Brisbane River Catchment

Regional Guideline for Flood Awareness Mapping and Communication

Queensland Government

Document details

Security classification	Approved
Date of review of security classification	December 2020
Authority	Queensland Reconstruction Authority
Document status	Final
Version	1.1
QRA reference	DOC/20/40980

Copyright

Licence

Attribution

This guideline has been developed as part of the Phase 4 (Implementation) of the Brisbane River Catchment Studies, through the collaborative efforts of the Queensland Reconstruction Authority, Brisbane City Council, Ipswich City Council, Lockyer Valley Regional Council and Somerset Regional Council.

Interpreter

The Queensland Government is committed to providing accessible services to Queenslanders from all culturally and linguistically diverse backgrounds. If you have difficulty in understanding this report, you can access the Translating and Interpreting Services via ***www.qld.gov.au/languages*** or by phoning 13 14 50.

Disclaimer

While every care has been taken in preparing this publication, the State of Queensland accepts no responsibility for decisions or actions taken as a result of any data, information, statement or advice, expressed or implied, contained within. To the best of our knowledge, the content was correct at the time of publishing.

Copies

Copies of this publication are available on our website at ***www.qra.qld.gov.au***.

Further copies are available upon request to:
Queensland Reconstruction Authority
PO Box 15428
City East QLD 4002
Phone (07) 3008 7200
info@qra.qld.gov.au
www.qra.qld.gov.au

Contents

Introduction

This document has been prepared to provide guidance to deliver regionally consistent flood awareness information in support of community engagement and awareness activities in the Brisbane River catchment.

The guideline is the deliverable of the Brisbane River Catchment Strategic Floodplain Management Plan action CAR2.3, which allocated the Queensland Reconstruction Authority to:

In strong collaboration with local governments, develop regional guidance for delivering consistency in the local provision of online flood awareness mapping, property-scale flood information, place-based installations, and community facing language and messaging.

Whilst developed specifically for the Brisbane River Catchment, the guideline has purposefully been developed with consideration for state-wide application. It is produced as a "living document", intended for ongoing monitoring and review to ensure alignment with best practice, developments and innovation.

Why is this guideline needed?

In developing the Brisbane River Catchment Strategic Floodplain Management Plan (the Strategic Plan), community survey responses clearly identified that residents in the Brisbane River catchment seek information from more than one local government area.

Prior to this guideline, councils within the catchment developed and implemented their own methods for communicating flood risk and building flood awareness. Whilst there are similarities across the campaigns, key aspects including the flood events used in messaging, formats and methods for making information available, language and key messaging varied, creating unnecessary complexities for the community. The project partners agreed that regionally consistent principles are required for:

- flood awareness mapping
- property level information
- place based installations
- community facing language and messaging.

Principles

This guideline has been prepared based on the following key principles.

Consistency: the guideline seeks to ensure consistent information is provided and communicated to the communities of floodplains, irrespective of the geographic area where they live.

Simplicity: whilst the science of understanding, defining and assessing flood behaviour can be complicated, communication of key information must be targeted and simplistic.

Tailored to local requirements: it is not expected that each council will apply all the content and features discussed in this guideline, however those which are adopted should be consistent with these guidelines.

Intended users

Representatives of councils and local authorities are encouraged to use this guideline to assist in the production and provision of flood awareness information for their communities.

What is a flood aware and resilient community?

The purpose of flood awareness communication is to create awareness and prompt action to prevent and reduce the impacts of flooding on communities within a floodplain.

The Strategic Plan defines a flood aware and resilient community as being:

- informed and aware of their flood risk
- appropriately prepared
- adaptable.

Flood awareness mapping

Source of flooding

This guideline focuses on flooding of rivers, specifically the Brisbane River, however, recognises local authorities experience flooding from various sources. Whilst from the community's perspective "water is water", flooding from different sources typically exhibit different behaviours which affects the impacts to the community.

These behaviours relate to different characteristics of floods, such as the volume of water, how fast the floods rise and recede, how fast the water flows, how long the flood lasts and the areal extent of flooding.

Generalised relative behaviours are discussed below, assuming the chance of a flood occurring from each different source is the same or similar.

Table 1: Generalised characteristics of floods by source

Source	General Characteristics
Large Riverine Catchments	Rainfall can build up over hours, days or weeks. The runoff from this rainfall flows across and then down gutters, drains, gullies, creeks and rivers and may create significant floods that inundate large areas of land for varying periods of time. With more time to react, flood warning is more effective for these types of floods.
Small River/Creek Catchments	Heavy, intense rainfall can occur suddenly, and the quickly rising floods caused by this can occur within minutes or hours after the rainfall. Referred to as flash floods, there is often limited time to react, and these events can be difficult to predict and manage in real time.
Coast	Large tides and storm surges can flood coastal areas. The affected area can be widespread, however there is usually the opportunity for effective flood warning with these events.
Overland flow	In urbanised areas, the formal drainage network is usually designed only to manage small, frequent rainfall events. When these are exceeded, water flows along the low points of the topography, often across private property and roads. These events are very hard to predict, with little to no warning time. They often occur at the same time as other types of flooding or can be independent events.

For the purposes of flood awareness mapping, experience indicates that overland flow should be differentiated from other sources as the characteristics are significantly different.

Unless a clear distinction is required, river, creeks and coastal flooding can be classified in the same manner.

Describing flood impacts

Flood awareness maps produced for areas within the Brisbane River catchment will be categorised into four areas based on the following agreed impact statements.

- **High Impact** - Comprises areas of deep and fast flowing water which pose a potential high risk to life and / or likely failure of buildings during a flood event. Typically, these areas are part of or immediately adjacent to the river or direct tributaries which experience frequent flooding. Alternatively, the areas may flood less frequently however due to the characteristics of the flood waters, pose a high risk due to the risk to life and property
- **Moderate Impact -** Generally, areas where the river breaks out and into low lying broader floodplains. These areas are predominately flood storage areas, filling and temporarily holding flood water during an event. Relatively frequently affected by flood but typically areas of deeper water with lower velocity. Durations of flooding and depth can vary depending on what part of the catchment.
- **Low Impact -** Often described as 'flood fringe'. Areas either relatively frequently inundated with low level sheet or overland flow or deeper slow flowing water in larger, infrequent events
- **Other areas of the floodplain -** Identifies all other areas of the floodplain that have the potential, albeit very low likelihood, to be affected by extreme flooding events. A flood in these areas is the most extreme and infrequent event that could occur in the catchment.

Categorising flood events

The flood events which form the basis of each impact category shown on the flood awareness maps is determined by each local council, based on the detailed understand of their creek and river systems. For the areas defined by the Brisbane River Flood Study, the Potential Hydraulic Risk (PHR) matrix is the agreed basis from which the categories will be derived.

The PHR as agreed in the development of the Strategic Plan is shown below. It groups areas of the floodplain based on a combination of the likelihood of floods occurring (in increasing likelihood on the vertical axis), and the flood hazard exhibited by the flood events (by increasing hazard category on the horizontal axis). Further detail can be obtained from the Brisbane River SFMP Technical Evidence Report (BMT, 2018).

AEP	HI	H2	H3	H4	H5	H6
1 in 100K	HR5	HR5	HR5	HR5	HR5	HR5
1 in 2000	HR5	HR5	HR4	HR4	HR4	HR4
1 in 500	HR5	HR4	HR4	HR3	HR3	HR3
1 in 100	HR4	HR4	HR3	HR2	HR2	HR2
1 in 50	HR4	HR3	HR2	HR2	HR1	HR1
1 in 20	HR3	HR2	HR2	HR1	HR1	HR1
1 in 10	HR2	HR1	HR1	HR1	HR1	HR1

Flood hazard (horizontal axis) is determined by both the flood depth and flood velocity, as recommended by Australian Disaster Resilience Guideline 7-3 Flood Hazard, reproduced below.

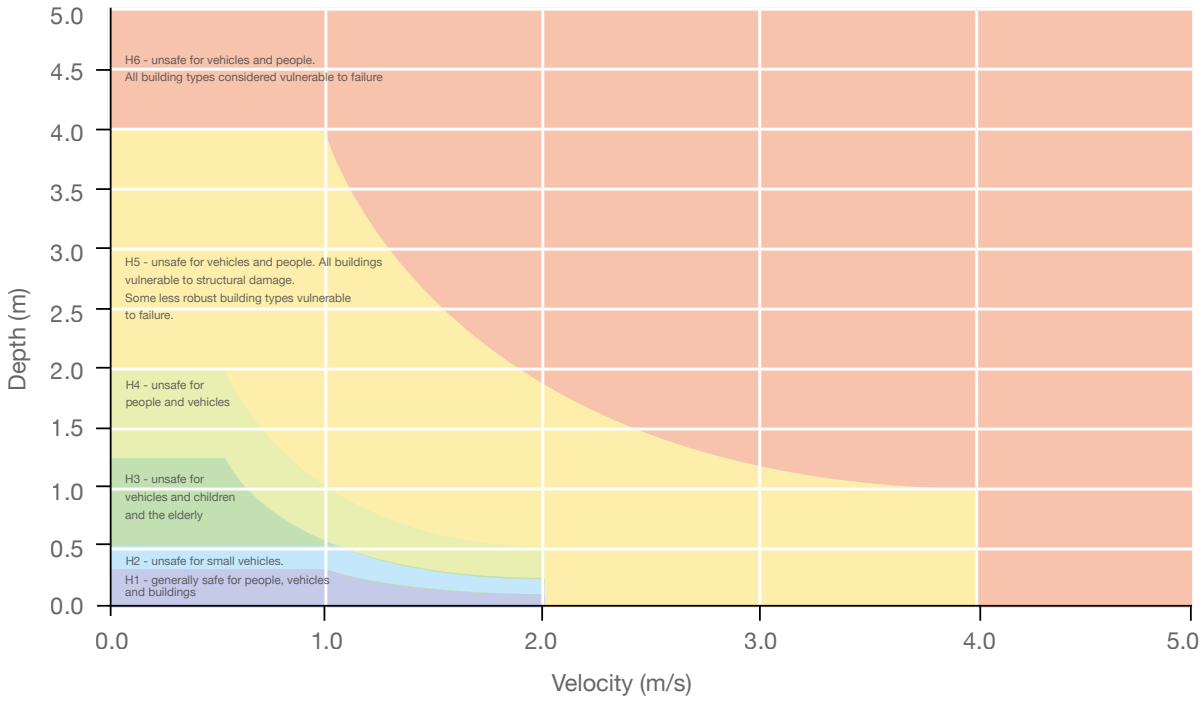


Table 2: Combined hazard curves - vulnerability thresholds classification limits

Hazard Vulnerability Classification	Classification limit (D and V in combination) m²/s	Limiting still water (D) m	
H1	D*V≤0.3	0.3	2.0
H2	D*V≤0.6	0.5	2.0
H3	D*V≤0.6	1.2	2.0
H4	D*V≤1.0	2.0	2.0
H5	D*V≤4.0	4.0	4.0
H6	D*V>4.0	-	-

Flood probability (vertical axis) is expressed in terms of Annual Exceedance Probability (AEP), which refers to the probability of a flood of the nominated size or larger occurring in any given year. For example, a 1 per cent AEP flood describes an event that has a 1 in 100 chance of being equalled or exceeded in any year. The PHR includes flood events ranging from the 1 in 10 AEP to the 1 in 100,000 AEP.

The PHR was determined through grouping flood likelihoods and hazards into five bands of similar and relative 'risk'. It represents the risk resulting from the likelihood of the flood occurring and the depths and velocities of the floodwaters only, independent of the actual use or development of the land. As such it presents only part of the actual flood risk.

Through the PHR, the floodplain is grouped into categories ranging HR1 (highest potential risk) to HR5 (lowest potential risk). Each council has the discretion to select the appropriate matrix cells used to map the agreed impact categories which best reflects the local context. At a minimum however, the following will be used:

- **High Impact** HR1, with consideration of components of HR2 as appropriate
- **Moderate Impact** HR3, with consideration of components of HR2 as appropriate
- **Low Impact** HR4, with consideration of component of HR5 as appropriate
- **Other areas of the floodplain**, all remaining cells (HR5).

Mapping Symbology

Flooding categories

The colour scheme for the impact categories of flooding is provided below. Research[1] has shown that the commonly used shades of blue can be hard to differentiate and confusing to interpret. As such it is recommended that the traffic light colours are used. The scheme includes patterned symbology for the low and medium impact categories, which considers accessibility for colour blindness. Suggested colours (with RGB numbers) and patterns are shown below. For high impact areas, Councils may choose either red or pink.

Table 3: Flood Awareness Mapping colours and symbology

Category	Colour	Pattern
Low impact	R78 G178 B101	
Moderate impact	R247 G240 B86	
High impact	R220 G5 B12 / R211 G93 B144	N/A
Other areas of the floodplain	R123 G175 B222	N/A

Base data on Flood Awareness Maps

Flood awareness maps should be presented on council cadastres, with street names and suburbs labelled. The option to also show aerial imagery should be considered.

The ability to zoom and pan should also be available, however, it is up to the discretion of the councils as to the appropriate scale permitted through the mapping.

Access and location of Flood Awareness Maps

Online

Flood awareness maps should be made available on council websites and titled 'Flood Awareness Maps'. They should be located within the area of the website which hosts information about water, not on a standalone section of the website.

The maps should be accessible on mobile and desktop and function across a wide range of browsers.

Councils should consider offering training sessions for their communities to assist those who are unfamiliar with web-based interfaces and mapping.

Offline

Not everyone has access to or feels sufficiently skilled to access information from the internet. In Queensland, it is estimated that approximately 25 per cent of the population is without internet connection at home. Proportionally this falls higher in the rural areas than urban areas.

Councils should considers mean to provide flood awareness information in print form, for distribution or to be access in public places, such as council offices, and libraries.

[1] Public Dialogues on Flood Risk Communication Evaluation Report SC120010R2, Environment Agency UK, 2015

Website design considerations

Research[2] has shown that users rarely click through subsequent pages of data. It is therefore necessary for the highest priority messaging to be conveyed on the landing page. At a minimum this should include:

- agreed messaging regarding the purpose and content of the flood awareness map
- the agreed definition of flood categorisation
- a link to Frequently Asked Questions (see Key Messages of this report).

It is important to avoid duplication of content. Outward links to appropriate sites should be included, rather than reproducing material within the flood awareness maps. Council may wish to provide other information including:

- link to emergency dashboards
- direct link to council planning scheme mapping
- link to the Bureau of Meteorology flood warning site
- historical flood information.

The design of the websites should encourage users to move beyond the landing page and provide the latest information for repeat visits.

Encouraging repeat visits

As the data used to develop flood awareness maps is regularly updated, it is important to encourage users to regularly visit the site. The following methods can be used to encourage repeat visits:

- ensuring the site loads quickly and is easy to navigate
- providing a mobile version
- refreshing the content regularly
- providing links to other areas of the site
- enabling direct feedback through the site
- providing end dates on downloadable content
- ensuring phone number, emergency info, and time-sensitive info is prioritised.

Encouraging users to access further information

Beyond the prioritised information on the landing page, it is important for users to be able to access more detailed information without having to click through numerous pages. The following methods may assist users to easily find the information they are looking for:

- Provide all related information on a page and encourage users to scroll rather than click through numerous links.
- Make it easy to navigate back to the original landing site and keep the navigation menu easily accessible.
- Create no more than three or four levels of information.
- The most important information on any page should stand out as the most visually prominent. Use colours and size contrast to differentiate primary and supporting details.
- Users scan pages for information. The first two or three words of the sentence are key to conveying information and ensuring users continue to read.

[2] Brisbane City Council Flood Maps Analytics

Property-scale flood Information

Property scale flood information is intended to provide communities with specific information about their home, schools, workplaces and surroundings but can also support other council functions, such as land use planning.

Property level information should be accessible through the Flood Awareness Map. Ideally, information should be available for all properties in the local government area not just those directly affected by flooding. This allows council to provide further information to residents whose property may not be directly impacted, but are isolated during an event, for example.

The webpage should allow users to save a copy of the information via a downloadable pdf or an email link.

Councils may wish to consider ways to encourage residents to access the page. For example, including QR scanner codes on rates notices, linking directly to the relevant property page information.

Content

The follow information should be provided at the property scale, where available.

- lowest recorded ground level within the lot boundary
- lowest known habitable floor level
- a detailed description of the flood category the property falls within
- design flood levels for a range of events. where possible this should be linked to the minor, moderate and major gauge classifications
- historical flood levels
- closest gauge for which warnings would be issued
- correlation of gauge heights with flood information at site
- information regarding any flood-liable access routes in the immediate vicinity
- local area high point / refuge area.

The information should be supported by interpretative notes, which includes the source and accuracy of data provided and explanatory notes of key terms, consistent with the key messages (see page 15).

The property-scale information should again reinforce the desired responses before, during and after flood events, and link through to the primary providers of this information, for example:

- Council Disaster Dashboards
- Bureau of Meteorology active flood warnings ***bom.gov.au/qld/warnings/flood/index.shtml***
- Queensland Government's Get Ready Queensland ***getready.qld.gov.au***
- Queensland Government's Disaster Recovery ***qld.gov.au/community/disasters-emergencies/recovery-after-disaster***.

Place-based installations

Types

Place-based installations are intended to act as flood awareness and information tools, conveying information about past events and potential flood impacts, at local points of interest. They include permanent installations, including flood markers, plaques, statues, and educational signage, temporary “pop-up” installations, and virtual installations.

The intention of installations are to maintain awareness in the community of the potential flood risk. Ideally permanent installations would feature on flood awareness mapping, creating connectivity between both sources of information.

Regional collaboration on the design, funding and procurement of such installations is encouraged.This would not only reinforce the catchment-based perspective of the Brisbane River, but would also assist in reinforcing the connectivity of communities and the messaging, across the catchment.

*New Rockhampton flood marker. **abc.net.au/news/2013-10-29 flood marker/5053578***

Locations

Local communities’ primary objection to the use of place-based installations is the perceived impact on property values. As such, permanent installations should be located away from residential areas, but within accessible community spaces such as parks and recreational areas that have a history of flooding.

The design should incorporate mechanisms to deter vandalism. It is also important to be sensitive to the local impacts of past flood events, for example locations which incurred a loss of life, or acts of heroism.

Information

Place based installations in the Brisbane River catchment should be designed to convey:

- magnitude of historical events, and areas of repeated flooding
- information about the Brisbane River catchment to incorporate information beyond a single local government area
- appropriate warnings and links to gauge information.

Tully (QLD) flood markers, Logan.
landscapeaustralia.com/articles/tully-memorial-flood-markers/#img-2

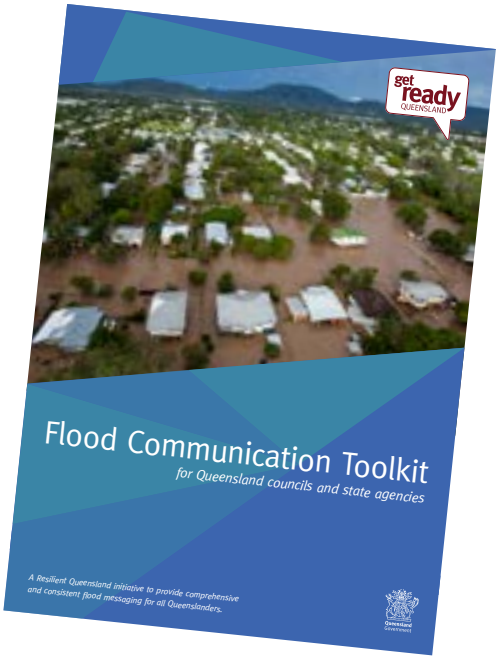
Community facing language and messaging

Key messaging across region

The Flood Communication Toolkit hosted on the Queensland Government's Get Ready Queensland Council Hub provides comprehensive and consistent flood messaging for all Queenslanders.

The Toolkit is designed for Queensland councils and relevant state agencies to communicate with the general public. The aim of the Flood Communication Toolkit is to increase community awareness and resilience to floods. The toolkit includes ready-to-use messages with images, graphics and tiles that are co-branded with council logos appropriate for social media. The suite of resources allows councils to pick and choose the material that is relevant to their communities. Resources in the Toolkit may also be used across other platforms such as disaster dashboards, community noticeboards, electronic billboards, emails, and text messages.

Councils can add to or amend the provided text to include localised information during a disaster event, to promote a council flood related project, a Get Ready Queensland initiative, or a related council event, web link or disaster dashboard.



Glossary of terms

Annual Exceedance Probability	The chance that a flood will reach or exceed a particular level in any given year. For example a 1% (1 in 100) AEP event.
Brisbane River Catchment Flood Studies	The full package of investigations of the Brisbane River carried out on behalf of the Queensland Government since 2013, covering data collection (Phase 1), hydrologic and hydraulic modelling (Phase 2 – Flood Study), the Technical Evidence Report and Strategic Floodplain Management Plan (Phase 3), and Implementation (Phase 4).
Community Resilience	A community's ability to rapidly accommodate and recover from the impacts of hazards, restore essential structures and desired functionality, and adapt to new circumstances. Community resilience is closely linked to the awareness of the community regarding flooding and the potential for impacts and damages from different sizes of events.
Floodplain	An area of land this is subject to inundation by floods up to and including the probable maximum flood event – that is flood-prone land.
Flood behaviour	The characteristics of a flood, such as the areal extent which is inundated, the volume of water, how fast the water flows, how fast the flood rise and recede, how long the floods last.
Flood conveyance	Where the vast majority of flood water flows through a floodplain and is typically deep and fast flowing during large flood events. Even partial blockage of flood conveyance areas would like cause significant redistribution of flood flow, or significant increase in flood levels.
Flood fringe	Parts of the floodplain that are farthest from the main river channel and flood conveyance areas. It is the remainder of the floodplain once flood conveyance and flood storage areas have been defined. Removal of flood fringe areas from the floodplain would have little overall impact on flood behavior.
Flood risk	The potential risk of flooding to people, their social setting, and their built and natural environment. The degree of risk varies with circumstances across the full range of floods and is determined from the probability of flooding and the consequences it causes.
Flood storage	Parts of the floodplain that fill up with floodwaters during a flood and temporarily detain the floodwaters, thereby slowing the progress of the flood and potentially lowering peak levels downstream.

Gauge classifications	The Bureau uses a three tiered classification scheme that defines flooding as minor, moderate, or major at key river height stations. Each classification is defined by water level that causes certain impacts upstream and downstream of the station. These levels have been determined based on standard descriptions of flood effects, historical data, and relevant local information. The classifications are revised from time to time by the Bureau's partner agencies and affected communities.
Habitable floor	Consistent with Building Code of Australia, Volume 2, Part 1.1, for residential properties the habitable floor areas are used for normal domestic activities and (a) Include a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room, home theatre and sunroom (b) Exclude a bathroom, laundry, pantry, lobby, clothes drying room, vehicle parking area or storage. For other land uses, a habitable area refers to that used for offices or to store valuable possessions susceptible to flood damage in the event of a flood.
Potential Hydraulic Risk	A combination of the likelihood of a flood event and the hazard level occurring. This is defined over a broad spectrum of likelihoods and hazards via a two-dimensional risk matrix. This represents the flood risk independent of use or occupancy of the land.