



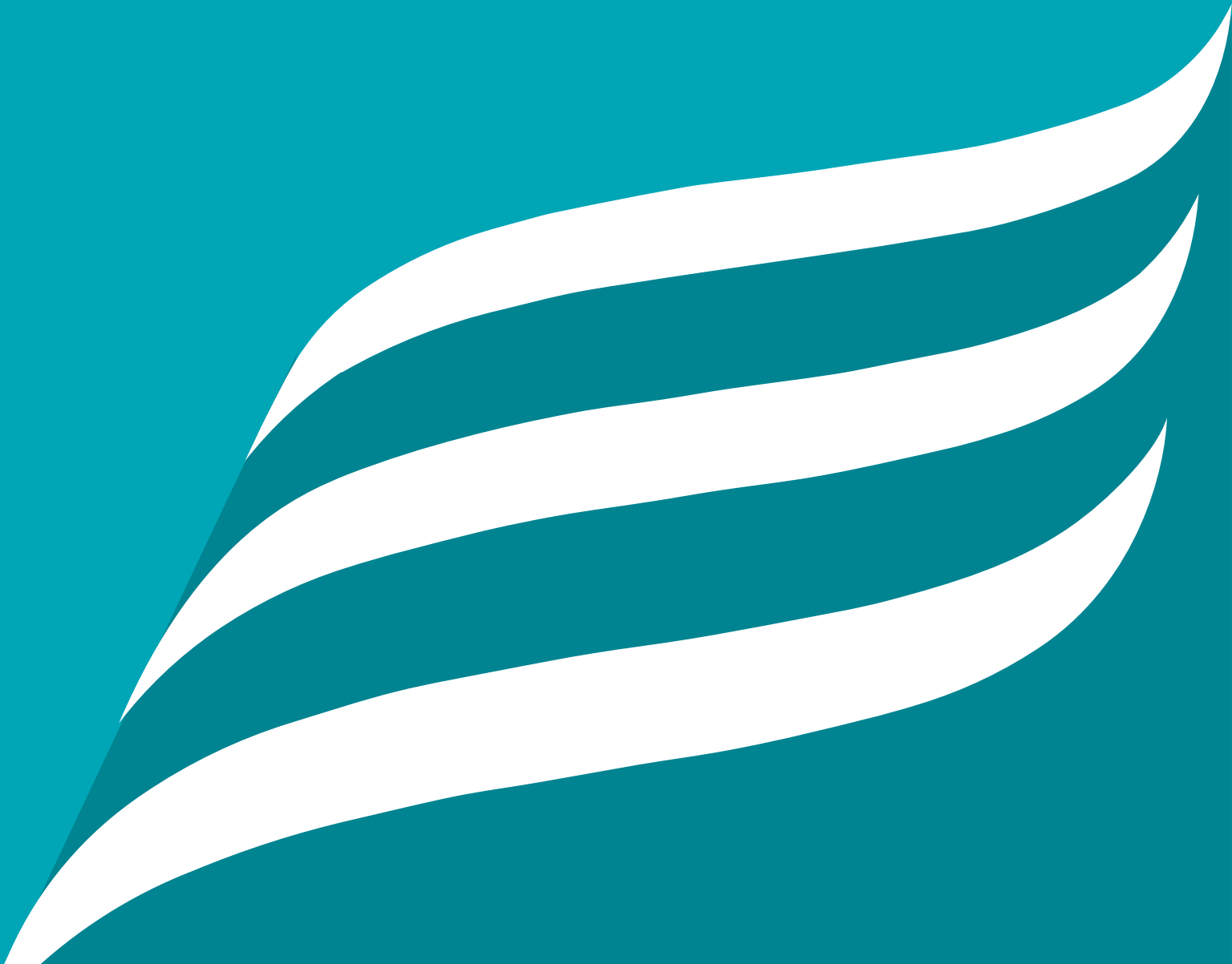
BYRON SHIRE COUNCIL

Byron Shire Overland Flood Study

Summary Report

BBNE00116_0018-REP-002-0

11 JUNE 2026



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1. CONTEXT

This is a concise summary of the more detailed *Byron Shire Overland Flood Study Report* (Ref: BBNE00116_0018-REP-001-1). The following subsections outline the types of flooding experienced within Byron Shire, provide background to the Byron Shire Overland Flood Study, and describe the study area. This establishes the context for understanding local overland flood risks and the study approach.

1.1 Types of Flooding

Flooding can occur in a variety of forms depending on its source, how it is conveyed, and the pathways it follows across the landscape:

- **Regional (riverine) flooding:** is defined as the covering of normally dry land by water that has escaped or been released from the normal confines of any lake, river, creek or other natural watercourse.
- **Stormwater:** is rainwater that has not yet entered a watercourse or soaked into the ground. Stormwater is managed to ensure that stormwater flows cause minimal nuisance, danger and damage to people, property and the environment.
- **Local overland flow (LOF):** is stormwater runoff that travels across land before reaching a watercourse or stormwater network. It can also occur when stormwater infrastructure is blocked or overwhelmed. In rural areas, LOF happens during short storms in depressions and intermittent creeks, influenced by landform, rural roads, and cross drainage. In urban areas, LOF, often called 'flash flooding', is shaped by development and the capacity of stormwater drainage systems.

Figure 1.1 demonstrates the difference between overland flow and regional flood.

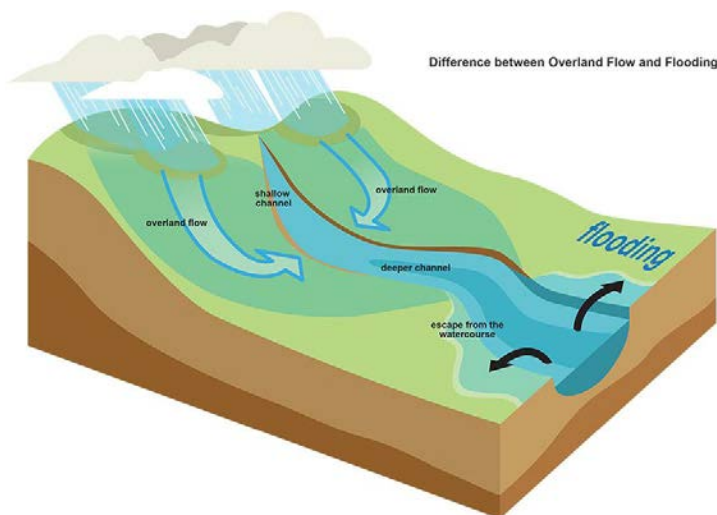


Figure 1.1: Difference Between Overland Flow and Regional Flood (Sunshine Coast Council, 2026).

1.2 Byron Shire Overland Flood Study

Following the significant March 2022 rainfall event, both residents and Byron Shire Council (BSC) have a renewed focus on local overland flood (LOF) risk within the Local Government Area (LGA). While regional catchment (riverine) flooding in Byron Shire is relatively well understood and addressed in existing Flood Risk Management Studies and Plans such as those for North Byron and the Tallow and Belongil Creek catchments, these do not cover overland flooding. To date, information relating to local overland flooding has been limited.

To address this gap, Engeny Australia was engaged to undertake the Byron Shire Overland Flood Study (OFS). The OFS analyses LOF across rural and selected urban areas in the LGA, aiming to improve understanding of overland flow, extend flood mapping beyond riverine extents, and inform future LOF risk management. For areas where the overland flow mapping overlaps with Council's regional flood mapping, planning controls should be based on the higher of the two peak flood levels, regardless of whether the flooding originates from overland flow or regional flood sources.

This summary report provides background on overland flooding in the Shire, details the hydraulic modelling methodology and results, outlines preliminary mitigation options for LOF hotspots, and supports future Council decision-making through the development of flood constraint mapping.

1.3 Study Area

Byron Shire, located on the far north coast of NSW and bordering Tweed, Lismore, and Ballina LGAs, covers 556 km² and has over 38,000 residents. The OFS models the entire Byron Shire LGA, as outlined in Figure 1.2, to improve understanding of overland flow and assess local flood impacts.

Detailed urban local overland flow (LOF) modelling was undertaken for Ocean Shores, New Brighton, South Golden Beach, Brunswick Heads, Mullumbimby, Ewingsdale and Federal Village. The remainder of the LGA was categorised as rural LOF areas and modelled using a broader-scale approach across four catchments: North Byron, South Byron, Wilsons River and Coopers Creek. The urban and rural LOF model areas have been demonstrated in Figure 1.2.

Some urban areas, such as Bangalow, Byron Bay, and Suffolk Park, were not included in this study's detailed modelling, as they are covered by separate ongoing or completed flood studies. These areas are, however, included within the broader rural LOF areas.

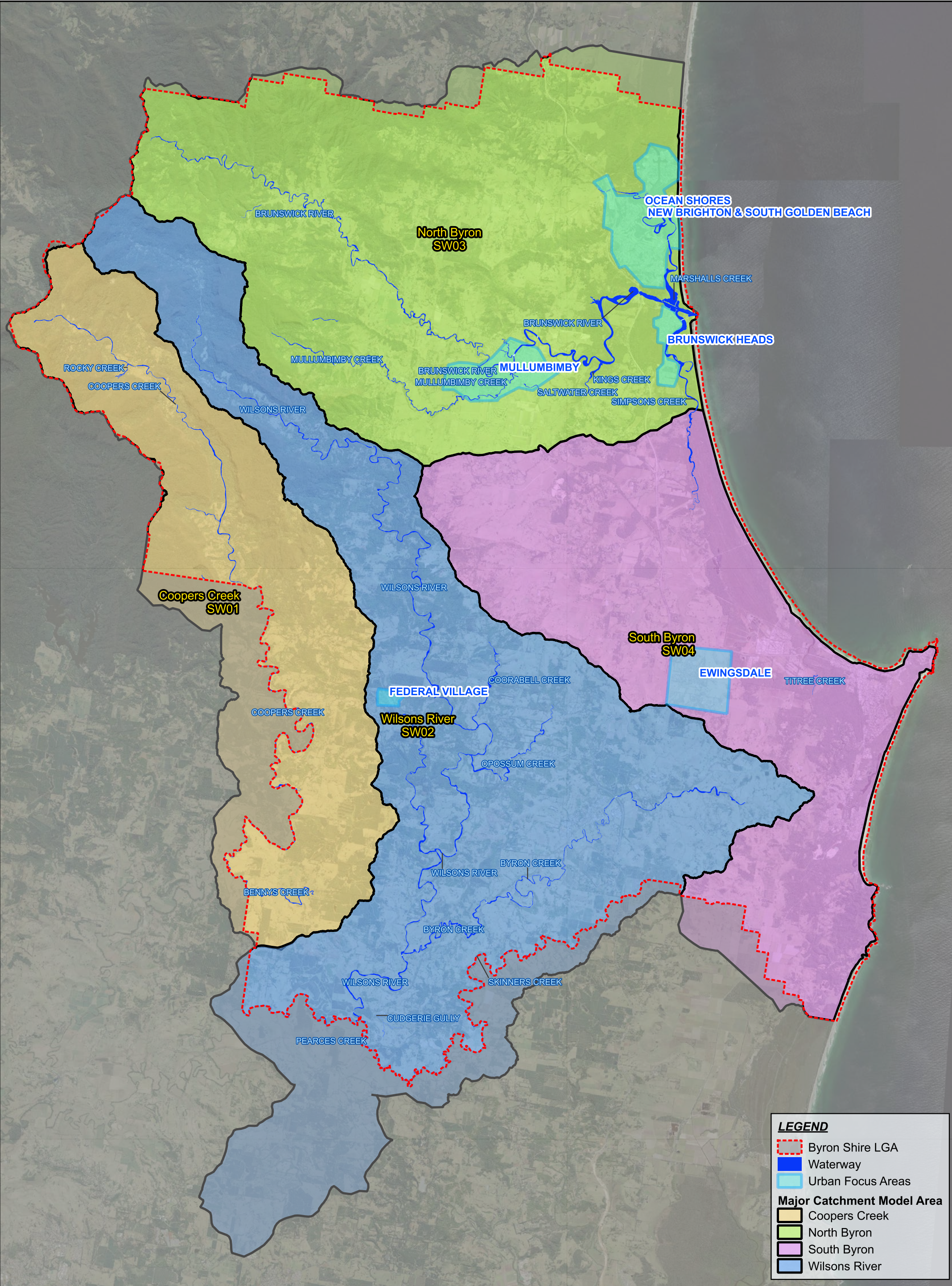
1.4 Historic Data and Community Information

Overland flood events are often under-recorded due to their localised, short-lived nature and occurrence outside formal monitoring networks (e.g., river gauge systems). Overland flow develops rapidly from intense rainfall and affects scattered locations, making systematic measurement and real-time monitoring difficult. Historical records mostly rely on anecdotal reports, insurance claims, and post-event surveys, which are often incomplete or inconsistent. Smaller or less damaging events are also less likely to be reported, further contributing to gaps within the available dataset.

The following datasets were provided by Council to undertake model verification:

- **February and March 2022 Event:** A database of 177 submissions was provided, containing flood locations, dates, times, behaviour, and some photos or videos. Most incidents related to regional flooding, but the data was reviewed to identify potential local overland flooding areas and support model verification.
- **Council's Flooding Complaints Database:** Council provided an internal database with 133 submissions across Byron Shire, spanning several years. It records flooding of properties and roads, as well as stormwater infrastructure issues. This information was reviewed and used to support model verification and hotspot identification.

To ground-truth the hydraulic model, hotspots, and flood constraint mapping described in the following sections, community feedback will also be sought through Community Feedback Sessions and Project Exhibition scheduled for the second half of 2026. Figure 2.1 illustrates where community data is incorporated within the OFS methodology.



LEGEND

Byron Shire LGA

Waterway

Urban Focus Areas

Major Catchment Model Area

Coopers Creek

North Byron

South Byron

Wilsons River

R DETAILS		DATE	© COPYRIGHT Engeny This drawing is confidential and shall only be used for the purpose of this project.				 0 1 2 km SCALE @ A3 - 1:110,000 GDA2020 / MGA zone 56	DISCLAIMER Engeny has endeavoured to ensure accuracy and completeness of the data. Engeny assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map. DATA SOURCE QLD Government Open Data Source			Figure 1.2: Study Area Byron Shire Council Byron Shire Overland Flood Study Drg Ref.
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2. DEFINING OVERLAND FLOOD BEHAVIOUR

Hydraulic modelling was undertaken using computer-based simulations to represent the movement of water through natural and built environments, supporting the prediction of flood behaviour and the development of effective management strategies. The modelling was undertaken in accordance with current best-practice guidance, including Australian Rainfall and Runoff (ARR v4.2).

2.1 Study Approach

Figure 2.1 summarises the approach undertaken to investigate overland flooding across Byron Shire, from collecting relevant data, building the flood models through to identifying flood hotspots, assessing preliminary mitigation options and preparing flood constraint mapping.

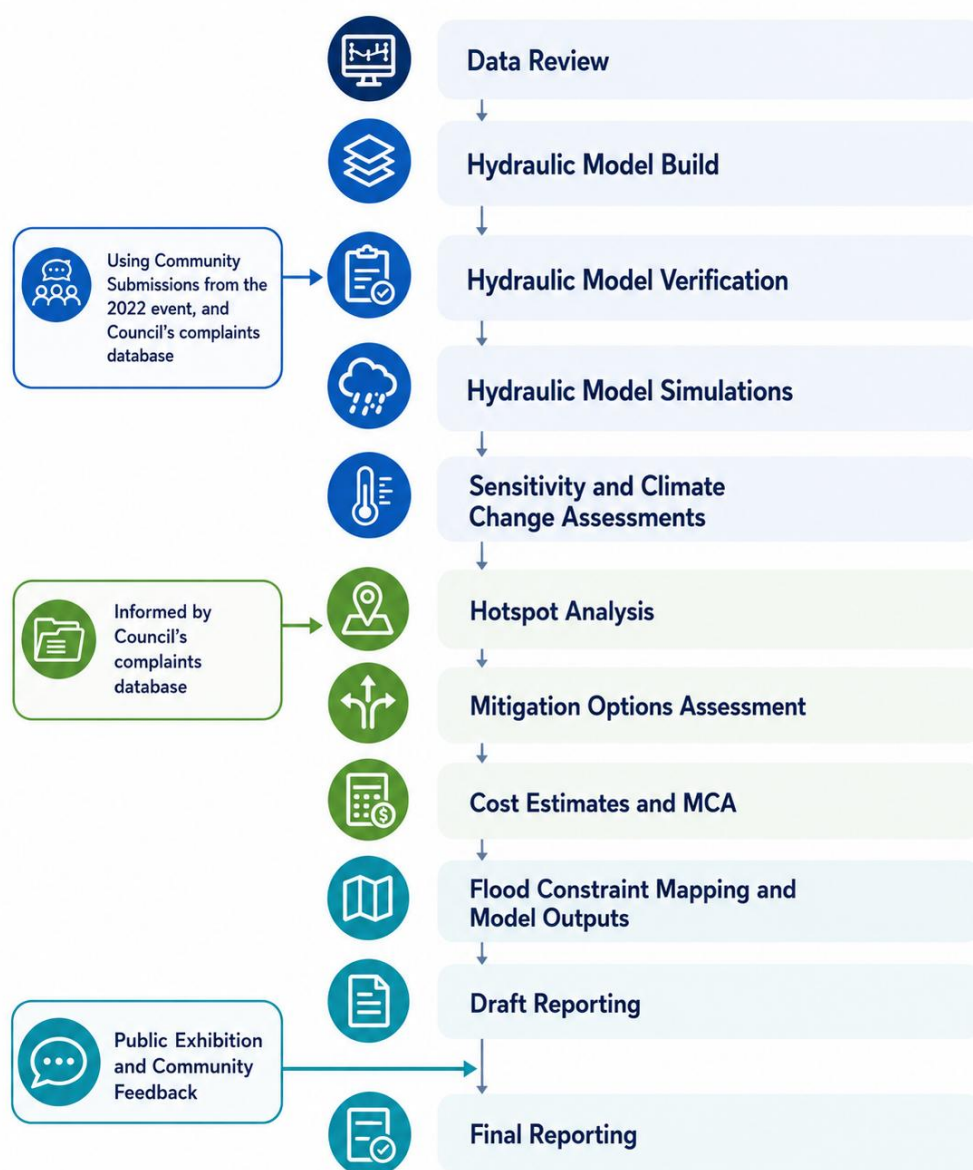


Figure 2.1: Study Approach and Incorporation of Community Data

2.2 Model Extents

A key outcome of this study is a better understanding of overland flow across Byron Shire and a detailed assessment of flooding impacts in selected urban townships. Therefore, the project area was modelled using two approaches:

- **Urban Local Overland Flooding (LOF)** areas are defined as the seven selected townships identified by Council where a higher level of modelling detail is required. These townships include:
 - Ocean Shores
 - New Brighton
 - South Golden Beach
 - Brunswick Heads
 - Mullumbimby
 - Ewingsdale
 - Federal Village
- **Rural Local Overland Flooding (LOF)** areas are defined as the remaining areas outside the selected urban LOF areas, where flood extent mapping is required but at a lower level of detail than for urban LOF areas. The Rural LOF areas were modelled within a total of four TUFLOW models which encompass the major contributing catchments. These catchments include:
 - North Byron (includes major watercourses such as Brunswick River, Mullumbimby Creek and Marshalls Creek)
 - South Byron (includes watercourses such as Simpsons Creek)
 - Wilsons River
 - Coopers Creek.

2.3 Model Results

The hydraulic models using TUFLOW software were simulated 50%, 20%, 10%, 5%, 2%, 1% AEP events, and the PMF, using multiple storm durations and ten temporal patterns for each event. Results were merged to create a “design flood envelope” by extracting and comparing peak flood levels, depths, and velocities at each grid cell, adopting the highest value for each characteristic.

Hydraulic categories, based on the NSW Flood Function Guideline FB02 (2023), classify flood behaviour as the following:

- Floodway / Overland Flow: Transmits large quantities of water.
- Flood storage: Stores significant water volume.
- Flood fringe: Plays a minor role in storage or conveyance.

To define overland flooding (floodway), filtering parameters were developed collaboratively with Council through workshops, where preferred criteria were selected. The filtered results formed the flood constraint mapping described in Section 4.

2.4 Description of Flood Behaviour

Flood behaviour in the Study Area is generally characterised by shallow overland flow in upper catchments, occurring when stormwater drainage is exceeded by local runoff. In lower catchments, major overland flow paths form as upstream catchments grow larger. Significant flooding tends to occur where major flow paths are not aligned with roads, easements, or are in local depressions.

During smaller floods (50% to 10% AEP events), overland flow is mostly contained within waterways and roadways. In larger events (5% AEP events and greater), property inundation occurs when overland flow drains through properties or when roadway flow overtops kerbs and enters properties.

2.5 Climate Change Assessment

A climate change assessment was conducted for medium (2050) and long-term (2100) horizons. Climate change scenarios were applied to the 1% AEP event for the critical duration and temporal pattern envelope:

- 1% AEP SSP2 - 4.5 Medium Term Planning Horizon (nominally 2050).
- 1% AEP SSP2-4.5 Long Term Planning Horizon (nominally 2100).

3. HOTSPOTS

The following subsections describe the identification of local overland flow (LOF) hotspots within Byron Shire, summarise the preliminary mitigation measures investigated to address flooding, and provide guidance to Council on prioritising further investigation of these measures.

3.1 Hotspot Identification

This section explains the methodology used to identify flooding hotspots and presents the associated findings. Across the study area, properties were identified as being impacted by overland flooding both within and outside of the defined hotspot areas. The non-hotspot affected properties are generally dispersed rather than concentrated along major flow paths.

Hotspots represent locations where overland flooding impacts are most severe, typically characterised by impacts extending across multiple properties and occurring across a range of flood magnitudes, including more frequent events. The study prioritised these areas as they present the greatest opportunity to achieve material reductions in risk and benefits to the most impacted communities. As such, the investigation of mitigation options focused primarily on hotspot locations.

Hotspots were determined through analysis of overland flood modelling, flood exposure assessment (FEA), and review of Council's flooding database. Identified hotspots and preliminary mitigation options were collaboratively reviewed with Council to ensure accuracy. The mitigation options are preliminary recommendations and require further assessment and design before implementation.

Hotspots were selected based on major overland flow paths, areas impacted by a range of flood magnitudes (including frequent events like the 50% AEP), locations with multiple affected properties during significant floods (1% AEP or more frequent), and known or reported flooding incidents. Only overland flooding was considered; regional riverine flooding was excluded.

Mitigation options were tailored to the critical AEP event at each hotspot, typically the 5% AEP, except for Hotspots 6 and 7, which focused on the 1% AEP event. The flood exposure assessment quantified properties at risk by combining flood modelling and floor level survey data across various flood scenarios.

3.2 Hotspot Locations and Mitigation Options

A detailed assessment identified seven key flooding hotspots within the study area, each affected by localised drainage constraints, overland flow, or insufficient stormwater infrastructure. For each hotspot, preliminary mitigation options were developed and modelled to address the primary causes of flooding and reduce impacts to affected properties.

The effectiveness of these options was evaluated in terms of flood level reduction, with some hotspots achieving more significant improvements while others showed only limited benefit due to broader catchment or regional flooding influences. Recommendations for future actions, such as integrating Water Sensitive Urban Design (WSUD) features and implementing performance-based fill controls, were also provided to further manage flood risk and enhance resilience. Table 3.1 summarises this assessment.

Section 7.3 of the *Byron Shire Overland Flood Study Report* (Ref: BBNE00116_0018-REP-001-1) provides further detail on the layouts of the preliminary mitigation options and the associated reductions in flood levels resulting from their implementation.

TABLE 3.1: HOTSPOT LOCATION, MITIGATION OPTIONS AND OUTCOMES

ID	Location	No. of Properties Affected	Mitigation Option	Flood Level Reduction	Comments
1	Parkway Drive, Ewingsdale	3	Upgrade culvert crossing (from 2 to 4 RCBCs), formalised channel works	Up to 0.3 m upstream, 50–200 mm on properties	Minor downstream afflux (up to 30 mm); WSUD features recommended
2	Coomburra Crescent, Ocean Shores	12	Acquire a property on Coomburra Crescent, build 17 m channel, upgrade Yamble Drive drainage, add inlet pits	100–160 mm on Coomburra Crescent, 50 mm on surrounding properties	Some flood levels remain above floor; downstream afflux up to 40 mm; WSUD features recommended
3	Fingal Street, Brunswick Heads	3	Additional stormwater network along Fingal Street	200–260 mm at hotspot, 30–60 mm along pipeline	–
4	New City Rd/Hollingsworth Ln, Mullumbimby	4	New twin 0.6 m pipes along Hollingsworth Lane	Up to 200 mm (short events), 15 mm on Queen St	Limited benefit for 5% AEP due to regional flooding; consider fill controls for future development
5	Rajah Rd, Ocean Shores	4	New stormwater pipe network (progressively increasing size)	40 mm at hotspot, 50–100 mm on Rajah Rd/Bindaree Way	Downstream afflux up to 100 mm
6	Yelgun Creek, South Golden Beach	2	Upgrade pipes, extra pits, pump system	260 mm across area (1% AEP)	Properties still inundated; consider fill controls for future development
7	Palmer Avenue, South Golden Beach	5	Bund and detention basin to divert flow	200–300 mm at hotspot (1% AEP)	Afflux up to 60 mm on Palmer Ave, 30 mm downstream; consider bioretention basins

3.3 Cost Estimates and Prioritisation

Preliminary cost estimation was undertaken to provide an indication of the capital cost of each mitigation option identified. The assumptions and exclusions used to develop these costs are provided in Section 7.4 of the *Byron Shire Overland Flood Study Report* (Ref: BBNE00116_0018-REP-001-1).

TABLE 3.2: COST SUMMARY (2026 AU \$)

Hotspot Location	Total Cost of Mitigation Option
Parkway Drive, Ewingsdale	\$740,000
Coomburra Crescent, Ocean Shores	\$700,000
Fingal St, Brunswick Heads	\$1,500,000
New City Road / Hollingsworth Lane, Mullumbimby	\$1,100,000
Rajah Rd, Ocean Shores	\$1,110,000
Yelgun Creek, South Golden Beach (From WAS, 2020)	\$5,600,000
Palmer Avenue, South Golden Beach	\$2,620,000

A Multi-Criteria Analysis (MCA) was undertaken to assist Council in prioritising the preliminary mitigation options for further investigation and funding. The MCA evaluated each option against economic (capital cost, flood reduction, feasibility), social (improved road access), and environmental (impacts on flora, fauna, and the public domain) criteria. Each criterion was scored according to a system detailed in Section 7.5 of the *Byron Shire Overland Flood Study Report* (Ref: BBNE00116_0018-REP-001-1), with the results guiding the following prioritisation of the mitigation options:

1. Option 2: Coomburra Crescent, Ocean Shores
2. Option 4: New City Road / Hollingsworth Lane, Mullumbimby
3. Option 5: Rajah Rd, Ocean Shores
4. Option 1: Parkway Drive, Ewingsdale
5. Option 6: Yelgun Creek, South Golden Beach
6. Option 3: Fingal St, Brunswick Heads
7. Option 7: Palmer Avenue, South Golden Beach.

4. OUTCOMES AND APPLICATIONS

This section presents broadscale tools and strategies developed to support Council in managing risks associated with overland flooding in the Shire, including flood constraint mapping, flood planning controls, and asset and risk management approaches for infrastructure within Byron Shire.

4.1 Flood Constraint Mapping

Flood constraint mapping, which considers the extent and hazard of overland flooding, has been developed to support Council in managing development and infrastructure within flood-prone areas. These mapping tools can trigger further assessment for development applications and help communicate flood risk to the community. Mapped flood areas are classified as High, Medium, or Low risk based on flood hazard and the associated risk to people and property, which in turn can guide the application of flood-related development controls. Most of the study area is classified as Low or Medium Flood Risk, with High Flood Risk areas generally confined to low-lying land near major watercourses and creeks.

4.2 Flood Planning

Flood planning is a critical tool for managing both regional and overland flooding by regulating land development in flood-prone areas. It aims to ensure that new developments do not obstruct natural overland flow paths or increase runoff and flood impacts. By carefully managing the location, density, and design of development, flood planning helps reduce residents' exposure to flood risk.

In the Byron Shire LGA, flood planning is implemented through the *Byron Shire Development Control Plan 2014 Chapter C2 Areas Affected by Flood*, adopted in May 2025. This DCP provides specific guidance on development controls, such as minimum fill and floor levels, for different types of buildings, such as critical facilities. The DCP applies to all land below the Probable Maximum Flood (PMF) extent, ensuring that development in these areas is designed to minimise flood risk and maintain safe overland flow paths.

Flood levels referenced in the DCP include:

- 1% AEP level for 2100 climate change conditions.
- Probable Maximum Flood (PMF) level.
- 5% AEP level.
- Projected 2050 Flood Planning Level (1% AEP event with 2050 climate change allowances plus 0.5 m freeboard).
- Projected 2100 Flood Planning Level (1% AEP event with 2100 climate change allowances plus 0.5 m freeboard).

These levels were defined using OFS Flood Constraint Mapping, which extends Council's regional flood mapping and informs development assessment and design. Where overland and regional flood mapping overlap, the highest flood level from either source should guide planning controls.

4.3 Asset and Risk Management

The outcomes of flood constraint mapping can be used to assess flood exposure for various types of infrastructure, including sewerage treatment plants, sewer pump stations, electrical and telemetry assets, emergency access routes, and critical facilities such as hospitals. This mapping identifies which assets are located within flood-affected areas and assesses their potential exposure during flood events.

Additionally, the mapping supports asset management by providing a foundation for risk screening, helping to identify and prioritise infrastructure that may be more vulnerable to flooding. This enables Council to plan and implement mitigation, upgrades, or maintenance works where necessary.