
UPPER HUNTER SHIRE COUNCIL

ABERDEEN FLOODPLAIN RISK MANAGEMENT PLAN

(Adopted By Upper Hunter Shire Council
on 23 November 2015)

November 2015



February 1955



2014



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FOREWORD

The NSW Government's Flood Policy recognises that flood-liable land is a valuable resource and should not be sterilised by unnecessarily precluding its development. The Policy also recognises the benefits flowing from the use, occupation and development of floodprone land. Accordingly, the Policy requires that all development proposals be treated on their merits.

The merit approach requires that flooding issues be considered along with other planning and environmental factors. Specifically, the merit approach seeks to balance social, economic, environmental and flood risk parameters to ascertain whether a particular development or use of the floodplain is appropriate and sustainable.

The prime responsibility for local planning and land management rests with local government. The study area falls under the administrative responsibility of Upper Hunter Shire Council.

The New South Wales Floodplain Development Manual (Ref. 1) has been prepared to assist councils in the development of management plans for flood-liable lands. The principal objective of the floodplain management process is to reduce the impact of flooding and flood liability on individual owners and occupiers and to reduce private and public losses resulting from floods.

The Floodplain Risk Management process comprises the following activities:

- establishment of a Floodplain Management Committee;
- data collection;
- completion of a Flood Study;
- preparation of a Floodplain Risk Management Study;
- adoption of a Floodplain Risk Management Plan; and
- implementation of the Floodplain Risk Management Plan.

Upper Hunter Shire Council has progressed on the Floodplain Management Process above for Aberdeen, with the object of updating their management practices. The five steps of the Floodplain Management process (establishment of Committee, data collection, Flood Study, Floodplain Risk Management Study and adoption of Floodplain Risk Management Plan) have been completed.

This report represents the adopted Floodplain Risk Management Plan.

This report has been prepared by Paterson Consultants Pty Ltd under the direction of the Aberdeen Floodplain Risk Management Committee, following a formal brief from Upper Hunter Shire Council.

Funding of this report has been provided jointly by Upper Hunter Shire Council and NSW State Government.

1. ABERDEEN FLOODPLAIN RISK MANAGEMENT PLAN

1.1 Overview

Low lying parts of Aberdeen and the surrounding rural areas are flood liable.

In the design once in 100 years Average Recurrence Interval (ARI) flood (equivalent to a 1% AEP flood), it is predicted that some 85 properties in Aberdeen will be inundated with some 69 houses inundated above floor levels.

The Aberdeen Flood Study has been completed (adopted by Upper Hunter Shire Council on 22 July 2013) and shows that areas of High Hazard Floodway will exist through the low lying areas of Aberdeen. Such floodways increase the flood risk to the persons and the properties within those floodways and severely hamper evacuation operations from other flood liable areas, even though those flood liable areas might have a lower flood hazard.

The Aberdeen Floodplain Risk Management Study and Draft Plan (Ref. 3) was completed and adopted by Upper Hunter Shire Council on 23 November 2015 without amendment.

The Floodplain Risk Management Plan is a reproduction of the Plan given in the Floodplain Risk Management Study.

The Plan has been published in a shortened form for easy use. Readers wishing to know the background to the Plan are directed to the Floodplain Risk Management Study.

The object of the Aberdeen Floodplain Risk Management Plan is to provide Upper Hunter Shire Council with a pathway to achieving the New South Wales Government objectives in the floodplain risk management manual, that is:

- to creation of a reduction in flood damages accruing both to the community and to individuals occupying the floodplain;
- to promote sustainable development of floodplain.

This Floodplain Risk Management Plan is not intended to be a firmly fixed document, but one that can be reviewed at regular intervals and adjusted according to both the works and measures that have been implemented and the experience derived from such implementation.

Within the Aberdeen Floodplain Risk Management Study, improvements to the flood evacuation planning and the implementation of the Upper Hunter Local Environmental Plan (LEP) and the recently adopted Development Control Plan (DCP) are self-evident inclusions within any floodplain management plan for Aberdeen.

Similarly, the consultant's perception is that the general community within the low lying areas of Aberdeen may not be generally aware of the flood risk, nor are they prepared for any evacuations.

The Floodplain Risk Management Plan outlined below lists floodplain management issues and the actions to be taken. A table is included outlining priorities and costings.

1.2 Components of the Aberdeen Floodplain Risk Management Plan

Issue: Flood warning and preparation for evacuation

It appears that there is no flash flood warning system for Aberdeen and, at this point, the SES rely on volunteers using the river level gauges on the Pages River, Rouchel Brook and Kingdon Ponds to estimate the magnitude of the flood.

Given the demonstrated rapid rise of Hunter River at Aberdeen and the number of people and properties likely to be affected, it is clear that there is a need for a better flood warning system, preferably a two-stage approach using:

- a flash flood warning system through the Bureau of Meteorology;
- a written procedure for the SES locally that can be followed as a backup to the Bureau of Meteorology system.

The “Willow Grove” development represents the largest concentration of persons within the areas that would require evacuation. A “temporary measure” to assist evacuation would be:

- topping of the levee with an all-weather surface between the north-eastern corner of “Willow Grove” and the existing New England Highway bridge over the Hunter River;
- creation of steps to give access from “Willow Grove” to the top of the levee;
- closure of the access to the New England Highway using a lockable gate with keys to be held by the SES and on-site management of “Willow Grove”.

The object of these minor works is to provide an emergency access for the residents of “Willow Grove” to a higher area. Whilst this work is not ideal, it would be better than current arrangements.

Action:

Upper Hunter Shire Council to press the Bureau of Meteorology to develop a flash flood warning system for Aberdeen, given the magnitude of the flood issues and the rapid rate of rise of the Hunter River at Aberdeen, and noting that a flash flood warning system is already in place for Scone.

Upper Hunter Shire Council to work with the SES to investigate a simple procedure to using the available river gauges, to predict as an approximate predictor of likely flood height, and times of flood arrival, at Aberdeen.

Upper Hunter Shire Council work conjointly with SES and “Willow Grove” to develop an evacuation plan for “Willow Grove” and incorporate an all-weather access for pedestrian evacuation from “Willow Grove” to the New England Highway bridge.

Issue: Community flood awareness

The low lying areas of Aberdeen were flooded in 1955 and 1971 and possibly in 1976 (subject to the precise construction completion of the Aberdeen levee at the time of the 1976 flood).

The Aberdeen Flood Study indicates that the Aberdeen levee does not provide protection up to the design once in 100 year flood event, or larger events, and only provides protection up to the once in 50 year ARI event but with no freeboard.

The consultant’s perception is that the general community within the low lying areas of Aberdeen may not be generally aware of the flood risk, nor are they prepared for any evacuations.

Action:

Upper Hunter Shire Council and the SES will need to undertake a locally specific public information program to inform the residents of:

- the flood liability of the lower lying areas of Aberdeen and the hazard attendant to flooding;
- the potential need for evacuations from the area.

Issue: Land use planning

The latest Upper Hunter Shire LEP and the recently adopted DCP include a variety of clauses and measures which will act to attain the objectives of any floodplain risk management plan in reduction of flood damages.

There are minor amendments that can be made to the DCP and it is suggested that an annual review of the DCP be undertaken, rather than Council seeking to occlude amendments as soon as the need of those amendments becomes evident.

Action:

Upper Hunter Shire Council undertake annual review of the DCP to incorporate amendments as required.

Issue: Future Development

There are areas of low lying, flood-labile land within Aberdeen and around Aberdeen that have the potential to attract interest for residential or commercial/industrial development. Such uses of floodplains are discouraged generally under the merit approach as enunciated by the New South Wales Floodplain Development Manual.

The provisions of the LEP and the DCP should act to:

- direct development of flood liable lands away from residential, commercial and industrial development;
- provide a level of flood protection to dwellings by enforcement of minimum floor levels (at the Flood Planning Level or above) and by enforcement of the use of flood compatible materials below the Flood Planning Level in buildings.

Additional residential development on the flood liable lands will only exacerbate the flood risk to properties and life and will only exacerbate the issues facing the SES in terms of emergency management in the area.

There are a number of vacant large blocks within the lower parts of Aberdeen that are zoned as “R1 General Residential” which potentially could attract interest for further development. It is suggested that these large lots be “back zoned” to rural zoning such as “RU1 Primary Production” or “RU4 Primary Production, Small Lots” such that the provisions for the rural land development would then apply to these.

Action:

“Back zone” the large vacant lots currently zoned as “R1 General Residential” in the lower parts of Aberdeen as “RU1 Primary Production” or “RU4 Primary Production, Small Lots”.

Issue: Levee works

The minor levee works (“McAdam levee”) have useful economic return on the works costs.

There are, however, several issues that should be addressed prior to a decision to proceed with construction. These issues are:

- the impact of the levee works on the surrounding properties needs better quantification (such as via a Review of Environmental Factors) to identify the precise impact of any changes to flood levels;
- survey and design of the proposed levee works is required with the object of accurately quantifying the works cost.

The Aberdeen Flood Study hydrodynamic model does require some additional work to identify if the increases in design flood levels above the 1955 flood levels, upstream of the New England Highway are due to:

- changes in the road and rail embankments post 1955;
- the model assumptions used to generate head losses through the bridges (verification that the model does not overestimated such losses).

Preparation of a Review of Environmental Factors (REF) is required to quantify the actual impact of any increased flood levels on the properties surrounding the flood liable area of Aberdeen. The object of the

REF would be provision of sufficient information such that Upper Hunter Shire Council can make a considered decision on whether to proceed with the works.

A more detailed cost estimate needs to be derived from a Schedule of Quantities, which would be produced by the design process. Given the design process should cost less than 10% of the total works cost, it is prudent to complete an accurate cost estimate before a decision to proceed with construction is made.

Action:

Further detailed review of parts of the hydrodynamic model used in the Aberdeen Flood Study to confirm its veracity in prediction of increased flood levels.

Preparation of an REF for the minor levee works to quantify the actual impact of any increased flood levels on the properties surrounding the flood liable area of Aberdeen.

Subject to the results of the REF, proceed with survey and design of the minor levee works with the object of producing a refined cost estimate for the works.

Issue: New England Highway

It appears that the raised carriageways on the New England Highway will create ponding in local run-off on the eastern side of the Highway itself. Rectification will probably require further drainage works underneath the Highway to resolve the situation.

Nonetheless, it appears that there is insufficient storage volume for local run-off within the protected area, such that a ring levee system (comprising upgrades of the existing levee plus closure levee along the western side of the New England Highway) may not provide the flood protection expected.

The provision of additional drainage beneath the New England Highway will also probably require fitting floodgates to the new drainage structures such that backwater flooding from downstream of the New England Highway does not enter into the protected area.

Action:

Upper Hunter Shire Council approach RMS regarding the joint investigation to rectify the drainage beneath the New England Highway at Aberdeen.

Issue: Limited voluntary acquisition or house raising

It is noted that there are 11 dwellings located on the eastern side of the New England Highway in the flood liable area of Aberdeen that have floor levels that are less than the once in 20 year flood event.

Eight of the buildings are suitable to be raised, however heritage considerations may prevent such works on three buildings.

Following resolution of the drainage issues created by the New England Highway, consideration should be given to either raising these houses or a voluntary acquisition program to provide a better level of protection. It is unlikely that these works will show a reasonable benefit cost ratio and thus the program would need to be undertaken under a “social obligation” consideration.

Action:

Consideration of a limited voluntary acquisition or house raising program for the 5 houses that currently have floor levels below once in 20 year flood level.

Table 1

Aberdeen Floodplain Risk Management Plan Summary

Issue	Action	Priority	Cost
Flood warning and preparation for evacuation	1. Press Bureau of Meteorology for flash flood warning	Immediate	-
	2. With SES develop a local flood warning check	Short term	\$20,000
	3. Provide all-weather pedestrian access from “Willow Grove” to the New England Highway with a lockable gate closure of the route. Gate keys to be held by SES and “Willow Grove” on-site management.	Immediate	\$10,000
Community flood awareness	1. Undertake a community awareness program for flood liable areas of Aberdeen	Immediate	\$15,000
Land use planning	1. Complete an annual review of DCP to incorporate amendments	On-going	\$5,000
Future development	1. Back zone large vacant lots in flood liable areas	Medium	-
Levee works	1. Review impact of increased flood levels	Short term	\$25,000
	2. REF for minor levee works	Short term	\$25,000
	3. Design of minor levee works	Medium	\$35,000
	4. REF for major levee works	Long term	\$30,000
New England Highway	1. Liaise with RMS re upgrade of drainage under New England Highway	Medium	\$30,000
	2. Fit gate to drains under New England Highway	Medium	\$30,000
Limited voluntary Acquisition	1. Raise 5 lowest houses in Aberdeen	Long term	\$400,000

REFERENCES

1. New South Wales Government, “Floodplain Development Manual, the Management of Flood Liable Land”, April 2005
2. Upper Hunter Shire Council, “Aberdeen Flood Study”, July 2013, prepared by WMA Water
3. Upper Hunter Shire Council, “Aberdeen Floodplain Risk Management Study and Draft Plan”, November 2015

GLOSSARY – Terms and Abbreviations

Note: A more extensive glossary is available in the 2005 Floodplain Development Manual. An extract from the Glossary of the Floodplain Development Manual, giving a fuller description of floodways, flood storages and flood fringe, appears in Appendix B.

Floodplain Management

Manual or Floodplain Management Manual: The New South Wales Government publication “Floodplain Management Manual”, 2005.

Australian Height Datum (AHD): a common notional plane of level corresponding approximately to mean sea level.

Reduced Level (RL): a measured height above Australian Height Datum.

Full Supply Level (FSL): The level of a water supply storage which corresponds to the full storage capacity.

Flood Probability

Annual Exceedence Probability (AEP): the probability of an event (say a flood) occurring or being exceeded in any one year.

Average Recurrence Interval (ARI): the long-term average number of years between the occurrence of a flood as big as or larger than the selected event.

Probable Maximum Precipitation (PMP): the rainfall calculated to be the maximum which is likely to occur.

Probable Maximum Flood (PMF): the flood resulting from the PMP storm.

Flood Damages

Direct Damage: damage caused by contact with floodwater eg. Structural damage to building, water damage to furniture or house contents or damage caused by silt and debris.

Indirect Damage: damage caused by flooding though not directly eg. Loss of trade, cost of alternative accommodation or loss of wages.

Tangible Damage: damage that can be quantified in monetary terms, includes direct and indirect damages.

Intangible Damage: damage that occurs but is difficult to quantify eg. Increased stress in the community or disruption to community life.

Potential Damages: an estimate of the flood damage that represents the maximum damage loss if no action is taken to reduce the damage.

Actual Damage: an estimate of the flood damage that makes allowance for any action taken to reduce the damage.

Mean Annual Damage: an estimate of the annual average damage from the full range of floods. It is obtained by summation of the product of damage and probability over the full range of flooding.

Economic Factors

Capital Cost: total construction cost of project, including land acquisition, survey, investigation and design.

Amortization: annual interest and redemption payments over the economic life of the project.

Economic Life: period during which a works item remains in a satisfactory working condition before being replaced.

Recurrent Cost: annual cost for maintenance and operation eg. Power, fuel, repairs.

Annual Cost: sum of amortization, operation and maintenance cost for a year.

Net Present Value: the annualised value of a project at a point in time comprising of the sum of project benefits less the sum of project costs.

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Recurrent Cost /Capital Cost Ratio: reflecting the relativities of capital and recurrent costs of a project.

Benefit-Cost Ratio: ratio of the monetary benefits of a project to the cost of a project. This ratio is usually determined on an annual cost basis.

Relative Cost Effectiveness: the ratio of the benefit-cost ratio for a project to the benefit-cost ratio for the reference project so that a variety of projects which provide different benefits to be compared.

Emergency Management

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.

Disaster plan (DISPLAN): a step by step sequence of previously agreed roles, responsibilities, functions, actions and management arrangements for the conduct of a single or series of connected emergency operations, with the object of ensuring the coordinated response by all agencies having responsibilities and functions in emergencies.

Flood plan (local): A sub-plan of a disaster plan that deals specifically with flooding. They can exist at state, division and local levels. Local flood plans are prepared under the leadership of the SES.

Flood awareness: Awareness is an appreciation of the likely effects of flooding and knowledge of the relevant flood warning, response and evacuation procedures.

Flood readiness: Readiness is an ability to react within the effective warning time.

Minor, moderate and major flooding: both the SES and the BoM use the following definitions in flood warnings to give a general indication of the types of problems expected with a flood:

minor flooding: causes inconvenience such as closing of minor roads and the submergence of low level bridges. The lower limit of this class of flooding on the reference gauge is the initial flood level at which landholders and townspeople begin to be flooded.

Moderate flooding: low-lying areas are inundated requiring removal of stock and/or evacuation of some houses. Main traffic routes may be covered.

Major flooding: appreciable urban areas are flooded and/or extensive rural areas are flooded. Properties, villages and towns can be isolated.

Flood Behaviour

flood prone land: land susceptible to flooding by the PMF event. Flood prone land is synonymous with flood liable land.

Flood risk: potential danger to personal safety and potential damage to property resulting from flooding. The degree of risk varies with circumstances across the full range of floods. Flood risk in the Floodplain Management Manual is divided into 3 types, existing, future and continuing risks as below:

existing flood risk: the risk a community is exposed to as a result of its location on the floodplain.

Future flood risk: the risk a community may be exposed to as a result of new development on the floodplain.

Continuing flood risk: the risk a community is exposed to after floodplain risk management measures have been implemented.

Floodway areas: those areas of the floodplain where a significant discharge of water occurs during floods.

Flood storage areas: those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood.

Flood fringe areas: the remaining area of flood prone land after floodway and flood storage areas have been defined.

Discharge: the rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (cu m/sec).

probable maximum precipitation: the PMP is the greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends (World Meteorological Organisation, 1986). It is the primary input to PMF estimation.

Probable maximum flood: the PMF is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation, and where applicable, snow melt, coupled with the worst flood producing catchment conditions.

Stage: equivalent to water level (both measured with reference to a specified datum).

Stage hydrograph: a graph that shows how the water level at a particular location changes with time during a flood. It must be referenced to a particular datum.

Development

Development: is defined in Part 4 of the EP&A Act.

Development Type for This Plan

Infill development: refers to the development of vacant blocks of land that are generally surrounded by developed properties and is permissible under the current zoning of the land.

New development: refers to development of a completely different nature to that associated with the former land use.

Redevelopment: refers to rebuilding in an area as urban areas age.

Flood planning levels: are the combinations of flood levels (derived from significant historical flood events or floods of specific AEPs) and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporated in management plans. FPLs supersede the “standard flood event” in the 1986 manual.

Freeboard: provides reasonable certainty that the risk exposure selected in deciding on a particular flood chosen as the basis for the FPL is actually provided.

flood planning area: the area of land below the FPL and thus subject to flood related development controls. The concept of flood planning area generally supersedes the “flood liable land” concept in the 1986 Manual.

Government Agencies:

<i>DECCW</i>	Department of Environment Climate Change and Water
<i>DLWC</i>	Department of Land and Water Conservation
<i>DWE</i>	Department of Water and Energy
<i>DWR</i>	Department of Water Resources
<i>OEH</i>	Office of Environment and Heritage
<i>SES</i>	State Emergency Service
<i>WC&IC</i>	Water Conservation and Irrigation Commission
<i>WRC</i>	Water Resources Commission

Legislation

<i>DCP</i>	Development Control Plan
<i>EP&A Act</i>	Environmental Protection and Assessment Act
<i>LEP</i>	Local Environment Plan
<i>LGA</i>	Local Government Area
