising that different land uses have different vulnerabilities to the same flood hazard. In addition to responding to flood risk through spatial differentiation of land uses, the method allows for controls in building the design of development to manage the consequences of flooding up to the PMF.

Consistent with the above, controls applied to development within a floodplain would typically relate to the following seven considerations:

- Floor level;
- Building components and method;
- Structural soundness;
- Flood affectation;
- Car parking and driveway access;
- Evacuation; and
- Management and design.



Floor level FPLs for residential development is a key control in reducing flood damages in the Hawkesbury-Nepean floodplain and to maximise potential for buildings to survive after flood inundation. The latter consideration is critical to economic and social impact on individuals (see Clarke and Tickle, 2001) and consequently the community.

The *Land Use Guidelines* (HNFMSC, June 2006a, pgs.108-109) suggest a range of Flood Planning Levels (FPLs) be used for residential floor levels (see Figure 14):

- If single storey dwellings are proposed, their lowest habitable floor level should be at or above the 200 year ARI flood level plus freeboard;
- Incorporating flood aware building measures for the design, materials and construction methods used in housing on flood prone land;
- For dwellings with a habitable floor level lower than the 200 year ARI flood level, incorporating the following measures can reduce flood damage:
 - including two or more storeys; and
 - building all external and load bearing internal walls below the 200 year ARI FPL of masonry construction e.g. double brick, concrete block, concrete panel rather than brick veneer or framed walls with sheet cladding; and
 - using timber frame walls with sheet cladding only for non load-bearing internal partitions.

In addition to the above it is also considered important to maintain and review floor level controls that apply to commercial and industrial development. In recognition that the ground level in existing industrial areas would likely result in the substantial sterilisation of land if the 100 flood standard was applied as typically occurs in other NSW LGAs, a differential FPL is recommended dependent on flood vulnerability and scale of development 100 year flood level, generally as follows:

- Land level to be equivalent of flood frequency to 3m below 100 year flood level – All sites.
- Floor level to be at 100 year – Large scale and vulnerable uses.

This would allow for the application of the risk management principle of the planning matrix approach which seeks to distribute land use in the floodplain based on flood vulnerability, where prohibition is undesirable.

The “3m below 100 year flood level” standard is currently extensively relied upon in Council’s existing planning controls. The carry across of this standard as an FPL can have useful application where needing to provide a control that allowed for the integration of new development in existing zoned areas. However this standard should be refined to equal an actual flood that can be mapped and provide an equal level of protection in different parts of the floodplain. A 20 year flood provides a suitable alternative that achieves these objectives. For example 20 year flood relates to an average level approximating 3m below 100 year which would otherwise be:

- a 30/35 year flood level at Windsor (i.e. 14.3m AHD while a 20 year flood is 15.3m AHD); or
- A 10/15 year flood level at North Richmond (i.e. 14.3m AHD while 20 year flood is 13.7m AHD).

While not a planning control specifically identified in the *Land Use Guidelines* (HNFMSC, 2006a) car parking and driveway access are considered to be important inclusions for Council’s FRM DCP provisions. Cars needed for self evacuation also need to be protected as long as road access available.

Notwithstanding the above the DCP provisions there is a need to accommodate concessions for existing changes to existing development. The economic and social

consequences of an absolute prohibition on minor changes to existing development that do not meet the current standards would likely be substantial for no significant FRM benefits.

Having regard, to the above past strategies and the Guidelines and the relevance of the 20, 100 200 and 1000 year flood levels in the Hawkesbury LGA context, it is considered that flood risks categories could be defined for the purposes of mapping, as follows:

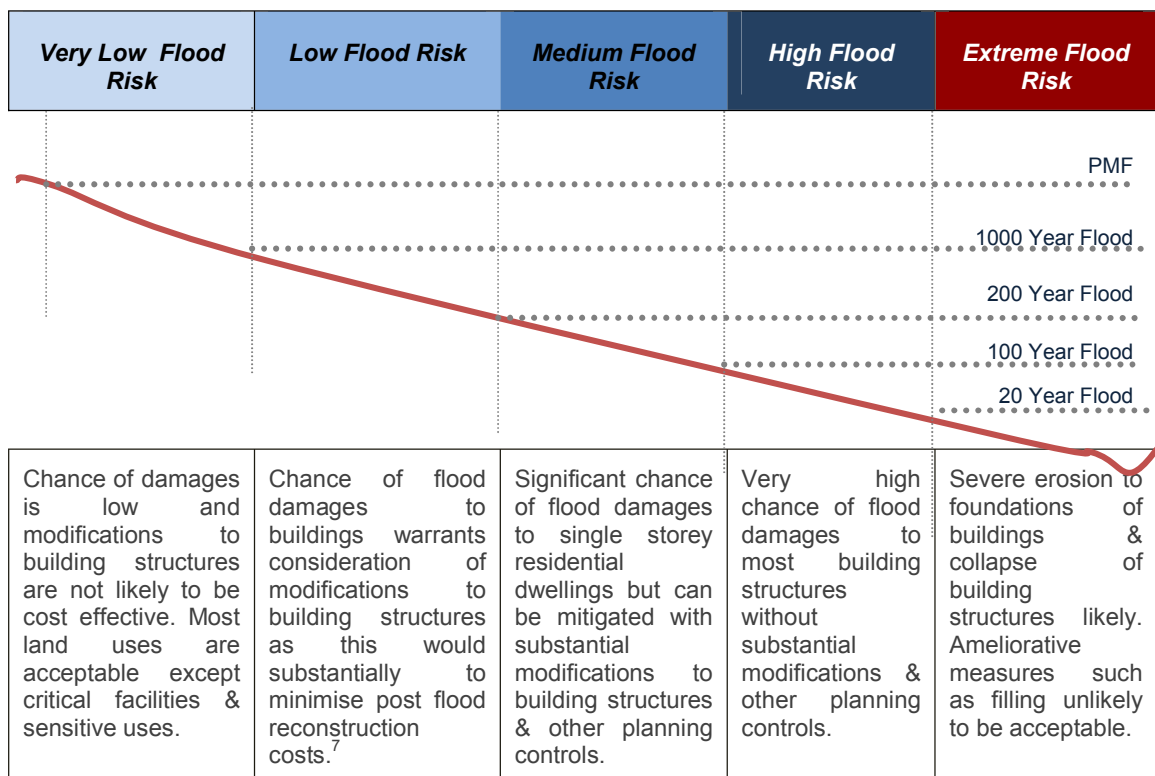


Figure 15: Flood Risk Categories for Mapping Purposes

It is emphasised that the above categorisations of flood risk reflect the delineation of risks after analysing a full range of potential floods and the implications of these floods on various land uses. This has been undertaken as part of past studies and, as specified by the study brief, need not be revisited.

As discussed within the main FRMS report, a separate mapping exercise is required to produce these maps. These maps should extend as far as possible and note any limitation to the area of coverage. The maps would ultimately be required to allow for the efficient application of DCP provisions which apply the planning matrix approach as referenced above. The DCP could apply where mapping is not available, but this will require site specific decisions as to whether further investigation of flood liability is required for individual applications (as would currently be the case). A draft Flood Risk Precincts Map, prepared by Bewsher Consulting is included as **Figure 16**.

⁷ The *Land Use Guidelines* ((HNFMSC, June 2006a, pg.118) identifies that risk can be reduced by minor building requirements. However, these requirements can be promoted as a voluntary measure. Consequently for the purposes of the DCP planning controls outlined later, the "Very Low" and "Low" flood risk categories will be combined.



The use of flood compatible building materials and methods is an important FRM measure in Council's existing planning controls and addressed in detail within *'Reducing Vulnerability of Buildings to Flood Damage – Guidance on Building in Flood Prone Areas'* (HNFMSC June 2006c). This document is an invaluable source of information but is not presented in a format that would be readily applicable in the Development Application (DA) assessment or Construction Certificate (CC) Certification processes. The relevant elements of this document require translation in a "building code" that could be appended to or referred to in Council's DCP as a standard condition for building in parts of the floodplain.⁹

As outlined above, in order to implement the anticipated provisions of the FRMP, an amendment to the DCP is proposed that will introduce an additional chapter within Part C of the DCP to address FRM issues. Draft recommended DCP provisions are

⁸ This Flood Risks Precincts Map incorporates the Low and Very Low categories into the one precinct – being the Low Flood Risk Precinct.

⁹ At the time of preparing this report the Australian Building Codes Board was in the process of preparing a national standard for building within flood prone areas. This standard when available may provide the appropriate mandatory and voluntary standards to be referenced within Council's DCP.

provided at **Appendix C** that incorporate a range of provisions that address the above typical FRM considerations in a manner consistent with the 1997 HNFMAC Strategy and the 2007 HNFMSC Land Use Guidelines. These recommended provisions will need to be considered by Council and ultimately adopted in accordance with the DCP making process specified by the EPA Act.

6.4.3 Communicating Flood Risk

As discussed above, while planning documents are not the principal means to advise people of flood risks for the purposes of creating a flood aware and prepared community, they nonetheless form a component of information sources. To ensure that council exercises an appropriate duty of care of responsibly informing the public of flood risks and to avoid undermining floor awareness education campaigns, it is important to ensure a consistent message is provided by:

- The FRMS and FRMP
- General planning studies and strategies
- Definitions, mapping and controls within planning policies (i.e. LEP and DCP); and
- S149 Planning Certificates

The relevant notification placed on S149(2) certificates are required to advise on whether “*flood related planning controls*” apply to the land for which the certificate applies. “*Flood related planning controls*” is an undefined term. However the relevant form and content recommended for Council’s forthcoming LEP and new DCP provisions would provide a consistent basis for providing S149 notifications, as follows:

- All properties known to be in the PMF would be notified that flood related planning controls apply.
- All properties noted as being subject to flood controls would also be noted as “flood control lots” for the purposes of the Codes SEPP.
- Where flood risk precinct (FRP) mapping has been undertaken the applicable FRP could be noted, with an explanation as to its meaning and application under the DCP provisions.
- Where Council is unsure of whether a property contains flood liable land (due to the lack of flood investigations and mapping in particular areas) a general notation to this effect can be placed with an explanation that a flood study could identify that the land is subject to flooding, in which case flood related controls would apply.

Appropriate wording for the notifications should be determined based on legal advice. This should occur concurrently with the adoption of the new LEP and FRM DCP provisions. At that time it would be appropriate to dispense with historical notations applying to Agnes Banks and the MacDonald Valley, which would become superfluous with the availability of new flood mapping as recommended by the FRMP. All of the above, would be dependent on obtaining of exceptional circumstances variation to the 2007 Flood Planning Guideline, as discussed further below,

6.4.4 Exempt and Complying Development

This issue has effectively become a matter for the DPI through the application of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 (the 'Codes SEPP'). The Rural and General Housing Codes and some exempt development within the Codes SEPP do not apply to "flood control lots" that are identified as high risk or high hazard.

The Codes SEPP provides Council the opportunity to determine where the relevant Codes would not apply, by providing that these areas can be defined as high risk or hazard by the FRMP. The DCP classifications can also serve this purpose. However, in order to take a cautionary view, the FRMP should specify that only areas identified and mapped by Council to be other than High or Extreme Flood risk (i.e. mapped as very low, low or medium risk) are deemed to be not high risk for the purposes of the codes SEPP. This would have the effect of excluding the application of the Codes SEPP in areas where flood risk information is not currently available, which would consequently require the lodgement of a DA where such issues could be reviewed by Council.

6.4.5 Application for Exceptional Circumstances

When a Council proposes to adopt a new planning control (LEP or DCP) which is inconsistent with the 2007 Flood Planning Guideline, approval is required from the Directors-General of the DPC and DPI. This approval needs to be accompanied by an "exceptional circumstances" justification applicable to local circumstances of an individual floodplain or LGA.

Consistent with the provisions of clause 25(5) of LEP 1989 flood related controls currently apply to all development on land within the floodplain, that is, up to and including the PMF. In normal circumstances, the application of any new controls, including the reintroduction of controls in the new comprehensive LEP for residential development above the default FPL would necessitate an application for exceptional circumstances prior to the introduction of a new DCP.

The DPI Circular (PS 07-003 dated 31 January 2007) which accompanied the Flood Planning Guideline, states the following:

"Justification for variations to the above should be provided in writing to, and agreed by, the Department of Natural Resources and the Department of Planning prior to exhibition of a Draft Local Environmental Plan or a Draft Development Control Plan that proposes to introduce flood-related development controls on residential development.

However, the Guideline does acknowledge that controls may need to apply to critical infrastructure (such as hospitals) and consideration given to evacuation routes and vulnerable developments (like nursing homes) in areas above the 100-year flood."

It is recommended that the Comprehensive LEP (LEP 2011) be reviewed in the future to include provisions that require consideration of evacuation and emergency management issues for land above the default FPL prescribed by the Guideline (i.e. 100 year flood plus freeboard). While it is recommended that the current model local provision clause be adopted, this is subject to the definition of flood liable as the area up to the PMF being inserted, and that this is the area of application of the clause where a mapped Flood Planning Area is not available.

Therefore an exceptional circumstance dispensation is required to support the wording in the recommended Draft LEP and DCP provisions. Such controls are consistent with past recommendations of the HNFMAC and HNFMSC, being committees reporting directly to the NSW Government. As discussed above, it is considered essential that Council submit to the DPI and DPC an exceptional circumstances application in order that the duty of care of Council and the DPI and DPC can be properly discharged in accordance with the requirements of the Floodplain Development Manual (as amended by the Flood Planning Guideline).

When seeking the exceptional circumstances dispensation to allow for the future amendment of Draft LEP 2011 (subsequent to making) and the introduction of new FRM DCP provisions as recommended, justification for the exceptional circumstances variation could include:

- The Hawkesbury LEP 1989 flood related provisions apply to land up to and including the PMF.
- The subject planning provisions are endorsed by a comprehensive FRMS and FRMP for the Hawkesbury River floodplain which encompasses a substantial proportion of flood affected land in the LGA.
- As discussed in the FRMS and associated reports, the ability to evacuate safely during major flood events, and the associated emergency management issues, are critical public safety concerns which constrain the viability of future residential development in some parts of the LGA. Therefore evacuation related controls on residential developments potentially affected by these major floods (including events larger than 100 year) are necessary.
- The subject provisions of the LEP and DCP do not seek to impose any prohibition on residential development in excess of that which would be imposed by the default FPL for residential development. In summary, the provisions would seek to require risk to life issues to be addressed and that single dwelling house development on land lower than the 200 year flood level to be of 2 storey construction and of flood compatible materials and construction.
- The proposed controls are consistent with the recommendations of the Hawkesbury-Nepean Floodplain Management Strategy prepared by the Hawkesbury-Nepean Flood Management Advisory Committee (November 1997) and the guidelines, prepared for the Hawkesbury-Nepean Floodplain Management Steering Committee (*Managing Flood Risks Through Planning Opportunities – Guidance on Land Use Planning in Flood Prone Areas*”; and *Reducing Vulnerability of Buildings to Flood Damage – Guidance on Building in Flood Prone Areas*” April 2009);
- No freeboard is proposed to be adopted in the setting of FPLs for planning controls. In particular, while some planning controls will apply to residential development at the 200 year level, this is generally only 0.9m higher than a 100 year flood level plus 0.5m freeboard, being the level that would be allowed by the 2007 Flood Planning Guideline without an exceptional circumstances variation.
- The FRMS has identified significant risk to life issues across all flood liable (i.e. land the subject of floods up to and including the PMF). The flood related risks

being now documented would obligate Council to have regard to these where relevant to a development application in accordance with section 79C (b), (c) and (e) of the EP&A Act, and accordingly it would be logical and administratively appropriate for the planning controls to reflect this.

- In some cases the ability to address the risk to life issues at the DA stage could allow council to support the rezoning of land to facilitate development that would otherwise be inappropriate.

An exceptional circumstances application should be formally drafted and issued to the respective approving Departments as a matter of priority. The application should be accompanied by copies of the FRMS, FRMP and associated reports. Indeed even if refused, the seeking of exceptional circumstances by Council in this case would be an appropriate exercise of its duty of care.

7.0 Summary & Conclusion

This report has been prepared to contribute to the preparation of the Hawkesbury FRMS and FRMP by reviewing planning related issues and providing input to other components of the FRMS (such as demographic characteristics and planning strategies) and to review and provide recommendations in regard to Council planning controls and associated policies. The following is a summary of the key findings:

1. During the 30 years between the 1986 and 2006 Censuses, the total number of persons within the floodplain have increased by around 17,000 and dwellings increased by about 7,700. This growth would likely have reached a plateau over recent years with the recognition of significant flood risks since the adoption of the 1997 HNFMAC Strategy and the subsequent adoption of modest growth targets for the LGA in recognition of these risks.
2. Key population characteristics of the floodplain as drawn for the 2006 Census include:
 - An aging population with about 4000 persons aged 65 or over, with the elderly being a potential sector requiring evacuation assistance;
 - Approximately 1500 persons are within the category of “*has need for assistance with core activity*” which is a further indicator of the number of persons that may require special attention during an evacuation;
 - An average car ownership of 1.6 per dwelling but noting that there are approximately 1020 dwellings with no vehicle and these may also need evacuation assistance.
3. Council has prepared a “Residential Land Strategy” to accommodate approximately 5,000 to 6000 additional dwellings by 2031 (as prescribed by the North West Subregional strategy) primarily within the existing urban areas. The Strategy was approached on the basis of maximising the potential for future housing in and around existing centres. In addition, Council’s Employment Lands Strategy identifies areas for investigation for further industrial development. In assessing the suitability of potential new urban releases and expanded urban areas based on flood risk, an assessment of risk to life is the paramount consideration.
4. The main FRMS report prepared by Bewsher Consulting outlines an approach to planners and the consent authorities regarding how to grade the acceptability of potential additional urban areas, into four classes (Evacuation Risk Categories – “ERCs”). This draws on the evacuation capability assessment (“ECA”) provided within the main report of the FRMS. In summary this assessment concludes as following:

INVESTIGATION AREAS	Existing Situation (2010)		2031 with Measures* to Improve Evacuation Capability	
	More Conservative Evaluation	Less Conservative Evaluation	More Conservative Evaluation	Less Conservative Evaluation
Residential Land Strategy plus Development within Existing Zoned Land				
Richmond	D	C	D	B
Windsor	D	C	C	B
N Richmond	B	B	B	B
Wilberforce	B	B	B	B
Glossodia	B	B	B	B
Windsor/Bligh Pk	B	B	B	B
Metropolitan Development Program (MDP)				
Bligh Park Stage 2	n.a.	n.a.	D	B
Pitt Town	B	B	n.a.	n.a.
Vineyard	B	B	B	B

* These measures include dual outbound lanes on the Jim Anderson Bridge and provision of community refuges on flood islands. A range of other measures canvassed in Volume 1 should also be considered and may also be appropriate in the circumstances of individual communities (but do not alter the general planning advice provided in this table).

Class A	Risks are Minor – Limited Consideration is Required
Class B	Risks are Moderate – Detailed Consideration is Required
Class C	Risks are Serious – Very Detailed Consideration is Required
Class D	Risks are Intolerable/Unacceptable – Development Should Not Proceed

- A number of SEPP's including deemed SEPPs (being SREP 20 - Hawkesbury Nepean River) refer and sometimes define what is understood to be flood liable land. These policies are not consistent in this regard. Council does not have control of these Policies but the FRMP should be forwarded to the DPI when adopted for a request that any future Policy reviews have regard to this Plan.
- Council's existing comprehensive DCP does include peripheral provisions that address some flood issues but do not include a specific FRM component. A FRM specific chapter has been prepared to reflect the detail planning recommendations of the FRMS and preceding HNFMAC Strategy and HNFMSC Guidelines for Council's consideration and incorporation within the

comprehensive DCP. This should occur in conjunction with a future review of Draft LEP 2011 (subsequent to it being made).

7. The adopted comprehensive Draft LEP 2011 (in the Standard Instrument format) does incorporate flood related provisions but was prepared prior to the adoption of a standard local provision by the DPI. It is recommended that Council review the flood related provisions of the Draft LEP in consultation with the DPI to generally incorporate the relevant parts of the standard local provisions, except that it consistently defines for all development types that flood liable land is up to and inclusive of the PMF. The LEP flood map should simply delineate the known extent of the PMF. This should now occur subsequent to the making of the LEP due to the stage it has progressed to.
8. Climate change flood risk is not an issue that requires to be specifically addressed in planning controls at this stage.
9. The FRMP should specify that only areas mapped by Council to be Medium, Low or Very Low Flood risk are deemed to not be 'high risk' for the purposes of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 (the 'Codes SEPP'). This would have the effect of excluding the application of the Codes SEPP in areas where flood risk information is not currently available as well as in High and Extreme Flood Risk precincts, which would consequently require the lodgement of a DA to allow flood risk issues to be reviewed by Council.
10. Maps should be prepared to support the DCP, which delineate five flood risk precincts – Extreme, High, Medium, Low and Very Low. The maps could provide a separate line that depicts the floodway extent. Once these maps are available, the draft DCP provisions (**Appendix C**) should be reviewed and finalised. The review should examine the practicality of the recommended controls with regard to development otherwise permissible in existing urban areas (e.g. whether a requirement for more than one storey for a dwelling house with a ground floor at the 100 year level would be of an appropriate scale with regard to streetscape and amenity considerations).
11. Existing S149 notifications generally reflect the legislative requirements of such documents plus some additional advice that has been historically provided. The recommended LEP and DCP provisions, together with the adoption of the FRMP will provide a basis for the rationalisation of S149 Notifications.
12. Development Contributions Plans could be established within the study area, where it is necessary or appropriate to fund flood risk mitigation works through such plans. This would be mostly relevant in new greenfield release areas or substantial urban renewal areas where such works are required to ensure the acceptability of the development.
13. An exceptional circumstances application should be formally drafted and issued to the respective approving Departments as a matter of priority to allow for the eventual implementation of planning controls, above the 100 year flood level, for residential development. An outline of the justification is provided which includes the current existence of planning controls for residential development

above the 100 year flood level, the exceptional risk to life and property due to the peculiar nature of flooding in the study area and a decision not to apply a freeboard. The application should be accompanied by copies of the FRMS, FRMP and associated reports.

The following table provides a summary of the existing and proposed planning policies and associated recommendations:

Consideration	LEP		DCP		S149 Certificates	
	Existing ¹¹¹²	Proposed	Existing	Proposed	Existing	Proposed
Definitions	1-in-100 year flood level for an area of land means the height above Australian Height Datum to which the Council has determined that a 1-in-100 year flood is likely to rise on that land.	Floodplain means the area of land which is subject to inundation by the probable maximum flood. Probable maximum flood is the largest flood that could conceivably occur at a particular location. ¹³	Floodplain means the floodplain level nominated in a LEP or those areas below the 1 in 100 flood event if no level has been nominated.	Floodplain (being synonymous with flood liable and flood prone land) is the area of land which is subject to inundation by the probable maximum flood (PMF). Probable maximum flood is the largest flood that could conceivably occur at a particular location. ¹⁴	Advices generally provide information on the level of the 100 year flood except for the MacDonald River catchment where information in regard to extreme floods is provided. In all cases appropriate warning that floods greater than the 100 year flood may occur.	LEP and DCP provisions to apply generally to all flood prone land (i.e. up to the PMF). Accordingly all S149(2) Certificates to advise that LEP and DCP apply to all land within the PMF. Advice of the applicable flood risk precinct and other site specific flood information available to Council should be provided on a S149(5) Certificate. While not mandatory, such additional information might also be included on a S149(2) Certificate as an advisory note. The final wording of S149 Certificates should be subject to legal advice.

¹¹ SREP 20 – Hawkesbury Nepean River overrides LEP 1989 in regard to some development and adopts separate definitions for a floodplain (up to a 100 year flood), flood prone land (up to the PMF) and floodways.

¹² The existing situation referred to for the purposes of this table is LEP 1989.

¹³ These terms are consistent with the definitions provided within the NSW Government FDM but simplified for the purposes of the LEP.

¹⁴ The floodplain definition is exactly as provided in the NSW Government FDM and has common terms that could increase public understanding. The PMF definition is simplified.

Consideration	LEP		DCP		S149 Certificates	
	Existing ¹¹¹²	Proposed	Existing	Proposed	Existing	Proposed
Residential floor level FPL	<u>Rural</u> New lots not to be created unless containing an area of land above the 100 year flood level suitable for a dwelling <u>Non-Rural</u> 100 year flood level for the area in which the land is located ¹⁵	<u>Rural</u> Not to be referred to <u>Non-Rural</u> Not to be referred to	<u>Rural</u> Compliance with LEP <u>Non-Rural</u> Compliance with LEP	<u>Rural</u> 200 year flood level if one storey (habitable) or 100 year flood level if min. two storeys (habitable). <u>Non-Rural</u> 200 year flood level if one storey (habitable) or 100 year flood level if min. two storeys (habitable).	<u>Rural</u> NA <u>Non-Rural</u> NA	<u>Rural</u> NA <u>Non-Rural</u> NA
Non Residential floor level FPL (Commercial, Industrial, etc)	No lower than 3m below the 100 year flood level for the area in which the land is located.	Not to be referred to.	Compliance with LEP	Differential FPL dependent on flood vulnerability and scale of development 100 year flood level, generally as follows: - Land level to be 20 year flood level – All sites. - Floor level to be at 100 year – Large scale and vulnerable uses.¹⁶	NA	NA

¹⁵ Applies to only habitable rooms. Buildings are permitted on land no lower than 3m below the 100 year flood level, which means that non-habitable floor levels could be as low as that level.

¹⁶ It is intended to adopt differential FPLs that relate to specific flood frequencies to provide a simplified and consistent basis to communicate flood risk. Uses considered to be large scale or vulnerable are defined in the recommended Draft DCP.

Consideration	LEP		DCP		S149 Certificates	
	Existing ¹¹¹²	Proposed	Existing	Proposed	Existing	Proposed
Freeboard	Nil	Nil	Nil	Nil	NA	NA
Consideration of Evacuation Issues	Required for all land subject to “flood liability” ¹⁷	To be required for all land in the “floodplain” as a head of consideration	Access to subdivision to be above 100 year flood	To be required for all land in the “floodplain” as a head of consideration	NA	NA
Objectives	None stated	To be stated – generally to reduce risk to people and property.	To reduce risk to people and property.	To be restated and expanded upon to provide clarity (see recommended Draft DCP).	NA	NA
Consideration of Zoning and Development Standards (1)	NA	- Do not zone new areas for urban development or provide planning controls in existing areas that allow higher density housing unless “evacuation capable.” - Adopt new model local LEP provisions in draft LEP 2009, subject to above definitions.	Reflects LEP provisions with minimal additional detail.	Amend DCP to introduce an additional chapter within Part C of the DCP to address FRM issues, including: - Differential FPLs - Details of flood compatible building materials and methods as per future National Construction Code or OEH Guidelines. - Site and local evacuation measures. - Other general best practice FRM controls.	NA	NA

¹⁷ This is required by clause 25(5) of the LEP. *Flood liability* is undefined but could reasonably be interpreted to apply to all flood liable land up to the PMF, consistent with the FDM definition.

Consideration	LEP		DCP		S149 Certificates	
	Existing ¹¹¹²	Proposed	Existing	Proposed	Existing	Proposed
Other Prescriptive requirement	Provides criteria for “ <i>minor structures such as outbuildings, sheds and garages.</i> ”	Nil	Nil	To contain detail prescriptive criteria for the majority of development types and issues.	NA	NA
Performance Criteria	NA	NA	Nil	To contain performance criteria for the majority of development types and issues.	NA	NA
Climate change factors	Not stated	Additional considerations not to be introduced at this stage. ¹⁸	Not stated	Additional considerations not to be introduced at this stage. (Defer until current review of <i>Australian Rainfall & Runoff</i> rainfall design data is completed).	NA	NA
Exempt Development	No exemptions due to flooding. ¹⁹	No exemptions due to flooding.			NA	NA
Complying Development	Excluded from land lower than 1.2m below the 100 year flood level.	Exclude all land that is lower than the 200 year flood level or evacuation constrained as high hazard. ²⁰	Nil	Identify all land that is lower than the 200 year flood level or evacuation constrained as high hazard. ²¹	NA	NA

¹⁸ Sea level rise benchmarks adopted by the NSW government would not have any substantive relevance to the determination of appropriate planning controls. Projected changes in regard to rainfall intensities are not yet definitive.

¹⁹ Subject to detail review, the type of development permitted as “exempt” is minor and should not require addition FRM considerations.

²⁰ This would be achieved by including the description within the list applying to “environmentally sensitive areas” under clause 3.3, and would have the effect of excluding the application of the Complying Development Codes SEPP to new housing and other development. Between this area and the PMF extent complying development for housing would be permitted with no additional FRM controls as set out in the SEPP.

²¹ This would have the effect of excluding the application of the Complying Development Codes SEPP to new housing and other development, to be consistent with the above.

8.0 Glossary

100 year flood	A flood that occurs on average once every 100 years. Also known as a 1% flood. See annual exceedance probability (AEP) and average recurrence interval (ARI) .
annual exceedance probability (AEP)	AEP (measured as a percentage) is a term used to describe flood size. It is a means of describing how likely a flood is to occur in a given year. For example, a 1% AEP flood is a flood that has a 1% chance of occurring, or being exceeded, in any one year. It is also referred to as the '100 year flood' or 1 in 100 year flood'. The terms 100 year flood , 50 year flood , 20 year flood etc, have been used in this study. See also average recurrence interval (ARI) .
Australian Height Datum (AHD)	A common national plane of level approximately equivalent to the height above sea level. All flood levels , floor levels and ground levels in this study have been provided in metres AHD.
average recurrence interval (ARI)	ARI (measured in years) is a term used to describe flood size. It is the long-term average number of years between floods of a certain magnitude. For example, a 100 year ARI flood is a flood that occurs or is exceeded on average once every 100 years. The terms 100 year flood , 50 year flood , 20 year flood etc, have been used in this study. See also annual exceedance probability (AEP) .
catchment	The land draining through the main stream, as well as tributary streams.
DPI	The NSW Department of Planning and Infrastructure (formerly Department of Planning – DoP).
Development Control Plan (DCP)	A DCP is a plan prepared in accordance with Section 72 of the <i>Environmental Planning and Assessment Act, 1979</i> that provides detailed guidelines for the assessment of development applications.
emergency management	A range of measures to manage risks to communities and the environment. In the flood context it may include measures to prevent, prepare for, respond to and recover from flooding.
EP&A Act	<i>Environmental Planning and Assessment Act, 1979.</i>
flood	A relatively high stream flow that overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami.
flood hazard	The potential for damage to property or risk to persons during a flood . Flood hazard is a key tool used to determine flood severity and is used for assessing the suitability of future types of land use.
flood level	The height of the flood described either as a depth of water above a particular location (eg. 1m above a floor, yard or road) or as a depth of water related to a standard level such as Australian Height Datum (eg the flood level was 7.8m AHD). Terms also used include flood stage and water level .

flood liable land	Land susceptible to flooding up to the probable maximum flood (PMF) . Also called flood prone land . Note that the term flood liable land now covers the whole of the floodplain , not just that part below the flood planning level .
flood planning levels (FPLs)	The combination of flood levels and freeboards selected for planning purposes, as determined in floodplain management studies and incorporated in floodplain management plans . The concept of flood planning levels supersedes the designated flood or the flood standard used in earlier studies.
flood prone land	Land susceptible to flooding up to the probable maximum flood (PMF) . Also called flood liable land .
flood proofing	A combination of measures incorporated in the design, construction and alteration of individual buildings or structures subject to flooding, to reduce or eliminate damages during a flood .
Flood risk precinct	An area of land with similar flood risks and where similar development controls may be applied by a council to manage the flood risk . (The flood risk is determined based on the existing development in the precinct or assuming the precinct is developed with normal residential uses). The floodplain is categorised into different flood risk precincts – in this case five precincts are to be applied for the purposes of preparing planning controls. (See also risk).
Flood Study	A study that investigates flood behaviour, including identification of flood extents, flood levels and flood velocities for a range of flood sizes.
floodplain	The area of land that is subject to inundation by floods up to and including the probable maximum flood event, that is, flood prone land or flood liable land .
Floodplain Risk Management Plan	The outcome of a Floodplain Risk Management Study . (Note that the term 'risk' is often dropped in common usage).
Floodplain Risk Management Study	Studies carried out in accordance with the <i>Floodplain Development Manual</i> (NSW Government, 2005) that assesses options for minimising the danger to life and property during floods . These measures, referred to as 'floodplain management measures/options', aim to achieve an equitable balance between environmental, social, economic, financial and engineering considerations. The outcome of a Floodplain Risk Management Study is a Floodplain Risk Management Plan .
floodway	Those areas of the floodplain where a significant discharge of water occurs during floods . Floodways are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood levels .
foreshore building line	A line fixed by resolution of Council in respect of land fronting any bay, river, creek, lagoon, harbour or ocean, which provides a setback distance where buildings or other structures would normally be prohibited.

freeboard	A factor of safety expressed as the height above the design flood level . Freeboard provides a factor of safety to compensate for uncertainties in the estimation of flood levels across the floodplain , such as wave action, localised hydraulic behaviour and impacts that are specific event related, such as levee and embankment settlement, and other effects such as “greenhouse” and climate change.
high flood hazard	For a particular size flood , there would be a possible danger to personal safety, able-bodied adults would have difficulty wading to safety, evacuation by trucks would be difficult and there would be a potential for significant structural damage to buildings.
hydraulics	Term given to the study of water flow in waterways; in particular, the evaluation of flow parameters such as water level and velocity .
hydrology	Term given to the study of the rainfall and runoff process; in particular, the evaluation of peak discharges , flow volumes and the derivation of hydrographs (graphs that show how the discharge or stage/flood level at any particular location varies with time during a flood).
Local Environmental Plan (LEP)	A Local Environmental Plan is a plan prepared in accordance with the <i>Environmental Planning and Assessment Act</i> , 1979, that defines zones, permissible uses within those zones and specifies development standards and other special matters for consideration with regard to the use or development of land.
low flood hazard	For a particular size flood, able-bodied adults would generally have little difficulty wading and trucks could be used to evacuate people and their possessions should it be necessary.
merit approach	The principles of the merit approach are embodied in the <i>Floodplain Development Manual</i> (NSW Government, 2005) and weigh up social, economic, ecological and cultural impacts of land use options for different flood prone areas together with flood damage, hazard and behaviour implications, and environmental protection and well being of the State’s rivers and floodplains .
OEH, DPC	Department of Premier and Cabinet - Office of Environment and Heritage (being the government agency currently responsible for flooding in NSW – formerly the Department of Environment, Climate Change and Water, DECCW).
overland flow path	The path that floodwaters can follow if they leave the confines of the main flow channel. Overland flow paths can occur through private property or along roads. Floodwaters travelling along overland flow paths, often referred to as ‘overland flows’, may or may not re-enter the main channel from which they left — they may be diverted to another water course.
probable maximum flood (PMF)	The largest flood likely to ever occur. The PMF defines the extent of flood prone land or flood liable land , that is, the floodplain . The extent, nature and potential consequences of flooding associated with the PMF event are addressed in the current study.
reliable access	Reliable access during a flood means the ability for people to safely evacuate an area subject to imminent flooding to a defined regional evacuation route within effective warning time, having regard to the depth and velocity of flood waters, the suitability of the local evacuation route, and without a need to travel through areas where water depths increase.

risk

Risk is measured in terms of consequences and likelihood. In the context of floodplain management, it is the likelihood and consequences arising from the interaction of floods, communities and the environment. For example, the potential inundation of an aged person's facility presents a greater flood risk than the potential inundation of a sports ground amenities block (if both buildings were to experience the same type and probability of flooding). Reducing the probability of flooding reduces the risk, increasing the consequences increases risk. (See also **flood risk precinct**).

9.0 References

Bewsher & Grech, May 1997, *A New Approach to the Development of Floodplain Controls for Floodplains*, paper presented to the 37th Annual Floodplain Management Conference, Maitland.

Clarke, Sue & Leonie Tickle May 2001 *Household Financial Flood Risk Investigation*. Prepared for HNFMSC.

DoP, December 2007, *North West Subregion Draft Subregional Strategy*.

DoP (February 2010) *Metropolitan Development Program Residential Forecasts 2008/09 - 2017/18*

DoP (August 2010) *NSW Coastal Planning Guideline: Adapting To Sea Level Rise*.

Don Fox Planning and Bewsher Consulting (October 1997), *'Land Use Planning and Development Control Measures'*, prepared for Hawkesbury-Nepean Flood Management Advisory Committee.

Egan National Valuers (NSW Pty Ltd) July 2000. *Valuation Study: Assessment of the impact of planning controls and public notifications regarding flood risks upon property values*. Prepared for the HNFMAC

Hassell, 2010, *'Hawkesbury Residential Land Strategy'*, prepared for Hawkesbury City Council.

Hawkesbury-Nepean Flood Management Advisory Committee (HNFMAC), November 1997, *'Achieving a Hawkesbury-Nepean Floodplain Management Strategy'*.

Hawkesbury-Nepean Floodplain Management Steering Committee (HNFMSC), June 2006a, *'Managing Flood Risk Through Planning Opportunities – Guidance on Land Use Planning in Flood Prone Areas'*.

Hawkesbury-Nepean Floodplain Management Steering Committee (HNFMSC), June 2006b, *'Designing Safer Subdivisions – Guidance on Subdivision Design in Flood Prone Areas'*.

Hawkesbury-Nepean Floodplain Management Steering Committee (HNFMSC), June 2006c, *'Reducing Vulnerability of Buildings to Flood Damage – Guidance on Building in Flood Prone Areas'*.

NSW Department of Planning, December 2007, *'North West Subregion Draft Subregional Strategy'*.

NSW Government, April 2005, *'Floodplain Development Manual: the management of flood liable land'*.

SGS Economics and Planning, December 2008, *'Hawkesbury Employment Land Strategy'*, prepared for Hawkesbury City Council.

Appendix A

Draft Model Flood Clause for Standard LEPs

Draft Model Local Provision – Flood Planning

Consultation is focussed on subclauses (4) & (5) relating to sea level rise impacts. Subclauses (1) to (3) inclusive have already been exhibited and submissions received as part of the exhibition of the second round of model clauses for the Standard Instrument.

General Comments

Councils are first encouraged to complete their flood studies and risk assessment, where practicable, and to translate the information regarding flood planning areas. This together with Council's other strategic work should inform, not only the application of appropriate zones and land uses in flood planning areas but also provide background to subdivision patterns and the associated consideration of evacuation routes. Care should therefore be taken in determining the permissible development on land that may be subject to flooding to ensure that appropriate uses are included and that relevant types of development require consent under the applicable zones.

Councils are then encouraged to apply the clause (below) in flood planning areas, particularly where flooding matters cannot be fully addressed by appropriate zoning and selection of land uses e.g. in areas where an existing zone and existing land uses include residential uses. Councils' attention is also drawn to the section 117 Direction 4.3 Flood Prone Land.

In applying the clause, councils should, wherever possible, provide a map of flood planning areas. This will assist councils in demonstrating their consideration of s 149(2) certificate matters. Further details of requirements behind the clause should be provided in councils' DCPs. This may include, for example, evacuation route maps, setbacks for buildings, types of construction.

Objectives of the clause:

The objectives incorporate material provided by DECCW and discussed again with DECCW and SES earlier this year (2010). Submissions to the second round of draft model clauses have also informed the content.

It is anticipated that DECCW will provide advice on detailed matters as an interim prior to Guidelines being issued.

Assessing flooding

The clause is worded so that if there are additional flood planning land that is not mapped, this land is included for consideration i.e. the heads of consideration still apply in determining whether consent should be granted.

Definitions and technical details

The terms in the clause are from the NSW Government's 2005 *Floodplain Development Manual*. Refer to this manual for appropriate technical details.

Mapping

Flood Planning Maps are to be drafted in accordance with the 'Standard technical requirements for LEP maps'. Flood Planning Maps must identify flood planning areas. Flood Planning Areas should be shown in solid colour on the map (one polygon class to identify the Flood Planning Area, where known – labelled "Flood Planning Area" and a fill RGB colour of XXX:XXX:XXX).

**Natural Resource Management in the Standard Instrument LEP
Not Government Policy
Draft for consultation only**

The map legend and corresponding marking on the map itself must clearly identify land as 'Flood Planning Area'. No other term is to be used for this area.

A note should be included in the legend of the map to make it clear that other land subject to the 1:100 ARI flood event is not shown on the map.

Once subclauses 4 and 5 are adopted the provision will also apply to unmapped areas that are subject to the discharge of a 1:100 average recurrence interval flood event, both current and projected for 2100, plus freeboard i.e. one polygon class to identify the projected 2100 Flood Planning Area, where known – labelled “projected 2100 Flood Planning Area” and a fill RGB colour of XXX:XXX:XXX.

Adapting to Sea Level Rise

The Department of Planning released the Draft NSW Coastal Planning Guideline: Adapting to Sea Level Rise for public consultation in November 2009. A draft coastal risk planning clause was included in the draft guideline for comment. In response to comments and submissions received, the draft clause has been amended to specifically relate to coastal risks associated with coastal erosion and tidal inundation, including exacerbation of risks as a result of sea level rise. Reference to coastal flooding has been removed and instead it is proposed to amend the following draft flooding clause to incorporate consideration of sea level rise.

The additional subclause in the draft flood planning area clause below is intended to be used to identify in the LEP land above the existing flood planning area that, as a result of sea level rise, may become part of the flood planning area in the future. That is, the 1:100 ARI or 1% AEP flood line may in some locations cover a greater area due to changes in tailwater levels. The procedure for councils to initially identify and map the 'projected 2100 flood planning area' is outlined in the draft Flood Risk Management Guide 2009 which (once finalised) will update the sea level rise information in the NSW Floodplain Development Manual (NSW Government 2005).

The additional subclause requires the consent authority to take into account the same considerations as development located in the flood planning area, in certain circumstances depending on:

1. proximity of the development to the flood planning area (e.g. immediately adjoining the current flood planning area)
2. intended design life of the development (e.g. major long-term infrastructure)
3. scale of the development (e.g. large subdivisions)
4. sensitivity of the development in relation to future safe evacuation requirements (e.g. aged-care, schools and other buildings with vulnerable occupants or evacuation challenges).

These four factors above may justify the application of “exceptional circumstances” in the context that the flood planning area may cover a far greater area in the future (as a result of sea level rise) and it will be of greater concern in those four instances listed above. If Council considers it may be able to make a case for exceptional circumstances, Council must follow the requirements of section 117 Direction 4.3(7) in this regard.

Influence on LEP

Consideration of flood impacts is important when preparing a LEP and the work done under the Floodplain Risk Management Manual 2005 is vital to this. The Manual indicates the flood planning area (up to the 1:100 ARI plus freeboard) is generally the appropriate area in which residential flood controls should be considered.

Once council has completed its flood study and its risk management plan, council has a number of tools that will assist in giving effect to the study and plan:

In the LEP where greatest risk is recognised (generally up to flood planning level), these tools include:

- appropriate zone/s selection in areas with high risk/hazard (generally the floodway and the rest of the flood planning area); and
- selecting appropriate land uses in these zones; and,

Natural Resource Management in the Standard Instrument LEP
Not Government Policy
Draft for consultation only

- then, applying a local provision (Flood clause) where there may be some residual impact on proposed development in the flood planning area,

In a DCP, council has the option of providing flooding controls in the DCP generally as additional detail for example, showing evacuation routes, setbacks and other details for development. This approach is generally consistent with both the existing s. 117 direction and the manual. There is always the consideration that the approach needs to be flexible and provide adequate controls particularly where flood frequency is greatest (below the flood planning level) yet not unduly constrain development, particularly above the flood planning level.

Draft Model Local Provision – Flood Planning Area

Flood planning

General information

Councils are first encouraged to complete their flood studies and risk assessment, where practicable, and to translate the information regarding flood planning areas. This together with Council's other strategic work should inform, not only the application of appropriate zones and land uses in flood planning areas but also provide background to subdivision patterns and the associated consideration of evacuation routes. Care should therefore be taken in determining the permissible development on land that may be subject to flooding to ensure that appropriate uses are included and that relevant types of development require consent under the applicable zones.

Councils are then encouraged to apply the clause (below) in flood planning areas, particularly where flooding matters cannot be fully addressed by limiting land uses e.g. in areas where an existing zone and existing land uses include residential uses.

Councils in coastal areas may wish to refer to 'projected sea level rise' instead of 'climate change' in subclause (1) (b).

Councils' attention is also drawn to the section 117 Direction 4.3 Flood Prone Land.

In applying the clause, councils should provide a map of the areas in which flood planning area is identified. This will assist councils in demonstrating their consideration of s 149(2) certificate matters.

Further details of requirements behind the clause should be provided in councils' DCPs. This may include, for example, evacuation route maps, setbacks for buildings, types of construction.

- (1) The objectives of this clause are as follows:
 - (a) to minimise the flood risk to life and property associated with the use of land,
 - (b) to allow development compatible with the land's flood hazard, taking into account projected changes as a result of climate change,
 - (c) to avoid significant adverse impacts on flood behaviour and the environment.
- (2) This clause applies to:
 - (a) land that is shown as "Flood planning area" on the Flood Planning Map, and
 - (b) other land at or below the flood planning level.

Drafting direction

Councils know of some areas that flood and those areas are mapped as "flood planning area", but there are other areas where accurate mapping is not possible. Consequently, the wording of this subclause captures the land that can be accurately mapped and the land that cannot. Such unmapped land includes the "flood planning area" (as defined in the Floodplain Development Manual) up to the "flood planning level".

- (3) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the development:
 - (a) is compatible with the flood hazard of the land; and
 - (b) will not significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties, and
 - (c) incorporates appropriate measures to manage risk to life from flood, and

Natural Resource Management in the Standard Instrument LEP
Not Government Policy
Draft for consultation only

- (d) will not significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses, and
- (e) will not be likely to result in unsustainable social and economic costs to the community as a consequence of flooding.

The following subclauses are ONLY to be added once the “Draft NSW Coastal Planning Guideline: Adapting to Sea Level Rise” has been finalised

- (4) Subclause (5) applies to:
 - (a) land shown as “projected 2100 flood planning area” and “projected 2050 flood planning area” on the Flood Planning Map; and to
 - (b) other land below the projected 2100 flood planning level and the projected 2050 flood planning level as a consequence of projected sea level rise.
- (5) When determining development to which this subclause applies, council must take into consideration any relevant matters outlined in **subclause 3(a) – (e)**, depending on the context of the following:
 - (a) the proximity of the development to the current flood planning area; and
 - (b) the location of development in relation to projected sea level rise; and
 - (c) the intended design life of the development; and
 - (d) the scale of the development; and
 - (e) the sensitivity of the development in relation to future effective self-evacuation of the land, and if not possible, the low risk occupation in time of flood, and
 - (f) the potential to relocate, modify or remove the development.

Drafting direction

Subclauses (4) & (5) shall only be used once council has identified the ‘projected 2100 flood planning area’ and ‘projected 2050 flood planning area’ as outlined in the to be finalised draft Flood Risk Management Guide 2009, which will update the sea level rise information in the NSW Floodplain Development Manual 2005.

Where a council does not adopt these sea level rise provisions, subclauses (7) and (8) become subclauses (4) and (5) respectively, except for the definition of “projected sea level rise.”

- (6) A word or expression used in this clause has the same meaning as it has in the NSW Government’s *Floodplain Development Manual* published in 2005, unless it is otherwise defined in this clause.
- (7) In this clause:
 - flood planning area** means the land shown as “Flood planning area” on the Flood Planning Map.
 - flood planning level** means the level of a 1:100 ARI (average recurrent interval) flood event plus [insert number 0.xx in metres] freeboard.
 - Flood Planning Map** means the [Name] Local Environmental Plan 2010 Flood Planning Map.
 - projected sea level rise** means the 2050 and 2100 sea level rise planning benchmarks as specified in the NSW Government’s *Sea Level Rise Policy Statement 2009*.

Drafting direction

The definition of **projected sea level rise** shall only be included in subclauses (6) once council has identified the ‘projected 2100 flood planning area’ as outlined in the to be finalised draft Flood Risk Management Guide 2009, which will update the sea level rise information in the NSW Floodplain Development Manual 2005.

Appendix B

Estimates of Vehicles to Evacuate SES Sectors in an Extreme Flood

Estimates of Vehicles to Evacuate SES Precincts in an Extreme Flood

Windsor SES Sector	2006	2010	2031
Residents (1)			
No of dwellings (2)(3)	3599	3653	4553
No of cars per occupied dwelling (4)(5)	4751	4822	6010
No of cars per dwelling that would be used to evacuate (6)(7)	4276	4340	5409
Non-resident Workers			
Total number of Workers (8)(9)	8035	8196	9633
Total number of workers less those counted as residents (10)(11)	1607	1639	1927
Non-private Vehicles			
No of addition vehicles (12)	294	299	367
TOTAL	6177	6278	7702

Notes:

- Numbers of workers and residents are calculated on those estimated to located within the PMF extent.
- The 2006 dwelling estimates are based on the 2006 census data for occupied dwellings (as counted on Census night which was marginally greater than adjusted figures for place of usual residence) for the collector districts which coincide with the SES Sectors. Where collector districts do not coincide the SES sectors, aerial photographs were used to estimated the proportion of the population of the collector district in the SES Sector.
- The dwelling forecasts for the Hawkesbury LGA at 2010 are based on an increase of the relative proportion of an additional 300 dwellings from the 2006 Census. The increase in 300 dwellings is estimated based on Council DA approvals between April 2006 and April 2010 (an additional 289 dwellings) and which allows 3 months for construction, construction proceeding on older DAs for about 10 additional dwellings and assumes all DAs are converted to actual building starts. The number of dwellings in the 3 SES precincts has been estimated based on the proportion of existing dwellings to total LGA population in each precinct by the total number of dwellings in the LGA.
- The dwelling forecasts for the Hawkesbury LGA at 2031 are based on planning targets for 2031, being an additional 5,000 dwellings between 2010 and 2031. The number of dwellings in the 3 SES precincts has been estimated based on the proportion of existing dwellings to total LGA population in each precinct by the total number of dwellings in the LGA.
- It is assumed that there is no net additional other persons that require to evacuate. For example if there are day or over-night visitors within the floodplain then there would be an equal number of usual residents in the floodplain that would be visiting locations outside of the floodplain. The 2006 census revealed that the adjusted resident population based on place of usual residence (39,909) was very close (99.2%) to the actual census count for persons residing in the PMF floodplain.
- The average number of vehicles per dwelling within the PMF floodplain at the 2001 and 2006 censuses was 1.54 and 1.56 respectively. The actual average number of cars per dwelling for each of the SES sectors as at the 2006 census is used plus an allowance for growth. (assuming an average upward trend of 0.02 vehicles per dwelling over 20 years).
- It is assumed that not all cars would be used to evacuate. Approximately 5% of dwellings within the PMF extent in the LGA do not have a car. Others, such as parents with young families may choose to travel together. Therefore it is assumed that 90% of dwellings would need to be able to evacuate.
- The NSW Transport Data Centre "Travel Zone Employment Forecasts" (October 2009 Release) use the 2006 Census data and a detailed forecast model. The forecasts for number of jobs within the Hawkesbury LGA at 2006, 2011 and 2031 are 25486, 25,998 and 30,556 respectively. The 2011 forecast is used for 2010 above.
- The number of workers in the 3 SES precincts has been estimated based on the total proportion of resident population to total LGA population by the total number of jobs in the LGA and then distributed across the 3 SES precincts based on the proportion of Commercial properties/businesses in each precinct as determined from the NEXIS data provided by Molino Stewart (June 2011, Table 3). As a substantial number of residents in the LGA work in the LGA and having regard to the types of industries that employ people in high proportions (such as public administration, education, health care and agriculture) this is considered a reasonable approach.
- The number of workers that may need to evacuate is then converted to non-resident workers, to avoid double counting of residents already accounted for as working in the LGA. The Employment Lands Strategy (SGS, 2008, pg.29) notes that in the Hawkesbury LGA around 80 percent of local jobs are filled by residents.
- It is assumed that each non-resident worker to evacuate will have do so by private vehicle. This is considered reasonable on the basis that the majority of people commuting into the LGA to work would do so by car.
- A number of residents do not have private vehicles and/or may require assistance to evacuate. The SES evacuation strategy provides for buses to be deployed to assist such people. In addition the evacuation traffic may include some commercial or heavy vehicles for various reasons including the movement of valuable goods out of the floodplain. While the volume of non-private traffic would be difficult to quantify, it is not expected to be significant. An allowance of 5% of private vehicle traffic is therefore added.

Estimates of Vehicles to Evacuate SES Precincts in an Extreme Flood

Bligh Park & Windsor Downs SES Sectors	2006	2010	2031
Residents (1)			
No of dwellings (2)(3)	2675	2715	3384
No of cars per occupied dwelling (4)(5)	4708	4779	5956
No of cars per dwelling that would be used to evacuate (6)(7)	4237	4301	5360
Non-resident Workers			
Total number of Workers (8)(9)	126	128	151
Total number of workers less those counted as residents (10)(11)	25	26	30
Non-private Vehicles			
No of addition vehicles (12)	213	216	270
TOTAL	4475	4543	5660

Notes:

- Numbers of workers and residents are calculated on those estimated to located within the PMF extent.
- The 2006 dwelling estimates are based on the 2006 census data for occupied dwellings (as counted on Census night which was marginally greater than adjusted figures for place of usual residence) for the collector districts which coincide with the SES Sectors. Where collector districts do not coincide the SES sectors, aerial photographs were used to estimated the proportion of the population of the collector district in the SES Sector.
- The dwelling forecasts for the Hawkesbury LGA at 2010 are based on an increase of the relative proportion of an additional 300 dwellings from the 2006 Census. The increase in 300 dwellings is estimated based on Council DA approvals between April 2006 and April 2010 (an additional 289 dwellings) and which allows 3 months for construction, construction proceeding on older DAs for about 10 additional dwellings and assumes all DAs are converted to actual building starts. The number of dwellings in the 3 SES precincts has been estimated based on the proportion of existing dwellings to total LGA population in each precinct by the total number of dwellings in the LGA.
- The dwelling forecasts for the Hawkesbury LGA at 2031 are based on planning targets for 2031, being an additional 5,000 dwellings between 2010 and 2031. The number of dwellings in the 3 SES precincts has been estimated based on the proportion of existing dwellings to total LGA population in each precinct by the total number of dwellings in the LGA.
- It is assumed that there is no net additional other persons that require to evacuate. For example if there are day or over-night visitors within the floodplain then there would be an equal number of usual residents in the floodplain that would be visiting locations outside of the floodplain. The 2006 census revealed that the adjusted resident population based on place of usual residence (39,909) was very close (99.2%) to the actual census count for persons residing in the PMF floodplain.
- The average number of vehicles per dwelling within the PMF floodplain at the 2001 and 2006 censuses was 1.54 and 1.56 respectively. The actual average number of cars per dwelling for each of the SES sectors as at the 2006 census is used plus an allowance for growth. (assuming an average upward trend of 0.02 vehicles per dwelling over 20 years).
- It is assumed that not all cars would be used to evacuate. Approximately 5% of dwellings within the PMF extent in the LGA do not have a car. Others, such as parents with young families may choose to travel together. Therefore it is assumed that 90% of dwellings would need to be able to evacuate.
- The NSW Transport Data Centre "Travel Zone Employment Forecasts" (October 2009 Release) use the 2006 Census data and a detailed forecast model. The forecasts for number of jobs within the Hawkesbury LGA at 2006, 2011 and 2031 are 25486, 25,998 and 30,556 respectively. The 2011 forecast is used for 2010 above.
- The number of workers in the 3 SES precincts has been estimated based on the total proportion of resident population to total LGA population by the total number of jobs in the LGA and then distributed across the 3 SES precincts based on the proportion of Commercial properties/businesses in each precinct as determined from the NEXIS data provided by Molino Stewart (June 2011, Table 3). As a substantial number of residents in the LGA work in the LGA and having regard to the types of industries that employ people in high proportions (such as public administration, education, health care and agriculture) this is considered a reasonable approach.
- The number of workers that may need to evacuate is then converted to non-resident workers, to avoid double counting of residents already accounted for as working in the LGA. The Employment Lands Strategy (SGS, 2008, pg.29) notes that in the Hawkesbury LGA around 80 percent of local jobs are filled by residents.
- It is assumed that each non-resident worker to evacuate will have to do so by private vehicle. This is considered reasonable on the basis that the majority of people commuting into the LGA to work would do so by car.
- A number of residents do not have private vehicles and/or may require assistance to evacuate. The SES evacuation strategy provides for buses to be deployed to assist such people. In addition the evacuation traffic may include some commercial or heavy vehicles for various reasons including the movement of valuable goods out of the floodplain. While the volume of non-private traffic would be difficult to quantify, it is not expected to be significant. An allowance of 5% of private vehicle traffic is therefore added.

Estimates of Vehicles to Evacuate SES Precincts in an Extreme Flood

Richmond & Richmond Lowlands SES Sectors	2006	2010	2031
Residents (1)			
No of dwellings (2)(3)	3577	3631	4525
No of cars per occupied dwelling (4)(5)	4364	4429	5520
No of cars per dwelling that would be used to evacuate (6)(7)	3928	3986	4968
Non-resident Workers			
Total number of Workers (8)(9)	4394	4482	5268
Total number of workers less those counted as residents (10)(11)	879	896	1054
Non-private Vehicles			
No of addition vehicles (12)	240	244	301
TOTAL	5047	5127	6323

Notes:

- Numbers of workers and residents are calculated on those estimated to located within the PMF extent.
- The 2006 dwelling estimates are based on the 2006 census data for occupied dwellings (as counted on Census night which was marginally greater than adjusted figures for place of usual residence) for the collector districts which coincide with the SES Sectors. Where collector districts do not coincide the SES sectors, aerial photographs were used to estimated the proportion of the population of the collector district in the SES Sector.
- The dwelling forecasts for the Hawkesbury LGA at 2010 are based on an increase of the relative proportion of an additional 300 dwellings from the 2006 Census. The increase in 300 dwellings is estimated based on Council DA approvals between April 2006 and April 2010 (an additional 289 dwellings) and which allows 3 months for construction, construction proceeding on older DAs for about 10 additional dwellings and assumes all DAs are converted to actual building starts. The number of dwellings in the 3 SES precincts has been estimated based on the proportion of existing dwellings to total LGA population in each precinct by the total number of dwellings in the LGA.
- The dwelling forecasts for the Hawkesbury LGA at 2031 are based on planning targets for 2031, being an additional 5,000 dwellings between 2010 and 2031. The number of dwellings in the 3 SES precincts has been estimated based on the proportion of existing dwellings to total LGA population in each precinct by the total number of dwellings in the LGA.
- It is assumed that there is no net additional other persons that require to evacuate. For example if there are day or over-night visitors within the floodplain then there would be an equal number of usual residents in the floodplain that would be visiting locations outside of the floodplain. The 2006 census revealed that the adjusted resident population based on place of usual residence (39,909) was very close (99.2%) to the actual census count for persons residing in the PMF floodplain.
- The average number of vehicles per dwelling within the PMF floodplain at the 2001 and 2006 censuses was 1.54 and 1.56 respectively. The actual average number of cars per dwelling for each of the SES sectors as at the 2006 census is used plus an allowance for growth. (assuming an average upward trend of 0.02 vehicles per dwelling over 20 years).
- It is assumed that not all cars would be used to evacuate. Approximately 5% of dwellings within the PMF extent in the LGA do not have a car. Others, such as parents with young families may choose to travel together. Therefore it is assumed that 90% of dwellings would need to be able to evacuate.
- The NSW Transport Data Centre "Travel Zone Employment Forecasts" (October 2009 Release) use the 2006 Census data and a detailed forecast model. The forecasts for number of jobs within the Hawkesbury LGA at 2006, 2011 and 2031 are 25486, 25,998 and 30,556 respectively. The 2011 forecast is used for 2010 above.
- The number of workers in the 3 SES precincts has been estimated based on the total proportion of resident population to total LGA population by the total number of jobs in the LGA and then distributed across the 3 SES precincts based on the proportion of Commercial properties/businesses in each precinct as determined from the NEXIS data provided by Molino Stewart (June 2011, Table 3). As a substantial number of residents in the LGA work in the LGA and having regard to the types of industries that employ people in high proportions (such as public administration, education, health care and agriculture) this is considered a reasonable approach.
- The number of workers that may need to evacuate is then converted to non-resident workers, to avoid double counting of residents already accounted for as working in the LGA. The Employment Lands Strategy (SGS, 2008, pg.29) notes that in the Hawkesbury LGA around 80 percent of local jobs are filled by residents.
- It is assumed that each non-resident worker to evacuate will have do so by private vehicle. This is considered reasonable on the basis that the majority of people commuting into the LGA to work would do so by car.
- A number of residents do not have private vehicles and/or may require assistance to evacuate. The SES evacuation strategy provides for buses to be deployed to assist such people. In addition the evacuation traffic may include some commercial or heavy vehicles for various reasons including the movement of valuable goods out of the floodplain. While the volume of non-private traffic would be difficult to quantify, it is not expected to be significant. An allowance of 5% of private vehicle traffic is therefore added.

APPENDIX C
Recommended Draft DCP
Flood Risk Management
Provisions

PART C

GENERAL GUIDELINES

Chapter 9 FLOOD RISK MANAGEMENT



9.1 INTRODUCTION

9.1.1 The Flood Risk Management chapter has been developed to provide guidelines for development on a floodplain.

9.1.2 The planning controls reflect the recommendations of the Hawkesbury Floodplain Risk Management Plans (FRMP) prepared in accordance with the State Government Flood Prone Lands Policy and Floodplain Development Manual (FDM). In areas where FRMPs have not yet been adopted the planning controls reflect Council Policy and are considered to be consistent with the principles of the State Government Flood Prone Lands Policy and FDM.

9.1.3 Other chapters that are relevant to the Flood Risk Management chapter include:

- Part C Chapter 7 Effluent Disposal
- Part D Chapter 3 Subdivision
- Part D Chapter 6 Dam Construction
- Part D Chapter 7 Landfill
- Part D Chapter 8 Erection of Rural Sheds

9.2 AIMS

The aim of this chapter is to manage the risk to human life and damage to property caused by flooding through controlling development on land affected by potential floods.

9.3 WHERE THIS CHAPTER APPLIES

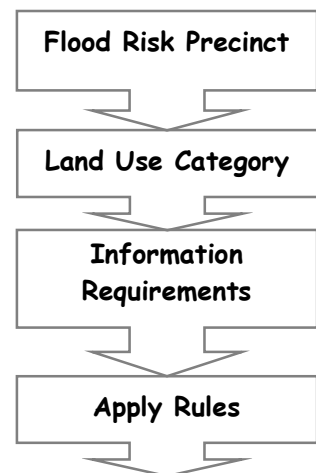
This Chapter applies to all flood prone land within the Hawkesbury Local Government Area.

9.4 HOW TO USE THIS CHAPTER

9.4.1 The criteria for determining applications for proposals potentially affected by flooding are structured in recognition that different controls are applicable to different land uses and levels of potential flood inundation and hazard.

9.4.2 To determine what controls apply:

- a. Firstly, identifying the land use category of the development. Specific development types, as defined by the Local Environmental Plan, are grouped into 6 land use categories and are listed in **Schedule A**
- b. Secondly, determining which floodplain and which part of that floodplain the land is located within (the Flood Risk Precinct). If no adequate flood mapping is available, Council may require that this be undertaken by the proponent in accordance with Clause 9.5.
- c. Thirdly, determine what information you need to provide Council with your development application – see clause 9.5.
- d. Then apply the rules outlined under clause 9.6 (general development) and/or clause 9.7 (for fencing and filling in the floodplain).



- 9.4.3 The rules for general development contain objectives, performance criteria and prescriptive controls, with the following purpose:
- The objectives represent the outcomes that the Council wishes to achieve from each control.
 - The performance criteria represent a means of assessing whether the desired outcomes will be achieved. The satisfaction of these criteria represents an alternate way of achieving the outcomes intended by prescriptive controls.
 - The prescriptive controls are those which when complied with would be expected to achieve the outcome intended in the majority of cases. While adherence to the prescriptive controls may be important, it is paramount that the objectives and the performance criteria are clearly satisfied.

9.5 INFORMATION REQUIREMENTS

- Applications must include information which addresses all relevant rules listed below, and the following matters, as applicable.
- Applications for Concessional Development (see Schedule A) to an existing dwelling shall be accompanied by documentation from a registered surveyor confirming existing floor levels to AHD.
- Other Applications shall be accompanied by a survey plan showing:-
 - The position of the existing building(s) and proposed building(s);
 - The existing ground levels to AHD around the perimeter of the building and contours of the site; and
 - The existing or proposed floor levels to AHD.
- Applications for earthworks, filling of land and subdivision shall be accompanied by a survey plan (with a contour interval of 0.5m or similar) showing relative levels to AHD.
- Council should be consulted prior to the preparation of a development application for flood liable. Council possesses substantial flood data for that can be provided. In some limited circumstances further flood information may be required to be obtained by the proponent for the purposes of preparing a development application.
- For large scale developments (such as residential development involving more than 20 lots or dwellings), or developments in critical situations (such as in a High or Extreme Flood Risk Precinct, including where an existing catchment based flood study is not available), a flood study using a fully dynamic one or two dimensional computer model may be required. For smaller developments consideration may be given to the use of an existing flood study if available and suitable (e.g. it contains sufficient local detail), or otherwise a flood study prepared in a manner consistent with the "Australian Rainfall and Runoff" publication and the FDM, will be required. From this study, the following information shall be submitted in plan form for the pre-developed and post-developed scenarios:
 - Water surface contours;
 - Velocity vectors;
 - Velocity and depth product contours;
 - Delineation of Flood Risk Precincts relevant to individual floodplains; and
 - Flood profiles for the full range of events for full development including all structures and works (including revegetation).
- For smaller developments, or developments not in critical situations, and an existing catchment based flood study is not available, Council may consider the use of historical flood levels when determining the need for a site specific flood study.

- h. Where the controls for a particular development proposal require an assessment of structural soundness during potential floods, the following impacts must be addressed having regard to the likely depths and velocities of flood waters:
- i. Hydrostatic pressure;
 - ii. Hydrodynamic pressure;
 - iii. Impact of debris; and
 - iv. Buoyancy forces.

Note that foundations need to be included in the structural analysis.

9.6 RULES FOR GENERAL DEVELOPMENT

9.6.1 Objectives

- a. To ensure the flood risk associated with development, comprising danger to life and damage to property is minimised and not increased beyond the level acceptable to the community.
- b. To ensure the proponents of development and the community in general are fully aware of the potential flood hazard and consequent risk associated with the use and development of land within the floodplain;
- c. To ensure that proposed development does not exacerbate flooding on other properties.
- d. To minimise the risk to life by ensuring the provision of appropriate evacuation measures are available within areas affected by flooding up to a PMF event;
- e. Where permitted, to maximise the potential for buildings to be returned to use as quickly and efficiently as practical, after being affected by flooding; and
- f. To ensure that the design and siting controls and built form outcomes required to address the flood hazard do not result in unreasonable impacts on the:
 - amenity and character of an area;
 - streetscape and the relationship of the building to the street; and
 - the environment and ecology.

9.6.2 Performance Criteria

- a. The risk associated with the inundation of development comprising danger to life and damage to property is minimised and not increased beyond the level acceptable to the community.
- b. The additional economic and social cost which may arise from damage to property from inundation is not greater than that which can reasonably be managed by the property owner and general community. The cost of damages that may be incurred over the expected life of a development should be no greater than that which could be reasonably expected to be met by the occupants and/or the developer without Government assistance.
- c. Effective warning is available for the evacuation of an area potentially affected by floods. Evacuation should be consistent with any relevant flood evacuation strategy where in existence.
- d. Appropriate procedures (such as warning systems, signage or evacuation drills) for land use categories of “critical uses and facilities” and “sensitive uses and facilities” be in place, if necessary, so that people are aware of the need to evacuate personnel and relocate goods and motor vehicles during inundation, and are capable of identifying an appropriate evacuation route.
- e. Development does not detrimentally increase the potential flood impact on other development or properties either individually or in combination with the cumulative impact of development that is likely to occur in the same floodplain. Development should not change the height or behaviour of flood waters elsewhere in the floodplain in a manner which is likely to materially and adversely impact other property or the environment. The assessment of these effects must include the potential for similar impacts that would arise as a consequence of other

- development in the floodplain that has the potential to occur in the future under current zoning and planning controls.
- f. Development does not result in significant impacts upon the amenity of an area by way of unacceptable overshadowing of adjoining properties, privacy impacts (e.g. by unsympathetic house-raising) or by being incompatible with the streetscape or character of the locality.
 - g. The proposal must not have an unacceptable adverse impact upon the ecological value of the waterway corridors, and where possible, should provide for their enhancement. Proposed development must be consistent with ESD principles.
 - h. Fencing should be designed to have a minimal effect on flood behaviour and to avoid the potential to become debris that is carried away with flood waters.

9.6.3 Prescriptive Controls

- a. Compliance with the requirements of **Schedule B**

9.7 RULES FOR FENCING AND FILLING

9.7.1 Fencing

- a. All new solid (non-porous) and continuous fences above 0.6m high within a floodway or Extreme FRP must be a security/ permeable/ open type/safety fence of a type approved by Council.
- b. The fence should not create impediment to the flow of floodwaters. Appropriate fences must satisfy the following:-
 - i. An open collapsible hinged fence structure or pool type fence;
 - ii. Other than a brick or other masonry type fence (which will generally not be permitted); or
 - iii. A fence type and siting criteria as prescribed by Council.
- c. Other forms of fencing may be considered by Council on merit.

9.7.2 Land Filling

- a. For the purposes of this clause, filling means the placing of material on a site to raise the level of the site as at the date of the adoption of this section of the DCP, by more than 100mm over 200m².
- b. Unless a Floodplain Risk Management Plan for the catchment has been adopted, which allows filling to occur, filling in flood prone areas is not permitted unless a report from a suitably qualified civil engineer is submitted to Council that certifies that the development will not increase flood impacts elsewhere, or Council otherwise determines that a report is not required.
- c. This analysis would form part of a flood study prepared in accordance with Council's requirements as outlined at Clause 9.5.

SCHEDULE A

Land Use Categories

Critical Uses and Facilities	Sensitive Uses and Facilities	Residential
Emergency services facilities; public administration building that may provide an important contribution to the notification or evacuation of the community during flood events (e.g. SES Headquarters and Police Stations); Hospitals.	Community facility; correctional centre; telecommunications facility; educational establishments; liquid fuel depot; electricity generating works; development including sewerage treatment plant; sewerage reticulation system; telecommunications facility; and water treatment facility which are essential to evacuation during periods of flood or if affected would unreasonably affect the ability of the community to return to normal activities after flood events; residential care facility; respite day care centres; school and seniors housing.	<u>Low Scale Residential</u> Residential development of one storey construction and defined as: attached dwelling; dual occupancy; dwelling; dwelling house; secondary dwelling; or semi-detached dwelling. <u>Other Residential</u> Residential development, including that which is of two or storeys construction and defined as: attached dwelling, dual occupancy, dwelling, dwelling house, secondary dwelling, or semi-detached dwelling; AND the following backpackers accommodation; bed and breakfast accommodation; boarding house; caravan park (long-term sites for permanent occupants i.e. other than short-term sites)^(see Note 1); child care centre; exhibition home; farm stay accommodation, group home; home based child care centre; home business; home industry; home occupancy; home occupation (sex services); hostel; hotel or motel accommodation; moveable dwelling; multi dwelling housing; neighbourhood shop; permanent group home; residential flat building; rural worker's dwelling; serviced apartment; tourist and visitor accommodation and transitional group home; AND Additions or alterations to existing dwellings which provide additional floor area that exceeds 40% of the habitable floor area which existed at the date of commencement of this Plan; AND Garages or outbuildings with a floor area exceeding 40m²

Commercial or Industrial	Recreation or Non-urban Uses	Concessional Development
General Types Agricultural produce industry; air transport facility; airport; amusement centre; car park; cellar door premises; community facility (other than critical and sensitive uses and facilities); correctional centre; crematorium; depot; entertainment facility; exhibition village; feed lot, food and drink premises; freight transport facility; function centre; funeral home; garden centre; hardware and materials supplies; health care professional; health consulting rooms; health services facility; heavy industry; heliport; high technology industries; highway service centre; industrial retail outlet; industrial training facility; industry; light industry; liquid fuel depot; livestock processing industry; market; medical centre; mixed use development; mortuary; passenger transport facility; place of public worship; pub; public administration building (other than critical uses and facilities); recreation facility (major); registered club; restaurant; restricted premises; retail premises; rural industry; rural supplies; sawmill or log processing works; service station; sex services premises; shop; shop top housing; storage premises; take away food or drink premises; timber yard; transport depot; truck depot; vehicle body repair workshop; vehicle repair station; vehicle sales or hire premises; veterinary hospital; warehouse or distribution centre; and wholesale supplies. Highly Vulnerable (HV) Uses Bulky goods premises; business premises; hazardous industry; hazardous storage establishment; offensive industry; offensive storage establishment; office premises; self-storage units; waste disposal facility; waste or resource management facility; waste or resource transfer stations.	Agriculture; airstrip; animal boarding or training establishment; aquaculture; biosolids treatment facility; boat launching ramp; boat repair facility; boat shed; Camp site and caravan site – short term sites (see Note 1); caravan park (with non permanent occupants); cemetery; charter and tourism boating facility; dairy (pasture based), environmental facility; environmental protection works; extensive agriculture; extractive industry; farm building; horticulture; helipad; information and education facility; intensive livestock agriculture; intensive plant agriculture; kiosk; jetty; landscaping materials supplies; marina; mine; mining; plant nurseries; port facilities; public utility undertaking (other than critical uses or facilities); recreation area; recreation facility (indoor); recreational facility (outdoor); research station; resource recovery facility; roadside stall; stock and sale yard; turf farming; utility installations (other than critical uses and facilities); viticulture; water recreation structure; and water supply systems.	Redevelopment for the purposes of substantially reducing the extent of flood affectation to the existing building, or Medium, Low and Very Low Flood Risk Precinct; (i) Additions or alterations to an existing dwelling where the proposed additional floor area does not exceed 40% of the habitable floor area which existed at the date of commencement of this Plan; or (ii) Garages or outbuildings with a maximum floor area of 40m²; or (iii) Decks that result in the total area of decks provided for a dwelling that does not exceed 40m². High or Extreme Flood Risk Precinct; (i) Additions or alterations to an existing dwelling up to 20m² to the habitable floor area which existed at the date of commencement of this Plan; or (ii) Garages or outbuildings with a maximum floor area of 20m².

Note:

- (1) As defined by the Local Government (Manufactured Home Estates, Caravan Parks, Camping Grounds and Moveable Dwellings) Regulation 2005
- (2) Where the Environmental Planning Instrument (EPI) land use definition is not used, the bracketed text refers to the EPI land use definition.

SCHEDULE B - General Prescriptive Controls

Planning Consideration	Flood Risk Precincts (FRP's)																										
	Low & Very Low Flood Risk						Medium Flood Risk						High Flood Risk								Extreme Flood Risk						
	Critical Uses & Facilities	Sensitive Uses & Facilities	All Residential	All Commercial & Industrial	Recreation & Non-Urban	Concessional Development	Critical Uses & Facilities	Sensitive Uses & Facilities	Low Scale Residential	Other Residential	All Commercial & Industrial	Recreation & Non-Urban	Concessional Development	Critical Uses & Facilities	Sensitive Uses & Facilities	Low Scale Residential	Other Residential	HV Commercial & Industrial	Other Commercial & Industrial	Recreation & Non-Urban	Concessional Development	Critical Uses & Facilities	Sensitive Uses & Facilities	All Residential	All Commercial & Industrial	Recreation & Non-Urban	Concessional Development
Floor Level	8	4				5	8	4	3,6	2,6			5			3,6,7	2,6,7	2,6,7	1,6,7	1	5,7					1	5,7
Building Components & Methods	1	1				1	1	1	2	2			1			2	2	1	1	1	1					1	1
Structural Soundness	2	2				2	2	2	2	2			2			2	2	2	2	2	2					1	1
Flood Affection							2	2	2	2			2			2	2	2	2	2	2					1	1
Car Parking & Driveway Access																1,3,5,6	1,3,5,6	1,3,5,6	1,3,5,6	2,3,4,6	6,7					2,3,4,6	6,7
Evacuation	1,2	1,2				1	1,2	1,2	1	1			1			1	1	1	1	1	1					1	1
Management & Design	1,2	1,2				1,2	1,2	1,2	1,2	1,2			1,2			1,2	1,2	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4					1,2,3,4	1,2,3,4

= Unsuitable Land Use (refer to General Note b). = No controls.

- General Notes:**
- a. The relevant environmental planning instruments (generally the Local Environmental Plan) identify development permissible with consent in various zones in the LGA. Notwithstanding, constraints specific to individual sites may preclude Council granting consent for certain forms of development on all or part of a site.
 - b. Filling of the site, where acceptable to Council, may change the FRP considered to determine the controls applied in the circumstances of individual applications.
 - c. Refer to Section 9.7.1 of the DCP for planning considerations for proposals involving only the erection of a fence. Any fencing that forms part of a proposed development is subject to the relevant flood effects and Structural Soundness planning considerations of the applicable land use category.
 - d. Terms in italics are defined in Appendix A of the DCP.
 - e. Design floor level or ground level means the minimum floor level or ground level that applies to the development. If the development is concessional development, this level is determined based on what land use category would apply if it was not categorised as Concessional Development.
 - f. *Habitable* and *non-habitable* floor levels are typically subject to different controls in this Schedule. Unless otherwise stated, consideration of 'floor levels' implies separate consideration of *habitable* and *non-habitable* floor levels.

- Floor Level**
- 1 Floor levels to be no lower than 20 year flood level unless justified by site specific assessment.
 - 2 *Habitable floor* levels to be no lower than 100 year flood level. *Non-habitable floor* levels to be no lower than 20 year flood level unless justified by a site specific assessment.
 - 3 *Habitable floor* levels to be no lower than 200 year flood level. *Non-habitable floor* levels to be no lower than 20 year flood level unless justified by a site specific assessment.
 - 4 *Habitable floor* levels to be no lower than 500 year flood level unless justified by a site specific assessment.
 - 5 Floor levels to be no lower than the *design floor level*. Where this is not *practical* due to compatibility with the height of adjacent buildings, or compatibility with the floor level of existing buildings, or the need for access for persons with disabilities, a lower floor level may be considered. In these circumstances, the floor level is to be as high as *practical*, and, when undertaking alterations or additions no lower than the existing floor level.
 - 6 Where it is not *practical* to achieve the design floor levels for a development in a business zone (e.g. to provide suitable access to footpath level), the floor levels should be as high as possible.
 - 7 A restriction is to be placed on the title of the land, pursuant to S.88B of the Conveyancing Act, where the lowest *habitable floor* area is elevated above finished ground level, confirming that the undercroft area is not to be enclosed, where Council considers this may potentially occur.
 - 8 *Habitable* floor levels to be no lower than PMF level unless justified by site specific assessment.

- Building Components & Method**
- 1 All structures to have *flood compatible building components* and *flood compatible building methods* below design floor level or the 100 year flood level, which ever is higher.
 - 2 All structures to have *flood compatible building components* and *flood compatible building methods* below 200 year flood level.

- Structural Soundness**
- 1 Engineer's report to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including the design floor level or the 100 year flood level, which ever is higher. In the case of alterations or additions to an existing development, the structure to be certified is that which is proposed to be newly constructed or otherwise required to be of a specified standard to satisfy other controls.
 - 2 Applicant to demonstrate that the structure can withstand the forces of floodwater, debris and buoyancy up to and including the design floor level or the 100 year flood level, which ever is higher.

- Flood Affection**
- 1 Engineers report required to certify that the development will not increase *flood* affection elsewhere.
 - 2 The impact of development on flooding elsewhere to be considered. An engineer's report may be required at Council's discretion.
Note: When assessing *flood* affection the following must be considered:
 - 1. Loss of net storage of *flood* waters in the *floodplain*. For example compensatory cut and fill earthworks in the *floodplain* may be a means to ensure no loss of net *flood* water storage.
 - 2. Changes in flood levels & velocities caused by alteration of conveyance of *flood* waters. For example by limiting additional obstructions in the *floodway*.
 - 3. The *flood affection* assessment will often require flood modelling. This will be at Council's discretion.

- Car Parking and Driveway Access**
- 1. The minimum surface level of open car parking spaces or carports shall be as high as *practical*, and not below: (i) 20 year flood level; or (ii) the level of the crest of the road at the location where the site has access; (whichever is the lower). In the case of garages, the minimum surface level shall be as high as *practical*, but no lower than the 20 year flood level.
 - 2. The minimum surface level of open car parking spaces, carports or garages, shall be as high as *practical*.
 - 3. Enclosed car parking must be protected from inundation by flood waters up to the 100 year flood level. Where the floor of these areas is more than 0.8m below the 100 year flood level, an aural and visual flood warning system is to be provided.
 - 4. The driveway providing access between the road and parking space shall be as high as practical and generally rising in the egress direction.
 - 5. Where the level of the driveway providing access between the road and parking space is lower than 0.3m below the 100 year flood level, the following condition must be satisfied - when the *flood* levels reach 100 year flood level, the depth of inundation on the driveway shall not exceed: (i) the depth at the road; or (ii) the depth at the car parking space. (Refer to Schedule D). A lesser standard may be accepted for single detached dwelling houses where it can be demonstrated that risk to human life would not be compromised.
 - 6. Restraints or vehicle barriers to be provided to prevent floating vehicles leaving a site during a 100 year *flood*.
 - 7. Driveway and parking space levels to be no lower than the *design floor level or ground level*. Where this is not *practical*, a lower level may be considered. In these circumstances, the level is to be as high as *practical*, and, when undertaking alterations or additions, no lower than the existing level.
- Note**
- a. A *flood* depth of 0.3m is sufficient to cause a small vehicle to float.
 - b. *Enclosed car parking* means car parking which is potentially subject to rapid inundation, which consequently increases danger to human life and property damage (such as basement of bunded car parking areas). The following criteria apply for the purposes of determining what is enclosed car parking:
 - i. Flooding of surrounding areas may raise water levels above the perimeter which encloses the car park (normally the entrance), resulting in rapid inundation of the car park to depths greater than 0.8m, and
 - ii. Drainage of accumulated water in the car park has an outflow discharge capacity significantly less than the potential inflow capacity.

- Evacuation**
- 1 The ability to safely evacuate from the development to the defined regional evacuation route, in accordance with any applicable flood evacuation strategy, is to be demonstrated. An engineer's report will be required if circumstances are possible where the evacuation of persons to this regional route might not be achieved within the *effective warning time*.
 - 2 Ability to access development during a flood, where relevant, to be considered. An engineer's report may be required.

- Management and Design**
- 1 If the application involves subdivision, the applicant to demonstrate that potential development as a consequence of a subdivision proposal can be undertaken in accordance with this Plan.
 - 2 *Site Emergency Response Flood plan* required where floor levels are below the *design floor level* (except for single dwelling-houses).
 - 3 Applicant to demonstrate that area is available to store goods above the 100 year flood level.
 - 4 No external storage of materials below the *design floor level* which may cause pollution or be potentially hazardous during any *flood*.

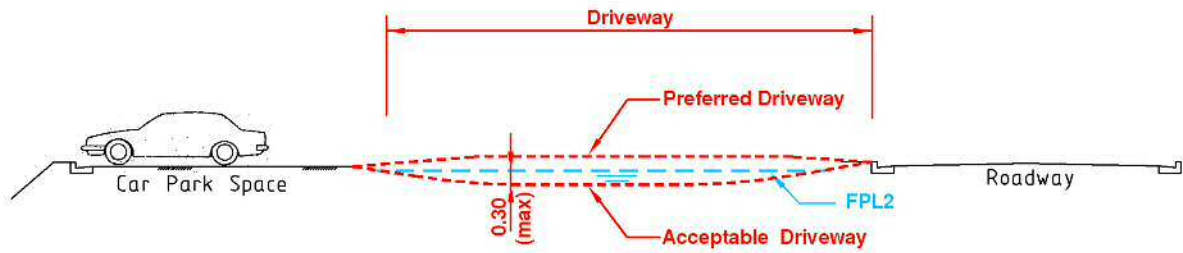
SCHEDULE C

Flood Compatible Building Materials and Methods

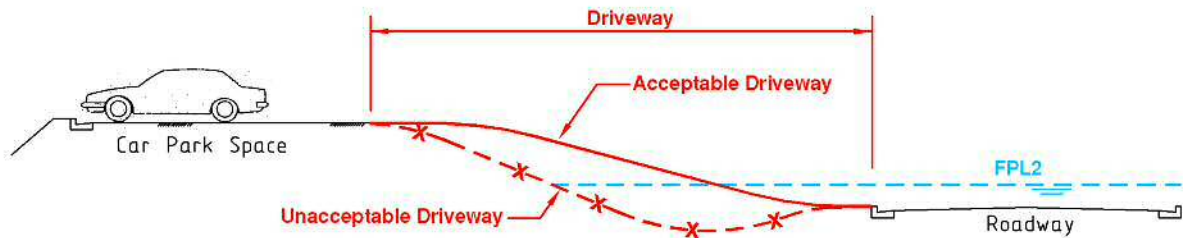
This schedule is to be inserted by Council at a later date. In the interim where the DCP refers to this schedule, consideration is required of the relevant provisions of Hawkesbury-Nepean Floodplain Management Steering Committee (HNFMSC), June 2006, *'Reducing Vulnerability of Buildings to Flood Damage – Guidance on Building in Flood Prone Areas'*.

SCHEDULE D

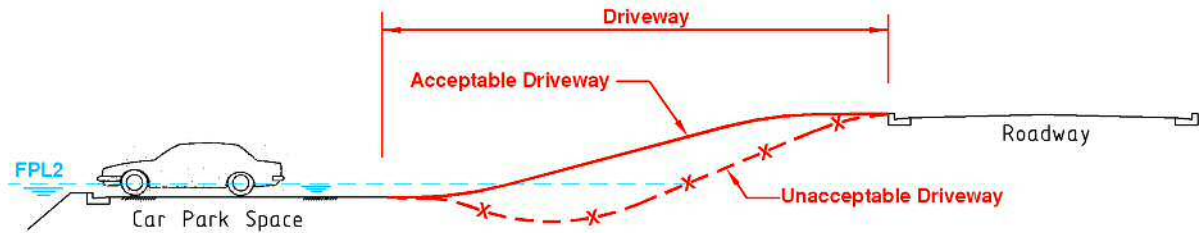
Parking and Access Control Diagrams



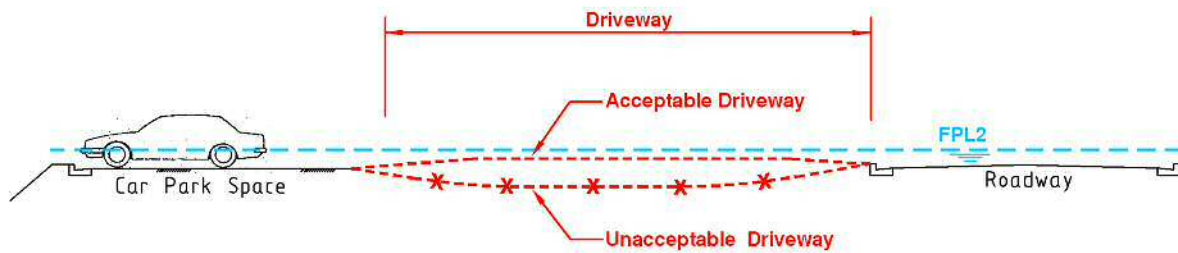
HIGH ROADWAY AND CAR PARK SPACE
(No part of driveway more than 0.3m below FPL2)



LOW ROADWAY
(Driveway inundation depth not greater than roadway inundation depth)



LOW CAR PARK SPACE
(Driveway inundation depth not greater than car park inundation depth)



LOW ROADWAY AND CAR PARK SPACE
(Driveway inundation depth not greater than car park or roadway inundation depth)

Appendix A

DEFINITIONS

[Delete the current definition of Floodplain and Habitable Room and add the following]

Effective warning time is the time available after receiving advice of an impending flood and before the floodwaters prevent appropriate flood response actions being undertaken. The effective warning time is typically used to raise furniture, evacuate people and transport their possessions.

Flood is a relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse, as defined by the Floodplain Development Manual (NSW Government 2005). (**Note:** Consistent with the FDM, this section of the DCP does not apply in the circumstances of local drainage inundation as defined in the Floodplain Development Manual and determined by Council. Local drainage problems can generally be minimised by the adoption of urban building controls requiring a minimum difference between finished floor and ground levels.).

Flood evacuation strategy means the proposed strategy for the evacuation of areas within effective warning time during periods of flood as specified within any policy of Council, the FRMP, the relevant State government disaster plan, by advices received from the State Emergency Services (SES) or as determined in the assessment of individual proposals.

Floodplain (being synonymous with **flood liable** and **flood prone land**) is the area of land which is subject to inundation by floods up to and including the probable maximum flood (PMF).

Habitable floor area means:

- a. In a **residential situation**: a room used for normal domestic activities and includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom and sunroom. It excludes a bathroom, laundry, water closet, food-storage pantry, walk in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes drying room, and other spaces of a specialised nature that are occupied only infrequently;
- b. In all **other situations**: an area used for offices, the display or sale of goods and services and/or to store valuable possessions susceptible to flood damage in the event of a flood and/or an area that is likely to be occupied frequently or for extended periods.

Note: Separate considerations are specified for the car parking area of a development irrespective of the land use with which it is associated.

Probable maximum flood (PMF) is the largest flood that could conceivably occur at a particular location.

Reliable access during a flood means the ability for people to safely evacuate an area subject to imminent flooding to a defined regional evacuation route within effective warning time, having regard to the depth and velocity of flood waters, the suitability of the local evacuation route, and without a need to travel through areas where water depths increase.