Schedule 1 – Sub-basins by Regional Planning Committee Area

Sub-basins in one RPC

Sub-basin	RPC
Balonne River Moonie River Macintyre & Weir Rivers Macintyre Brook Dumaresq River Maranoa River	Darling Downs
Settlement River Eight Mile Creek Lagoon Creek Cliffdale Creek Morning Inlet Mornington L Creek	Gulf Region
Endeavour River Hann River Jeannie River Kendall River Holroyd River Edward River Stewart River Lockhart River Archer River Coen River Watson River Embely River Mission River Wenlock River Misc Other Islands Pascoe River Torres Strait Island Olive River Ducie River Jacky Jacky River Skardon River McDonald River Jardine River Normanby River	No Regional Plan (Cape York)
Walsh River Tully River South Johnstone River North Johnstone River Russell River Daintree River Hinchinbrook Island Mulgrave River Barron River and Freshwater Creek Mossman River Murray River	Far North Queensland
Black River Bohle River Ross River Haughton River Barratta Creek	No Regional Plan (NQ)
Proserpine River Bowen River Pioneer River Plane River Whitsunday Island Isaac River O'Connell River	Whitsunday Hinterland and Mackay
Fitzroy River Waterpark Creek Shoalwater Curtis Island Comet River Calliope River	Central Queensland

Sub-basin	RPC
Lower Burnett River Elliott River Upper Burnett River Gregory River Isis River Burrum River Lower Mary River Barker & Barambah River Fraser Island	Wide Bay-Burnett
Bremer River Logan River Albert River Coomera & Nerang River Stanley River Caboolture River Stradbroke Island Moreton Island North Pine River South Pine River Maroochy River	South East Queensland
Paroo River Lake Frome	South West
Hay River	Central West

Sub-basins with two RPCs

Sub-basin	Applicable RPC
Cooper Creek	South West Central West
Bulloo River	South West Central West
Wallam Creeks	South West Darling Downs
Eyre Creek	Central West North West
Georgina River	Central West North West
Barcoo River	South West Central West
Boyne & Auburn Rivers	Darling Downs Wide Bay-Burnett
Lockyer Creek	SEQ Darling Downs
Upper Mary River	Wide Bay-Burnett SEQ
Noosa River	Wide Bay-Burnett South East Queensland
Mackenzie River	Central Queensland Whitsunday Hinterland and Mackay
Nicholson River	Gulf Region North West
Cloncurry River	Gulf Region North West
Norman River	Gulf Region North West
Saxby River	Gulf Region North West
Lower Burdekin River	No Regional Plan (NQ) Whitsunday Hinterland and Mackay

Sub-basin	Applicable RPC
Don River	No Regional Plan (NQ) Whitsunday Hinterland and Mackay
Herbert River	Far North Queensland No Regional Plan (NQ)
Palmer River	Far North Queensland No Regional Plan (Cape York)
Diamantina River	Central West North West
Baffle Creek	Central Queensland Wide Bay Burnett
Boyne River	Central Queensland Wide Bay Burnett
Styx River	Central Queensland Whitsunday Hinterland and Mackay
Coleman River	Gulf Region No Regional Plan (Cape York)
Staaten River	Gulf Region Far North Queensland
Kolan River	Wide Bay Burnett Central Queensland
Alice River	No Regional Plan (Cape York) Gulf Region

Sub-basins with three RPCs

Sub-basin	Applicable RPC
Suttor River	Central West No Regional Plan (NQ) Whitsunday Hinterland and Mackay
Warrego River	South West Central West Darling Downs
Nogoa River	Central West Central Queensland Whitsunday Hinterland and Mackay
Dawson River	Darling Downs Central Queensland Wide Bay Burnett
Brisbane River	South East Queensland Wide Bay Burnett Darling Downs
Leichhardt River	Gulf Region Central West South West
Mitchell River	Gulf Region Far North Queensland No Regional Plan (Cape York)
Condamine River	Darling Downs South East Queensland Wide Bay Burnett
Einasleigh River	Gulf Region Far North Queensland No Regional Plan (NQ)
Gilbert River	Far North Queensland Gulf Region North West

Sub-basins with 4 RPCs

Sub-basin	Applicable RPC
Flinders River	Gulf Region North West No Regional Plan (NQ) Central West
Thomson River	North West Central West Whitsunday Hinterland and Mackay No Regional Plan (NQ)
Upper Burdekin River	Far North Queensland North West Gulf Region No Regional Plan (NQ)
Sub-basins mapped with no IFAO - Lake Frome, Hay River	

Sub-basins not mapped

Caboolture River, Stradbroke Island, Moreton Island, Curtis Island, Fraser Island, Whitsunday Islands, Hinchinbrook Islands, South Pine River, North Pine River, Maroochy River and miscellaneous other islands

Schedule 2 – Flood investigation Level 2 step-by-step methodology

Please refer to http://www.qldra.org.au/publications-guides/land-use-planning/planning-for-stronger-more-resilient-flood-plains for the latest step-by-step methodology.

Schedule 3 – Terms of reference – Flood investigation Level 3

Flood investigation level 3
<Insert name of study area>

Project governance

The <*insert name of sub basin*> Flood Investigation sub committee has been established by the <*insert Regional Planning Committee*>. The project subcommittee oversees the project and provides advice to the <*insert the name of the Regional Planning Committee*>.

Objectives

The objective of the flood investigation level 3 is to comprehensively define the flood behaviour and hazards of the <*insert the name of the river*> and its associated sub-basin as shown on attached map <*insert map name/number*>, so that appropriate planning responses can be included in the <*insert planning scheme name*>.

The primary component of the investigation is estimation of flood discharges and Annual Exceedance Probabilities, for floods of various severities, and the estimation of water levels and velocities for those floods.

Rationale for flood investigation Level 3

This level of flood investigation has been selected because: <*insert the below options as appropriate*>

1. the study area covers developed/urban areas;
2. there is a medium to high rate of growth;
3. there is a history of repeated significant impacts of flooding in this area; and/or
4. the community resilience to floods is limited.

Data collection

The data collection phase is to compile available reports and historic information on floods in the study area, including the source of the material. This includes the QldRA mapping showing the Interim Floodplain Assessment Overlay, aerial photography, satellite imagery and other applicable local knowledge.

This will require consultation with a range of organisations including the Bureau of Meteorology, the Department of Environment and Resource Management and Department of Transport and Main Roads as well as local residents who have experienced flood events.

The digital data set provided by the Department of Environment and Resource Management for the Interim Floodplain Assessment Overlay mapping may be used as the base data.

The rationale for determining the level of topographic information collected is to be outlined. Topographic information (typically 0.1 to 0.3m vertical and 1 to 10m grid size) needs to be captured from aerial imagery and or field survey. The grid size should be determined to give a good representation of the areas of interest. Broader scale and resolution of data may be appropriate.

The specification for this topographic detail needs to be confirmed with a Registered Professional Engineer of Queensland due to the complexity of the investigations and the computer modelling to be developed.

A public consultation process is to be conducted to assist in finding all available information.
information.

Hydrologic analysis and flood frequency analysis

Determine the design discharge hydrograph and peak design discharges for a range of design floods across the <insert study area name> floodplain by undertaking hydrologic analyses. The design discharge hydrograph and peak design discharges are to be for the following design floods, 2%, 1% 0.5% and 0.2% AEPs and the PMF.

The size and nature of the study area, the availability of recorded flood and rainfall data will determine which method or combination of methods is most effective.

A calibrated hydrological model may be used to estimate design flood flows based on design rainfalls, checked by flood frequency analysis if possible.

The outcome is an estimate of design discharge hydrograph and peak design discharges.
The specification for range of design floods and the approach to be undertaken for the hydrologic analyses needs to be confirmed with an experienced flood modeller who is preferably a Registered Professional Engineer of Queensland due to the complexity of the investigations and the computer modelling to be developed.

Clearly state the rationale as determined by the Registered Professional Engineer of Queensland for the approach undertaken for the hydrologic analyses of design floods. This may include consideration of the data available, the complexity of the investigations and the computer modelling developed.

Hydraulic analysis

Determine the flood behaviour in terms of water levels, velocities and the extent of flooding for the range of design floods being considered.

This may be undertaken using a 1-dimensional (1D), 2-dimensional (2D) or 3-dimensional (3D) model hydraulic model to represent the design discharge hydrographs and peak design discharges for the design floods.

The model is to be calibrated to historical flood events.

The rationale as determined by the Registered Professional Engineer of Queensland for the approach undertaken for the hydraulic analyses should be outlined. This may include consideration of the data available, the complexity of the investigations and the computer modelling developed

Climate change

Climate change is to be incorporated using the "*Increasing Queensland's resilience to inland flooding in a changing climate: Final report on the Inland Flooding Study*", and specifically how the following climate change factors for increased rainfall intensity. The climate change factors are - a 5 per cent increase in rainfall intensity per degree of global warming. This 5 per cent increase in rainfall intensity per degree of global warming can be incorporated into the 2%, 1%, 0.5% and 0.2% Annual Exceedance Probability (AEP) flood events. For the purpose of applying this climate change factor, use the following temperature increases and planning horizons: 2^{o}C by 2050, 3^{o}C by 2070 and 4^{o}C by 2100.

Accounting for uncertainty

The uncertainty related to the output from this flood investigation is to be outlined.

The degree of uncertainty in the definition of flood behaviours is dependent on the quality and the quantity of topographic, rainfall, streamflow and flood data. The uncertainty relates to the quality of this data.

The grid size and vertical accuracy of topographic information is to be outlined. This will include recognition of the type of any development to be assessed.

Outline if a sensitivity analysis was used to test the significance of errors in relevant data inputs and assumptions.

Deliverables

The flood study is to produce maps showing the extent of various design flood flows (at a range of AEPs – 2%, 1% 0.5% and 0.2% and the PMF), and low/medium/high hazard areas based on depths and velocities across the study area. Determination of low/medium/high hazard areas should be made with reference to the best practice categorisation of these hazard areas relative to at least flood height and velocity.

A computer model is to be made available to enable assessment of new development (where size of development is greater than the distance between cross-sections).

Schedule 4 - Flood hazard criteria

Indicative flood hazard criteria

The following indicative flood hazard criteria have been prepared for use in preparing flood investigations (level 2), and planning evaluations based on latest available engineering guidance. In the absence of other more appropriate flood hazard definitions, the criteria below may be used.

Depth (m)

2.2	0.2	0.4	0.7	0.9	1.1	1.3	1.5	1.8	2	2.2	2.4	2.6	2.9	3.1	3.3	3.5	3.7	4	4.2	4.4	4.6	4.8
2.1	0.2	0.4	0.6	0.8	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.2	3.4	3.6	3.8	4	4.2	4.4	4.6
2	0.2	0.4	0.6	0.8	1	1.2	1.4	1.6	1.8	2	2.2	2.4	2.6	2.8	3	3.2	3.4	3.6	3.8	4	4.2	4.4
1.9	0.2	0.4	0.6	0.8	1	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3	3.2	3.4	3.6	3.8	4	4.2
1.8	0.2	0.4	0.5	0.7	0.9	1.1	1.3	1.4	1.6	1.8	2	2.2	2.3	2.5	2.7	2.9	3.1	3.2	3.4	3.6	3.8	4
1.7	0.2	0.3	0.5	0.7	0.9	1	1.2	1.4	1.5	1.7	1.9	2	2.2	2.4	2.6	2.7	2.9	3.1	3.2	3.4	3.6	3.7
1.6	0.2	0.3	0.5	0.6	0.8	1	1.1	1.3	1.4	1.6	1.8	1.9	2.1	2.2	2.4	2.6	2.7	2.9	3	3.2	3.4	3.5
1.5	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.7	1.8	2	2.1	2.3	2.4	2.6	2.7	2.9	3	3.2	3.3
1.4	0.1	0.3	0.4	0.6	0.7	0.8	1	1.1	1.3	1.4	1.5	1.7	1.8	2	2.1	2.2	2.4	2.5	2.7	2.8	2.9	3.1
1.3	0.1	0.3	0.4	0.5	0.7	0.8	0.9	1	1.2	1.3	1.4	1.6	1.7	1.8	2	2.1	2.2	2.3	2.5	2.6	2.7	2.9
1.2	0.1	0.2	0.4	0.5	0.6	0.7	0.8	1	1.1	1.2	1.3	1.4	1.6	1.7	1.8	1.9	2	2.2	2.3	2.4	2.5	2.6
1.1	0.1	0.2	0.3	0.4	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5	1.7	1.8	1.9	2	2.1	2.2	2.3	2.4
1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2	2.1	2.2
0.9	0.1	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.8	1.9	2
0.8	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.6	0.7	0.8	0.9	1	1	1.1	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.8
0.7	0.1	0.1	0.2	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.8	0.8	0.9	1	1.1	1.1	1.2	1.3	1.3	1.4	1.5	1.5
0.6	0.1	0.1	0.2	0.2	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.8	0.8	0.9	1	1	1.1	1.1	1.2	1.3	1.3
0.5	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.9	0.9	1	1	1.1	1.1
0.4	0	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9
0.3	0	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.7
0.2	0	0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4
0.1	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	0.1	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**	**1**	**1.1**	**1.2**	**1.3**	**1.4**	**1.5**	**1.6**	**1.7**	**1.8**	**1.9**	**2**	**2.1**	**2.2**

Velocity (m/s)

Extreme Hazard
High Hazard
Significant Hazard
Low Hazard

Rules

	Low	Significant	High	Extreme
Depth	<0.5	<2	<2	2+
Velocity	<1.5	<2	<2	2+
DxV Ratio	<0.6	0.6 to <0.8	0.8 to <1.2	1.2 +

Rationale

1. **Low** – self evacuation possible for adults and children, vehicle stability within tolerance for large 4WD
2. **Significant** – working limit for trained safety workers, Vehicle evac unsuitable, Building Code limitation
3. **High** – limit of uncompromised stability for adults (dangerous to most)
4. **Extreme** – in excess of known stability limits

References

1. ARR Revision Project 10: Appropriate Safety Criteria for People
    a. Children – Significant Hazard DV ≤ 0.6 & D ≤ 0.5
    b. Adult – Moderate Hazard DV ≥ 0.6
    c. Working limit for trained safety workers or experienced and well equipped persons DV < 0.8
2. ARR Revision Project 10 State 2 Report: Appropriate Safety Criteria for Vehicles (Draft)
    a. Large 4WD DV ≤ 0.6 & D ≤ 0.5
3. Dale et al. (2004) Structural flood vulnerability and the Australianisation of Black's Curves
    a. Fibro/Tile construction D < 0.5 & V < 2
    b. Draft QDC for flood hazard areas for Deemed to Satisfy provisions – V < 1.5
4. BMT WBM (2012) Newcastle City-wide Floodplain Risk management Study and Plan P.81-82
    a. Hydraulically suitable for wading by able-bodied adults V < 2 & D < 0.8
    b. Hydraulically suitable for light construction (e.g. timber frame and brick veneer) V < 2 and D < 2
5. Jonkman et al. (2008) Methods for the estimation of loss of life due to floods: A literature review and proposal for a new method Natural Hazards P. 364
    a. Level of hazard to people can be categorized as low, moderate, significant or extreme.