

# Increasing Queensland's resilience to inland flooding in a changing climate:

## Policy options for incorporating climate change into the flood risk management framework in Gayndah (North Burnett Regional Council)

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## Background

In response to advice requested by the Local Government Association of Queensland (LGAQ), the Minister for Climate Change and Sustainability and the Minister for Planning and Infrastructure jointly established the State Government/LGAQ Inland Flooding Study. The purpose of the Inland Flooding Study was to deliver:

1. An improved methodology for assessing inland flooding risk that considers how to take account of climate change.
2. Specific policy options for improved flood risk management in the case study area, namely the Gayndah township in the North Burnett Regional Council (NBRC).
3. General policy options for consideration as part of the review of State Planning Policy 1/03 Mitigating the Adverse Impacts of Flood, Bushfire and Landslide (SPP 1/03).

This paper addresses the second deliverable above and provides recommended policy options to improve flood risk management in Gayndah township for consideration by the NBRC.

## Context

SPP 1/03 is intended to ensure that flooding is adequately considered when making decisions about development.

SPP 1/03 does not provide detailed guidance to assist local governments incorporate climate change science and potential impacts into their planning schemes.

The proposed planning policy options and associated constraint code presented in this document are intended to provide interim options and guidance for the Gayndah area for consideration by NBRC. Although the outcomes of the study are specific to Gayndah, this case study and its recommendations will be of interest to other local governments in Queensland. The recommended options align with SPP 1/03 to the fullest extent possible. Any measures that NBRC adopts outside of the SPP 1/03 may leave them liable to litigation.

The Queensland Climate Change Centre of Excellence (QCCCE) has developed a climate change factor for increased rainfall intensity for incorporation into flood studies. This approach provides guidance to local governments on a benchmark for factoring climate change considerations into flooding risk assessments, specifically a five per cent increase in potential rainfall intensity per degree of global warming.

This climate change factor has been developed using the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) high (A1FI) greenhouse gas emissions scenario. The A1FI scenario assumes continued dependence on fossil fuels. This emissions scenario is recommended by the Queensland Office of Climate Change as the most appropriate scenario for land use planning as current global emissions are tracking at this level. Revised global emissions scenarios will be provided in the release of the IPCC Fifth Assessment Report in 2013. Any implications of changes to global emission scenarios on rainfall intensity and flooding impacts will be considered as part of the Australian Rainfall and Runoff review due to be released in 2014.

## Overlay maps and planning horizons

It is recommended that overlay maps for flood affected areas are identified in the NBRC planning scheme consistent with the Queensland Planning Provision.

Two options are presented below to provide different means of incorporating the potential impacts of climate change into Gayndah's flood risk management framework. These options are intended to provide planners with transitional arrangements while the SPP 1/03 is being reviewed.

The proposed policy options enable development to be conditioned differently depending on whether or not there is a development commitment in place.

For proposals already subject to a development commitment, conditions will ensure that development is subject to stringent design and evacuation standards. To achieve this, development either has to be consistent with appropriate land uses for specific flood hazard areas, or development must be designed and constructed to appropriate flood level and height of habitable rooms. In addition, evacuation routes must be maintained to specific flood levels.

For land that is not already subject to a development commitment, the policy options are intended to steer development to areas of lowest flood risk based on the proposed land use by requiring that new development be built above specific flood levels, and that evacuation routes must also be maintained to specific flood levels.

Two policy options are being provided for Gayndah, recognising that there is more than one pathway for considering climate change in the NBRC planning scheme.

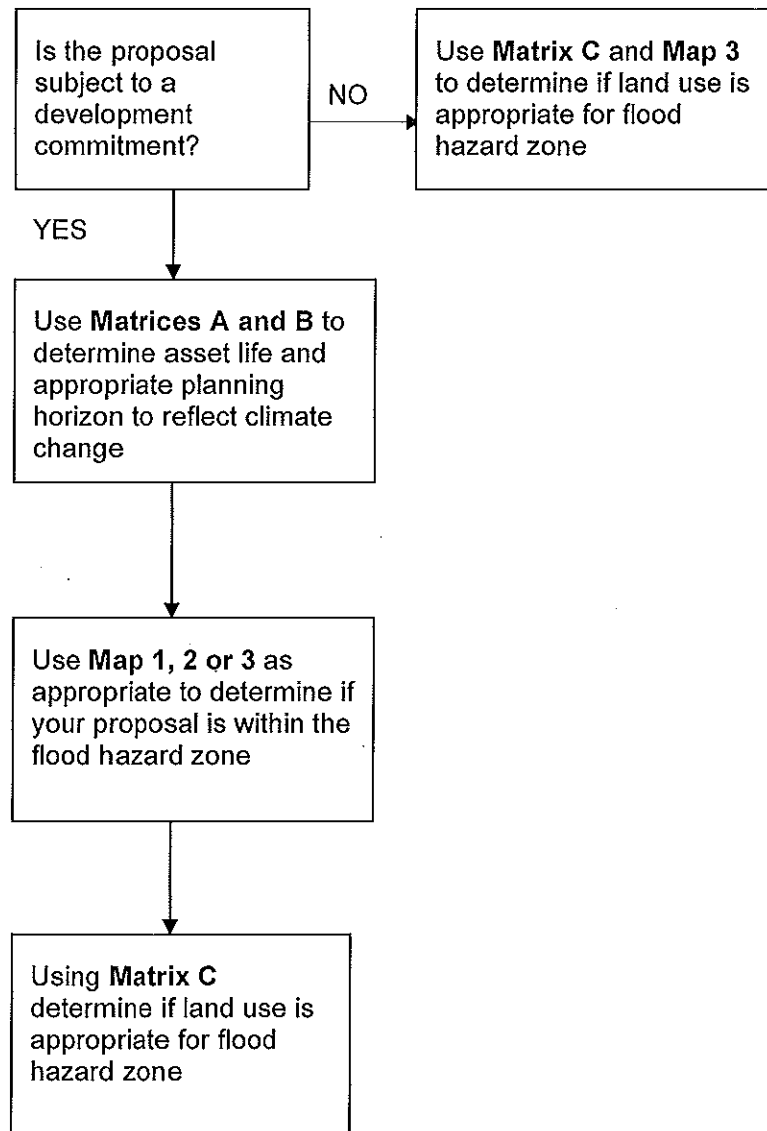
## Option 1: New flood maps incorporating climate change in 2050, 2070 and 2100

Option 1 is based on four hazard areas mapped to incorporate the climate change factor<sup>1</sup> over three planning horizons: 2050, 2070 and 2100. Development is constrained based on the anticipated asset life of the development.

	Proposals not subject to a development commitment (non urban or non-specific urban zone, e.g. future urban)	Proposals subject to a development commitment (existing urban zone)
Maps	Use map 3 (where flood levels incorporate climate change for the 2100 planning horizon).	Consider development against appropriate planning horizon based on anticipated asset life (see Matrix A and B below).  Use maps 1, 2 and 3 (where flood levels incorporate climate change for 2050, 2070 and 2100).
Outcomes	Development is steered to areas of lowest flood hazard based on land use (i.e. residential, commercial, industrial above 1% AEP + cc factor and community infrastructure above 0.5% AEP or 0.2% AEP as appropriate).	Development approval subject to stringent design and evacuation standards.
Acceptable solutions	Development is consistent with appropriate land uses for flood hazard areas based on climate in 2100 (see Matrix C below)  AND  Evacuation routes are maintained (e.g. situated above flood levels).	Development is consistent with appropriate land uses for flood hazard areas (see Matrix C below)  OR  Development is constrained through construction to appropriate flood level and freeboard (e.g. designed to be above flood waters)  AND  Evacuation routes are maintained (e.g. situated above flood levels).

<sup>1</sup>The climate change factor is determined by increasing rainfall intensity for the 1 per cent, 0.5 per cent, and 0.2 per cent AEP flood levels by 5 per cent per degree increase in global mean temperature.

## Option 1—decision tree





**Matrix A—Planning period for proposals subject to a development commitment <sup>2</sup>**

Type of development	Planning period based of anticipated asset life	Relevant map
Short term tourist accommodation (i.e. campgrounds and caravan parks)	40 years	Map 1. Flood extents in future climate scenario— 2050
Residential dwelling (less than 7 units)	50 years	Map 2. Flood extents in future climate scenario—2070
Residential dwelling (7 or more units)	60 years	Map 3. Flood extents in future climate scenario—2100
Residential and multi-use developments	80 years +	Map 3. Flood extents in future climate scenario—2100
Industrial building	40 years	Map 1. Flood extents in future climate scenario—2050
Commercial building (single storey)	40 years	Map 1. Flood extents in future climate scenario—2050
Commercial building (multiple storeys)	60 years	Map 3. Flood extents in future climate scenario—2100

**Matrix B—Anticipated asset life and appropriate planning horizon**

Type of development	Asset life 40 years Map 1. Flood extents in future climate scenario— 2050	Asset life 50 years Map 2. Flood extents in future climate scenario—2070	Asset life 60 years + Map 3. Flood extents in future climate scenario— 2100
Existing development infill/re-development	If development proposed is within the mapped area, assess against the draft flood constraint code.  If development is outside the mapped area, no assessment is required.	If development proposed is within the mapped area, assess against the draft flood constraint code.  If development is outside the mapped area, no assessment is required.	If development proposed is within the mapped area, assess against the draft flood constraint code.  If development is outside the mapped area, no assessment is required.
Greenfield/new urban – no existing structures but with development commitment	No residential, commercial or industrial subdivision (development commitment is beyond 40 years).	No residential subdivision. Commercial/industrial subdivision assessed against the draft flood constraint code.	All development assessed against the draft flood constraint code.

<sup>2</sup> These planning periods are consistent with those presented in other state planning policy.

**Matrix C—Option 1—Appropriate land uses for flood hazard areas**

		Very low hazard area	Low hazard area	Moderate hazard area	High hazard area
Development status	Land use	Area above the 0.2% AEP year level, including climate change factor	Area between 0.5% AEP year and 0.2% AEP year level, including climate change factor	Area between 1% AEP year and 0.5% AEP year level, including climate change factor	Area below 1% AEP year level, including climate change factor
		Hazard maps incorporate climate change factor			
Constrain development in committed and uncommitted areas based upon anticipated asset life and associated planning horizon	Group 1a Critical community infrastructure	Land use appropriate	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)
	Group 1b Essential community infrastructure	Land use appropriate	Land use appropriate	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)
	Group 2a Essential industrial or commercial use	Land use appropriate	Subject to special conditions*	Subject to special conditions	Code assessable (see Schedule 1)
	Group 2b Residential, commercial development	Land use appropriate	Land use appropriate	Land use appropriate	Code assessable (see Schedule 1)
	Group 3 Open space and rural activities	Land use appropriate	Land use appropriate	Land use appropriate	Subject to special conditions

\*Subject to special conditions: Council may wish to develop a special code to assess certain industrial, commercial and rural uses that pose a higher risk in flooding situations.

## Strengths of Option 1

The following strengths have been identified in Option 1, it:

- takes account of the asset life of the development through the use of multiple planning horizons (2050, 2070 and 2100)
- achieves climate change outcomes directly by mapping the revised flood extents taking account of climate change
- considers proposals with and without development commitments over different planning horizons.

## **Limitation of Option 1**

The following limitation has been identified for Option 1:

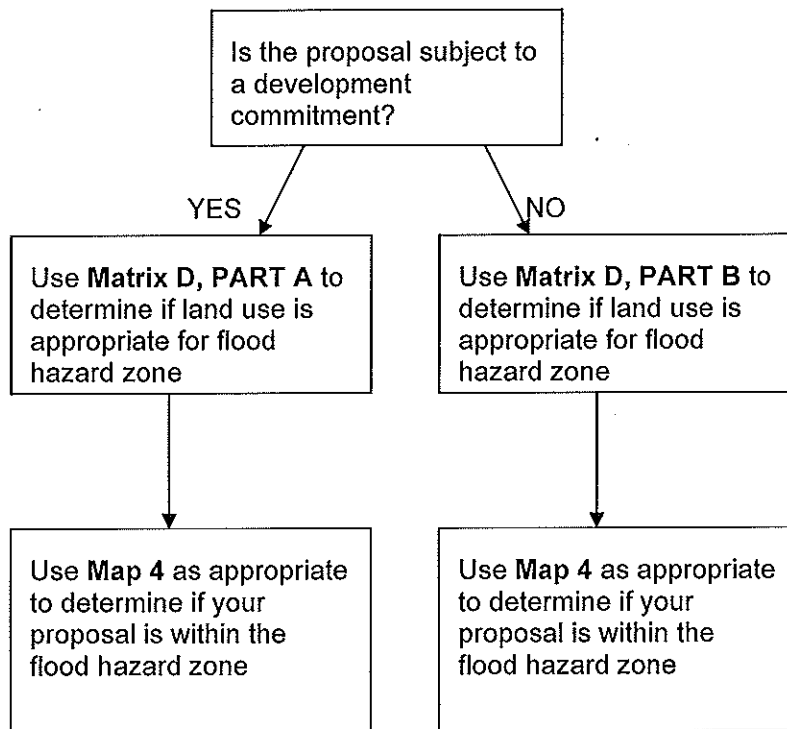
- Flood hazard areas reflecting climate change may move after AR&R method is released, which could cause confusion.

## **Option 2: Existing flood maps approximate climate change in 2050 and 2100**

Option 2 is based on four hazard areas mapped to reflect the current climate at 2010. Climate change is addressed by increasing the level of constraint on planning proposals to:

- approximate the 2050 flood levels (including climate change factor) for assessing development in committed areas
- approximate the 2100 flood levels (including climate change factor) for assessing development in uncommitted areas.

**Option 2—decision tree**



**Matrix D—Option 2—Appropriate land uses for flood hazard areas shown on Map 4**

		Very low hazard area	Low hazard area	Moderate hazard area	High hazard area
Development status	Land use	Area between 0.2% AEP year level and PMF	Area between 0.5% AEP year and 0.2% AEP year level	Area between 1% AEP year and 0.5% AEP year level	Area below 1% AEP year level
<b>PART A</b>		Hazard maps based on current climate in 2010 (i.e. no climate change factor in mapping)			
Proposals subject to a development commitment (future built development outside current urban areas) – approximate climate change to 2050	Group 1a Critical community infrastructure	Land use appropriate	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)
	Group 1b Essential community infrastructure	Land use appropriate	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)
	Group 2a Essential industrial or commercial use	Land use appropriate	Subject to special conditions	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)
	Group 2b Residential, commercial development	Land use appropriate	Land use appropriate	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)
	Group 3 Open space and rural activities	Land use appropriate	Land use appropriate	Subject to special conditions	Subject to special conditions
<b>PART B</b>		Hazard maps based on current climate in 2010 (i.e. no climate change factor in mapping)			
Proposals not subject to a development commitment (development inside committed urban areas) – approximate climate change to 2100	Group 1a Critical community infrastructure	Land use appropriate	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)
	Group 1b Essential community infrastructure	Land use appropriate	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)

	Group 2a Essential industrial or commercial use	Land use appropriate	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)
	Group 2b Residential, commercial development	Land use appropriate	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)	Code assessable (see Schedule 1)
	Group 3 Open space and rural activities	Land use appropriate	Land use appropriate	Subject to special conditions	Subject to special conditions

\*Subject to special conditions: Council may wish to develop a special code to assess certain industrial, commercial and rural uses that pose a higher risk in flooding situations.

## Strengths of Option 2

The following strengths have been identified in Option 2, it:

- adopts a conservative/incremental approach
- constrains proposals with and without development commitments over different planning horizons
- allows Council to review constraints in currently committed areas in the future without shifting the flood level zones represented in the overlay maps
- uses shorter planning horizon (to 2050) in recognition of need to balance existing commitments with consideration of climate change
- establishes a firm basis for flood levels based on current climate – may have better community acceptance
- provides interim approach that leaves flood hazard areas in stable location until AR&R method is released.

## Limitations of Option 2

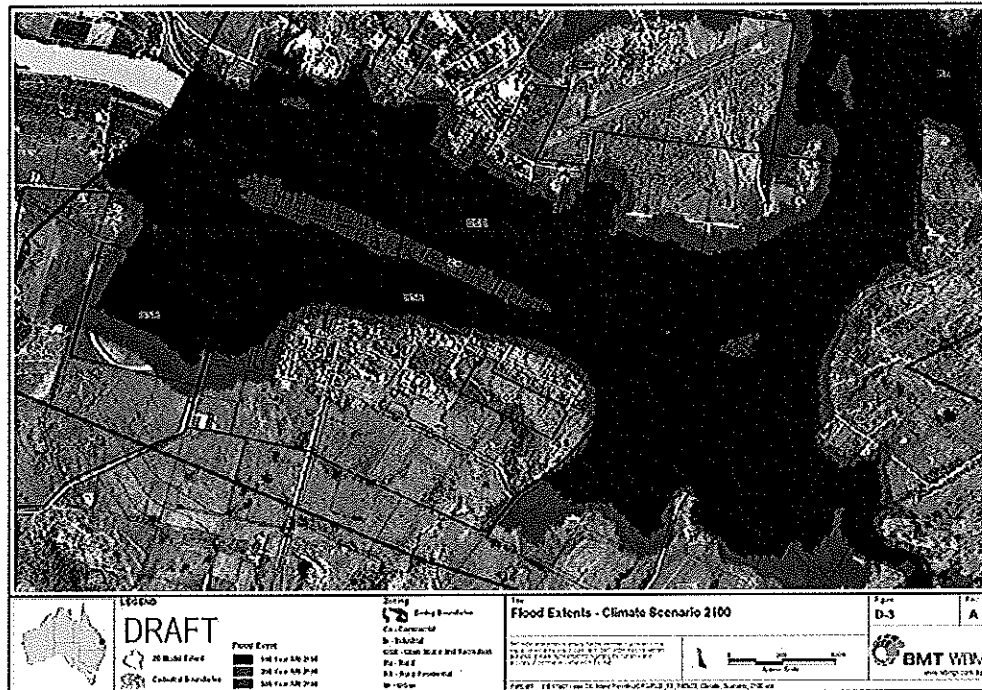
The following limitations have been identified in Option 2, it:

- achieves climate change outcomes indirectly via constraints, not changing the flood hazard maps
- imprecisely allocated constraints under climate change (may under constrain development in 0.2 per cent AEP + zone)
- does not take into account asset life of development.

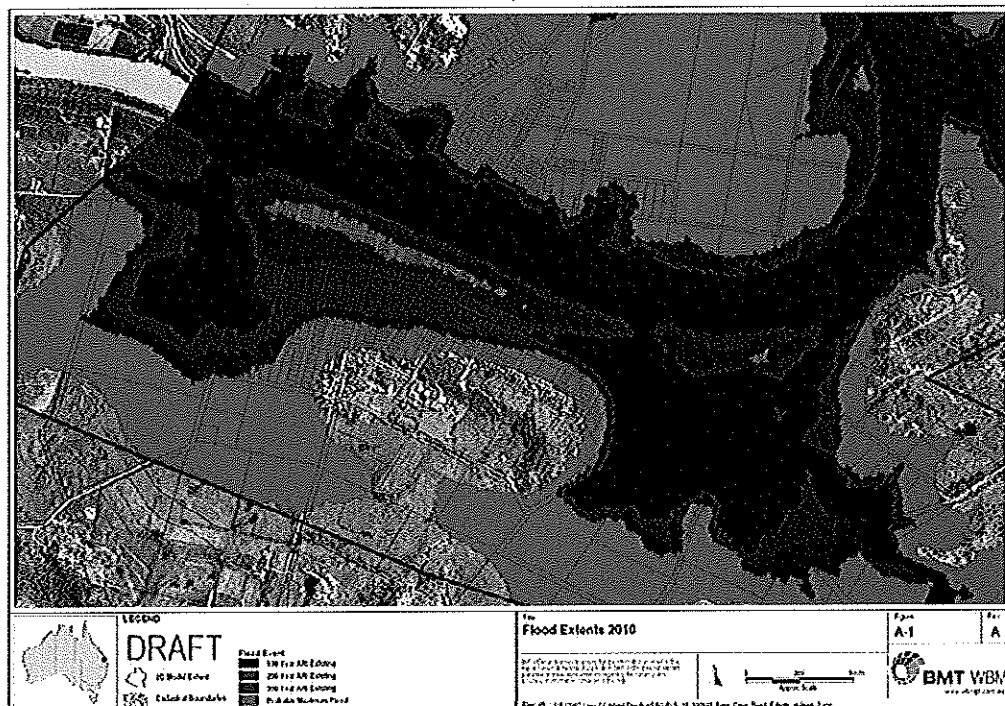




MAP 3: Flood levels in 2100



MAP 4: Flood levels in 2010



# Schedule 1—Draft flood constraint code for flood affected areas in Gayndah

## Purpose

The purpose of this code is to assess development in flood affected areas according to levels of risk so that:

- property damage is limited
- safety is increased and lives are protected
- cumulative impacts of flooding are reduced.

## Outcomes

The application of this code is to achieve the following outcomes:

- minimise the addition of risk in flood affected areas
- lessen the adverse impacts of flooding
- facilitate development in low probability flooding areas
- maintain local flood plain processes (water storage and flows, river discharge and capacity, banks of river, streams and water bodies are protected from erosion)
- maintain a network of evacuation routes
- maintain critical emergency infrastructure and services during flood events
- maintain functionality of community infrastructure during and immediately following flood events
- reduce the overall level of flood risk through the layout and form of the development and building design and construction.

## Application

This code applies to land that is located within the identified flood hazard areas on overlay maps for flood affected areas. In this constraint code, the Defined Flood Event (DFE) is the 1 per cent AEP plus climate change factor.

The Local Disaster Management Group is to use the maps, identified flood levels and scheme solutions to inform preparation of local disaster management plans.

This code applies to development that is:

- building or other work that involves any physical alteration to a watercourse or floodway including vegetation clearing, or involves net filling exceeding 50 cubic metres; and
- material changes of use and reconfigurations of a lot that:
  - increase the number of people living or working in a flood hazard area (e.g. residential development, shopping centres, tourist facilities, industrial or commercial uses) except where the premises are occupied on a short term or intermittent basis); or
  - involve institutional uses where evacuating people may be particularly difficult (e.g. hospitals, schools, aged care, nursing homes, correctional centres); or
  - involve the manufacture or storage of hazardous materials in bulk; or
  - would involve the building or other work described in (a) as an intrinsic element of the development proposal.

The code does not apply to Class 1 buildings as defined in the Building Code of Australia, except where Council has declared an area to be flood prone under Section 13 of the Building Regulation 2006. However, this code designates minimum floor levels of buildings with habitable rooms within flood prone land.

**Performance criteria and acceptable solutions for development that is self assessable, code assessable or impact assessable**

Performance criteria	Acceptable solutions
<b>Flooding risk</b>	
PC1 Development does not result in unacceptable risk to people or property.	<p>AS1.1 For development not subject to a development commitment, the proposed use is consistent with the uses and flood level in Table 1.</p> <p>OR</p> <p>AS1.2 For development subject to a development commitment, the development is consistent with Table 2.</p>
<b>Building floor levels</b>	
PC2 Habitable rooms have acceptable levels of flood immunity.	<p>AS2.1 Where the lot is subject to a resolution about minimum floor levels of habitable rooms under the Building Regulation, the floor level of all new rooms satisfy the level determined in the resolution.</p> <p>OR</p> <p>AS2.2 Where the residential building is on floodable land, but the lot is not subject to a resolution about minimum floor levels of habitable rooms under the Building Regulation, the floor level of all habitable rooms is not less than those set out in Table 2.</p> <p>AS2.3 Where a building has been destroyed and is being re-built, the reconstructed floor level accords with Table 2.</p>
<b>Disaster management</b>	
PC3 Development in flood affected areas must not increase the level of risk to life or be to the detriment of flood evacuation procedures.	<p>AS3.1 Development does not:</p> <ul style="list-style-type: none"> <li>• increase the number of people calculated to be at risk from flooding</li> <li>• increase the burden on disaster management operations</li> <li>• increase traffic volumes on evacuation routes</li> <li>• adversely impact on the ability of traffic to use evacuation routes.</li> </ul> <p>AND</p>

	<p>AS3.2 Evacuation access in accordance with Tables 3 and 4 is provided.</p> <p>Note: Compliance with this acceptable solution can be demonstrated by the submission of a report identifying that where there is an increase in the number of people, the disaster management burden is taken into account in Council's disaster management plan.</p>
PC4 Access or egress to and from the site is available to enable evacuation during flooding.	AS4.1 Evacuation routes are in accordance with Tables 3 and 4.
Flood processes	
PC5 The development must not directly, indirectly or cumulatively cause an increase in flood level or velocity or negatively impact drainage resulting in the potential to cause real damage to upstream, downstream or adjacent properties.	AS5.1 Where the development is located within a high flood hazard area or moderate flood hazard area (as defined in Table 1), a hydraulic and hydrology report is provided from a Registered Professional Engineer of Queensland (using the flood mapping methodology developed by QCCCE) that demonstrates there are no increased flooding impacts on upstream, downstream or adjacent properties.
PC6 Filling, excavation, physical alteration to a watercourse, floodway or flow path must not directly, indirectly or cumulatively cause an increase in flood level or velocity, or negatively impact drainage resulting in the potential to cause real damage to upstream, downstream or adjacent properties.	<p>AS6.1 No filling, excavation or physical alteration to a watercourse, floodway or flow path is located within the 100 year ARI extent.</p> <p>OR</p> <p>AS6.2 A report is provided from a Registered Professional Engineer of Queensland that demonstrates the following is achieved:</p> <ul style="list-style-type: none"> <li>• Filling and excavation do not cause ponding to any adjoining site and land upstream and down stream</li> <li>• Changes to flooding due to filling and excavation will not adversely affect the safety or use of any adjoining site and land upstream and downstream</li> <li>• Any changes to run-off characteristics resulting from filling for storm events, up to at least the two year ARI design storm, are minimised in an ecologically sensitive manner.</li> </ul>

PC7 Development does not reduce the flood storage capacity of the catchment.	AS7.1 The flood storage volume on the site is maintained for flood levels up to the DFE.
Overland Flow	
PC8 Building work must not provide obstructions to the free passage of water through a property.	AS8.1 Water is allowed free passage across a property, in accordance with the provisions of the Building Code of Australia and the Queensland Urban Drainage Manual.

*Note: Tables 1 to 3 reflect land uses identified in the North Burnett Regional Council Planning Scheme and types of community infrastructure identified in SPP1/03 Guideline Appendix 9 <sup>3</sup>*

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<sup>3</sup> Updates to Tables 1 to 3 should reflect the land uses identified in the Queensland Planning Provisions and the relevant local planning scheme

Table 1 for use with planning horizons Option 1–Appropriate land uses for flood hazard areas				
Land Use	Very low hazard area	Low hazard area	Moderate hazard area	High hazard area
	Area between 0.2% AEP year level and probable maximum flood +climate change factor	Area between 0.5% AEP year and 0.2% AEP year level +climate change factor	Area between 1% AEP year and 0.5% AEP year level +climate change factor	Area below 1% AEP year level +climate change factor
Group 1a				
Disaster management facilities	✓			
Hospitals and associated facilities	✓			
Major electrical switchyards, power stations and substations	✓			
Group 1b				
Fire and police stations	✓	✓		
Emergency shelters	✓	✓		
Public utility (including water and sewage treatment plants)	✓	✓		
Retirement village, homes for the aged, hospice	✓	✓		
Community oriented activities (including child care centres, educational establishment, places of worship)	✓	✓		
Group 2a				
Regional fuel storage	✓	subject to special conditions	subject to special conditions	
Food storage warehouses	✓	subject to special conditions	subject to special conditions	
Group 2b				
Camping grounds, caravan parks	✓	✓	✓	
Residential activities (including detached house,	✓	✓	✓	

home business, and multiple dwelling (except retirement village), bed and breakfast premises, caretaker's residence, and visitor accommodation)				
Commercial activities (including hotels, professional offices and shops)	✓	✓	✓	
Clubs/ non-habitable buildings associated with enjoyment of public open space	✓	✓	✓	
Industrial activities	✓	✓	✓	
Group 3				
Open space, recreation, and conservation	✓	✓	✓	Subject to appropriate land assessment and planning
Rural activities (including agriculture, grazing, intensive animal husbandry)	✓	✓	✓	Some intensive rural uses may not be appropriate in this area and may only be acceptable with special conditions

\*Subject to special conditions: Council may wish to develop a special code to assess certain industrial, commercial and rural uses that pose a higher risk in flooding situations.

Table 1 for use with planning horizons Option 2—Appropriate land uses for flood hazard areas PROPOSALS SUBJECT TO A DEVELOPMENT COMMITMENT				
Land use	Very low hazard area	Low hazard area	Moderate hazard area	High hazard area
	Area above 0.2% AEP year level (based on 2010 climate)	Area between 0.5% AEP year and 0.2% AEP year level (based on 2010 climate)	Area between 1% AEP year and 0.5% AEP year level (based on 2010 climate)	Area below 1% AEP year level (based on 2010 climate)
Group 1a				
Disaster management facilities	✓			
Hospitals and associated facilities	✓			
Major electrical switchyards, power stations and substations	✓			
Group 1b				
Fire and police stations	✓			
Emergency shelters	✓			
Public utility (including water and sewage treatment plants)	✓			
Retirement village, homes for the aged, hospice	✓			
Community oriented activities (including child care centres, educational establishment, places of worship)	✓			
Group 2a				
Regional fuel storage	✓	Subject to special conditions	Subject to special conditions	
Food storage warehouses	✓	Subject to special conditions	Subject to special conditions	
Group 2b				
Camping grounds, caravan parks	✓	✓		



Residential activities (including detached house, home business, and multiple dwelling (except retirement village), bed and breakfast premises, caretaker's residence and visitor accommodation)	✓	✓		
Commercial activities (including hotels, professional offices and shops)	✓	✓		
Clubs/ non-habitable buildings associated with enjoyment of public open space	✓	✓		
Industrial activities	✓	✓		
Group 3				
Open space, recreation, and conservation	✓	✓	Subject to appropriate land assessment and planning	Subject to appropriate land assessment and planning
Rural activities (including agriculture, grazing, intensive animal husbandry)	✓	✓	Some intensive rural uses may not be appropriate in this area and may only be acceptable with special conditions	Some intensive rural uses may not be appropriate in this area and may only be acceptable with special conditions

*\*Subject to special conditions: Council may wish to develop a special code to assess certain industrial, commercial and rural uses that pose a higher risk in flooding situations.*

Table 1 for use with planning horizons Option 2—Appropriate land uses for flood hazard areas				
PROPOSALS NOT SUBJECT TO A DEVELOPMENT COMMITMENT				
Land use	Very low hazard area	Low hazard area	Moderate hazard area	High hazard area
	Area above 0.2% AEP year level (based on 2010 climate)	Area between 0.5% AEP year and 0.2% AEP year level (based on 2010 climate)	Area between 1% AEP year and 0.5% AEP year level (based on 2010 climate)	Area below 1% AEP year level (based on 2010 climate)
Group 1a				
Disaster management facilities	✓			
Hospitals and associated facilities	✓			
Major electrical switchyards, power stations and substations	✓			
Group 1b				
Fire and police stations	✓			
Emergency shelters	✓			
Public utility (including water and sewage treatment plants)	✓			
Retirement village, homes for the aged, hospice	✓			
Community oriented activities (including child care centres, educational establishment, places of worship)	✓			
Group 2a				
Regional fuel storage	✓			
Food storage warehouses	✓			
Group 2b				
Camping grounds, caravan parks	✓			
Residential activities (including detached house, home business, and multiple dwelling (except retirement village), bed and breakfast premises, caretaker's residence and visitor accommodation)	✓			
Commercial activities (including hotels, professional offices and shops)	✓			

Clubs/ Non-habitable buildings associated with enjoyment of public open space	✓			
Industrial activities	✓			
Group 3				
Open space, recreation, and conservation	✓	✓	Subject to appropriate land assessment and planning	Subject to appropriate land assessment and planning
Rural activities (including agriculture, grazing, intensive animal husbandry)	✓	✓	Some intensive rural uses may not be appropriate in this area and may only be acceptable with special conditions	Some intensive rural uses may not be appropriate in this area and may only be acceptable with special conditions

*\*Subject to special conditions: Council may wish to develop a special code to assess certain industrial, commercial and rural uses that pose a higher risk in flooding situations.*

Table 2. Minimum design freeboard for development subject to a development commitment	
Land use	Minimum design freeboard
Disaster management facilities	0.2% AEP + cc factor + 300 mm
Hospitals and associated facilities	0.2% AEP + cc factor + 300 mm
Major electrical switchyards, power stations and substations	0.2% AEP + cc factor + 300 mm
Fire and police stations	0.5% AEP + cc factor + 300 mm
Emergency shelters	0.5% AEP + cc factor + 300 mm
Public utility (including water and sewage treatment plants)	0.5% AEP + cc factor + 300 mm
Retirement village, homes for the aged, hospice	0.5% AEP + cc factor + 300 mm
Community oriented activities (including child care centres, educational establishment, places of worship)	0.5% AEP + cc factor + 300 mm
Camping grounds, caravan parks	1% AEP + cc factor + 300 mm
Residential activities (including detached house, home business, and multiple dwelling (except retirement villages), bed and breakfast premises, caretaker's residence, and visitor accommodation)	1% AEP + cc factor + 300 mm
Commercial activities (including hotels, professional offices and shops)	1% AEP+ cc factor
Industrial activities	1% AEP+ cc factor
Regional fuel storage	subject to special conditions
Food storage warehouses	subject to special conditions
Clubs/non-habitable buildings associated with enjoyment of public open space	1% AEP+ cc factor
Open space and recreation activities/conservation	not specified
Rural activities (including agriculture, grazing, intensive animal husbandry)	not specified

*\*Subject to special conditions: Council may wish to develop a special code to assess certain industrial, commercial and rural uses that pose a higher risk in flooding situations.*

Table 3. Maximum degree of flood hazard for emergency routes	
Land use	Maximum degree of flood hazard for evacuation routes
Disaster management facilities	low
Hospitals and associated facilities	low
Major electrical switchyards, power stations and substations	low
Fire and police stations	low
Emergency shelters	low
Public utility (including water and sewage treatment plants)	low
Retirement village, homes for the aged, hospice	low
Community oriented activities (including child care centres, educational establishment, places of worship)	low
Camping grounds, caravan parks	medium
Residential activities (including detached house, home business, and multiple dwelling (except retirement villages), bed and breakfast premises, caretaker's residence, and visitor accommodation)	medium
Commercial activities (including hotels, professional offices and shops)	high
Industrial activities	high
Regional fuel storage	high
Food storage warehouses	high
Clubs/non-habitable buildings associated with enjoyment of public open space	high
Open space and recreation activities/conservation	extreme
Rural activities (including agriculture, grazing, intensive animal husbandry)	extreme

Table 4. Flood hazard criteria for emergency routes				
Criteria	Degree of flood hazard			
	Low	Medium	High	Extreme
Wading ability	If necessary children and the elderly could wade (generally, safe wading velocity depth product is less than 0.25.)	Fit adults can wade (generally, safe wading velocity depth product is less than 0.4.)	Fit adults would have difficulty wading (generally, where wading velocity depth product is less than 0.6.)	Wading is not an option
Evacuation distances	< 200 m	200 – 400 m	400 – 600 m	> 600 m
Maximum flood depths	< 0.3 m	< 0.6 m	< 1.2 m	> 1.2 m
Maximum flood velocity	< 0.4 m/sec	< 0.8 m	< 1.5 m	> 1.5 m
Typical means of egress	Sedan	Sedan early, but 4WD or trucks later	4WD or trucks only in early stages, boats or helicopters	Large trucks, boats or helicopters
Timing	Ample for flood forecasting. Warning and evacuation routes remain passable for twice as long as evacuation time.	Evacuation routes remain trafficable for 1.5 times as long as the evacuation time	Evacuation routes remain trafficable for only up to minimum evacuation time	There is insufficient evacuation time
<i>Note: The evacuation times for various facilities or areas would be included in the local disaster management plan (flooding). Generally, safe wading conditions assume even walking surfaces with no obstructions, steps, soft underfoot, etc.</i>				

## Definitions

**Critical community infrastructure** includes disaster management facilities; hospitals and associated facilities; major electrical switchyards, power stations and substations.

**Development** is any of the following (as defined in s7 and s10 *Sustainable Planning Act 2009*) —

- carrying out building work
- carrying out plumbing or drainage work
- carrying out operational work
- reconfiguring a lot
- making a material change of use of premises

**Development commitment** means any of the following:

- development with a valid preliminary approval or development that arises from and is necessary to give effect to a valid approval; or
- development that is:
  - consistent with a relevant statutory regional plan or any applicable State Planning Regulatory Provision; and
  - explicitly anticipated by and consistent with the specific relevant zone (or equivalent), all applicable codes, and any other requirements of the relevant planning scheme
- development that is located within a State development area and is consistent with the development scheme prepared for the State development area
- development consistent with a designation for community infrastructure.

**Essential community infrastructure** includes fire and police stations; emergency shelters; public utility including water treatment plants and sewage treatment plants; retirement village, homes for the aged, and hospices; community oriented activities (including child care centres, educational establishments and places of worship).

**Evacuation route** means a path of travel from:

- any place in the development, through a final exit of the development to a place of safety outside the flood affected area; or
- a common area of the development to a place of safety outside the flood affected area.

**Urban area** means an area allocated under a planning scheme for an urban or rural residential purpose and the allocation is consistent with any applicable State planning regulatory provisions and statutory regional plan.